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학회장 인사말

2013년도 춘계학술대회를 맞이하여

회원 여러분 안녕하십니까?

쌀쌀했던 겨울도 물러나고 생동감 넘치는 봄을 맞이하고 있습니다. 회원 여러분께서 보다 활기차고 건강한 봄을 맞이하시기를 기원합니다.2013년도 춘계학술대회는 "창조적 의공학의 미래: Towards smallness in biomedical diagnosis and therapy" 라는 주제를 정해 구미로 회원 여러분을 초대하게 되었음을 매우 기쁘게 생각합니다.

본 학회는 1979년 창설된 이래로 우리나라의 융합 연구에 중심에서 의학과 공학이 함께 노력하여 의공학 연구를 진행하여 왔습니다. 또한 첨단 BT, NT, IT 기술의 융합 연구의 결과물로 의료에 진단과 치료에 다양한 의용생체공학 연구를 진행하였으며, 특히 HT 라는 새로운 기술을 창조 하였습니다. 이러한 바탕위에 의용생체공학회의 모든 선후배 회원님들의 노력과 창조적인 연구로 의료기기산업을 선도함으로써 국가발전을 위한 초석이 되리라는 것을 기대하고 있습니다.

이번 춘계학회에서는 첨단 의료기술이 소형화 다각화 되는 주제로 앞으로 나아가야 할 창조적인 의공학의 미래에 대하여 학문적 분석과 토론을 전개해 보려고 합니다. 이번 학술대회에 회원여러분들께서 빠짐없이 참석하시어 우리나라 의공학의 리더로서 확고한 자리매김 할 수 있는 행사로사의 역할을 다했으면 하는 바램을 가져봅니다.

학술대회 준비에 큰 도움을 주신 금오공과대학교와 구미시 그리고 학회 임원진께 진심으로 감사를 표합니다.

감사합니다.

2013년 5월

대한의용생체공학회 제47회 춘계학술대회
회 장 선 경 올림

조직위원장 인사말

2012년도 추계학술대회를 맞이하여

구미 국가산업단지는 IT산업 기반확충과 육성을 위하여 1969년에 조성되어 IT산업이 우리나라의 대표산업으로 자리매김하는데 지대한 공헌을 하고 있습니다. 최근에는 IT산업을 기반으로 IT융합 분야로 업종다각화를 위하여 지식경제부의 국책사업인 “전자의료기기 부품소재 산업화 기반구축사업”을 유치하여, 구미산업단지가 향후 의료기기 산업발전에 중추적인 역할을 하기 위하여 노력하고 있습니다.

한편, 금오공과대학교는 박정희 대통령께서 구미국가산업단지의 발전을 위한 교육기관 설립을 지시하시어 1980년 개교하여, 국가 IT산업을 이끌 인재양성과 실용연구를 지원하고 있습니다. 차세대 국가 성장동력인 의료기기 산업분야를 지원하기 위하여 2011년에는 첨단의료기기연구소를 설립하였으며, 메디컬IT융합공학과를 개설하여 의료기기산업을 이끌어 갈 창조적 전문인력을 양성하고 있습니다.

이에 대한의용생체공학회 춘계학술대회를 개최하게 된 것을 금오공과대학교와 구미시를 대신하여 회원 여러분들께 감사를 드립니다. 부디 많은 분들이 참석하셔서 산업현장과 어우러진 금오산과 낙동강의 멋진 자연도 감상하시고, 풍성한 학문적인 교류도 이루시길 바랍니다.

2013년 5월

대한의용생체공학회 제47회 춘계학술대회
조직위원장 김 상 희 배상

대한의용생체공학회 제20대 임원

직 책	성 명	소 속
명예회장	조진호	경북대
회 장	선 경	고려대
수석부회장	박광석	서울대
부회장	송시영	연세대
감 사	윤영로	연세대
	허 영	한국전기연구원
총 무	이성호	고려대
	이원진	서울대
기 획	김인영	한양대
	김희찬	서울대
학 술	문치웅	인제대
	최영빈	서울대
	김상희	금오공대
편 집	이상훈	고려대
	이재성	서울대
	이경중	연세대
간 행	박현진	성균관대

직 책	성 명	소 속
교 육	김동욱	전북대
	지영준	울산대
	김주명	광양대
산학협력	박희병	한국의료기기협동조합
	강태건	한국의료기기산업협회
	최보영	가톨릭대
	홍성화	삼성서울병원
국제협력	김법민	고려대
	김태성	경희대
재 무	김명남	경북대
	김성민	동국대
정 보	안원식	서울대
	노정훈	부산대
	임영진	서울대
회원관리	김한성	연세대
	이상민	인하대
협 력	김윤년	계명대
	최귀원	KIST
	이두용	KAIST

정보위원회

직 책	성 명	소 속
정보이사	노정훈	부산대
정보이사	임영진	서울대
정보이사	안원식	서울대
위원	서광석	서울대

직 책	성 명	소 속
위원	최성욱	강원대
위원	신범주	부산대
위원	정동근	동아대

학술위원회

직 책	성 명	소 속
학술이사	문치웅	인제대학교
학술이사	최영빈	서울대학교
학술이사	김상희	금오공과대
위원	강현욱	부경대
위원	김필한	KAIST
위원	남윤기	KAIST
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위원	박중열	중앙대
위원	박지호	KAIST
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위원	성준경	고려대
위원	양 성	광주과기원

직 책	성 명	소 속
위원	유형석	울산대학교
위원	유홍기	한양대
위원	윤종인	대구카톨릭
위원	이수홍	차의과대학
위원	임기무	금오공대
위원	임도형	세종대
위원	임창환	한양대
위원	장동표	한양대
위원	전상범	이화여대
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위원	천홍구	고려대
위원	최연호	고려대
위원	한동욱	부산대학교
위원	허동은	서울대
위원	허찬영	서울대
위원	황도식	연세대

교육위원회

직 책	성 명	소 속
교육이사	김동욱	전북대
교육이사	김주명	광양보건대
교육이사	지영준	울산대
위원	권기진	영남이공대
위원	권춘기	순천향대
위원	김덕현	광주대
위원	김성민	동국대
위원	김영곤	인제대
위원	김윤년	계명대
위원	김인영	한양대
위원	김정래	을지대
위원	김형훈	광주여자대
위원	김휘영	동주대
위원	나승권	폴리텍대학(원주)
위원	박준식	강릉영동대
위원	박해암	남부대
위원	서종범	연세대
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위원	심은보	강원대
위원	오대호	한림성심대

직 책	성 명	소 속
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위원	오정환	부경대
위원	원철호	경일대
위원	윤종인	대구가톨릭대
위원	이기영	관동대
위원	이동훈	동명대
위원	이석재	서남대
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위원	이정환	건국대
위원	이주원	안동과학대
위원	임용규	상지대
위원	임재근	강동대
위원	정광손	상지영서대
위원	조성보	가천의과학대
위원	진경수	충북도립대학
위원	최병철	춘해보건대
위원	최승한	대구한의대
위원	최연호	고려대
위원	최중한	해천대
위원	태기식	건양대

(국문) 편집위원회

직 책	성 명	소 속
편집이사	이상훈	고려대
편집이사	이재성	서울대
편집이사	이경중	연세대
위원	권성훈	서울대
위원	김동욱	전북대
위원	김한성	연세대
위원	남기창	연세대
위원	남윤기	KAIST
위원	송병섭	대구대
위원	신정욱	인제대
위원	엄광문	건국대

직 책	성 명	소 속
위원	유선국	연세대
위원	이계한	명지대
위원	이성재	인제대
위원	이수열	경희대
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위원	임도형	세종대
위원	임창환	한양대
위원	정동근	동아대
위원	한동근	한국과학기술연구원
위원	이 전	연세대

(영문) 편집위원회

직 책	성 명	소 속
편집위원장	이상훈	고려대
편집이사	이재성	서울대
간행이사	박현진	성균관대
위원	박지호	KAIST
위원	김한성	연세대
위원	임창환	한양대

직 책	성 명	소 속
위원	정봉근	서강대
위원	임용규	상지대
위원	김광기	암센터
위원	박재석	고려대
위원	윤대성	연세대

조직위원회

직 책	성 명	소 속
조직위원장	김상희	금오공대
위원	송광섭	금오공대
위원	임기무	금오공대
위원	최성대	금오공대

직 책	성 명	소 속
위원	주백석	금오공대
위원	지광환	금오공대
위원	장의순	금오공대
위원	손정우	금오공대

2013년 춘계학술대회 프로그램 일정

● 주제: 창조적 의공학의 미래: 미세진단기술과 치료기기소형화
Towards smallness in biomedical diagnosis and therapy

- 주 최: 대한의용생체공학회
- 주 관: 대한의용생체공학회, 금오공과대학교, 구미시
- 일 정: 2013년 5월 10일(금) ~ 11일(토)
- 장 소: 구미코 컨벤션센터 (경상북도 구미시)

5월 10일 (금)			
시 간	대회의실	중회의실	소회의실
10:00 ~ 12:00		National Instrument Tutorial	
13:00 ~ 13:20	개회식		
13:20 ~ 13:40	전임회장님 발표		
13:40 ~ 14:30	기조강연 좌장: 문치웅, 최영빈		
14:30 ~ 14:50	Tea break		
14:50 ~ 16:50		심포지엄 I (Imaging Small Things) 좌장: 윤종인, 임창환	심포지엄 II (Small Biomedical Devices) 좌장: 최연호, 문홍상
16:50 ~ 17:10	Tea break		
17:10 ~ 18:10	포스터 I (2층 전시장)	첨단의료복합단지 세션 좌장: 김명남	금오공대 IT의료융합기술사업단 세션 좌장: 황도식
18:10 ~ 20:30	저녁 만찬 및 공연		
5월 11일 (토)			
	대회의실	중회의실	소회의실
09:30 ~ 10:30	포스터 II (2층 전시장)		
10:30 ~ 11:45	일반연제 3 (Biomaterials, Physiological Modeling, U-Health & eHealth and Medical Nano and Microtechnology) 좌장: 천홍구, 장동표	일반연제 1 (Biomedical Optics, Robotics and Medical Imaging) 좌장: 전상범, 변경민	일반연제 2 (Cardiovascular, Neural, Orthopedic and Rehabilitation Engineering) 좌장: 허동은, 박중열
11:45 ~ 13:00	식사	의료기기 산업기술 R&D 전략 특별세션	
13:00 ~ 15:00	포스터 III (2층 전시장)	신진연구자 세션 좌장: 김필한, 유형석	식품의약품 안전평가원 세션 좌장: 성종환, 민세동
15:00 ~ 15:30	폐회식		

Imaging Small Things – 중회의실

중회의실						
Date	Time	Session	Session Topic	Name	Lecture Title	Affiliation
5월 10일 금요일	2:50 ~ 3:20	Symposium I	Imaging Small Things	김현구	Image-guided Cancer Surgery Using Biomedical Engineering	고려대학교 의과대학 구로병원 흉부외과
	3:20 ~ 3:50			김기현	생체조직 미세환경 관찰을 위한 다중 광학영상기술 개발과 응용	포항공대 기계공학과/융합생명공학부
	3:50 ~ 4:20			강태욱	Tiny Plasmonic Nanoantennae for Future Imaging & Sensing Applications	서강대학교 화공생명공학과
	4:20 ~ 4:50			김필한	In Vivo Fluorescence Cellular Imaging by Intravital Microscopy	KAIST 나노과학기술대학원

Small Biomedical Devices – 소회의실

소회의실						
Date	Time	Session	Session Topic	Name	Lecture Title	Affiliation
5월 10일 금요일	2:50 ~ 3:20	Symposium II	Small Biomedical Devices	이종현	MEMS Technologies for Biomedical Applications	광주과학기술원 의료시스템학과
	3:20 ~ 3:50			남윤기	Neuron-on-a-Chip technology: Neurons meet small devices	KAIST 바이오및뇌공학과
	3:50 ~ 4:20			장동표	폐루프 뇌신경자극을 위한 실시간 신경전달물질 측정기술	한양대학교 의생명공학전문대학원 생체의공학과
	4:20 ~ 4:50			김대형	진단과 치료를 위한 고성능 유연 바이오메디칼 소자	서울대학교 공과대학 화학생물공학부

신진연구자 세션 – 중회의실

중회의실						
Date	Time	Session	Session Topic	Name	Lecture Title	Affiliation
5월 11일 토요일	1:00 ~ 1:20	신진연구자		전세영	Motion Correction in Positron Emission Tomography (PET) for Cancer Imaging	울산과학기술대학교 전기전자컴퓨터공학부소
	1:20 ~ 1:40			최성용	세포구름분석기를 이용한 성체줄기세포의 동적부착능력분석	경희대학교 생체의공학과
	1:40 ~ 2:00			강현욱	Photocoagulation of Endometrial Cell Layers	부경대학교 의공학과
	2:00 ~ 2:20			유홍기	Hybrid intra-arterial imaging for cardiovascular disease	한양대학교 생체공학과
	2:20 ~ 2:40			구교인	인공망막 시스템을 위한 화살촉 형상의 미세전극 어레이	울산대학교 전기공학부 의공학전공

식품의약품 안전평가원 특별세션 – 소회의실

소회의실						
Date	Time	Session	Session Topic	Name	Lecture Title	Affiliation
5월 11일 토요일	1:00 ~ 1:30	식품의약품 안전평가원 특별세션		강범선	전기기계적 안전에 관한 보조규격 기준설정을 위한 연구	KTL
	1:30 ~ 2:00			맹은호	약물방출 스텐트의 평가가이드 라인 개발	KTR
	2:00 ~ 2:30			정진백	의료기기 허가 심사의 이해	심혈관기기과
	2:30 ~ 3:00			허 영	첨단의료기기의 현황과 전망	한국전기연구원

Special program – 중회의실, 소회의실

중회의실, 소회의실						
Date	Time	Session	Session Topic	Name	Lecture Title	Affiliation
5월 10일 금요일		첨단복합단지 특별세션		박종백	Activities in Medical Device Development Center of DGMIF	대구경북 첨단의료기기개발지원센터
				김선일	오송첨단의료기기개발지원센터 발전방향	오송 첨단의료기기개발지원센터
				김충용	Activities in LAC of DGMIF	대구경북 첨단의료복합단지 실험동물센터
		금오공대 IT의료융합기술사업단 세션		김상희	첨단 전자의료기기 부품·소재 산업화 기반구축사업	금오공과대학 전자공학부/IT 의료융합기술사업단장
5월 11일 토요일		의료기기산업기술R&D 전략 특별세션		허영	의료기기산업동향 및 R&D 전략	한국산업기술평가관리원

Scientific program – 대회의실, 중회의실, 소회의실

대회의실, 중회의실, 소회의실						
Date	Time	Session	Session Topic	Name	Lecture Title	Affiliation
5월 11일 토요일		일반연제 1	Biomedical Optics	이형오	레이저 흉터 치료에서의 광감응 리보플라빈의 효과	대구가톨릭대학교 의료과학대학 의공학과
			Biomedical Robotics	김민태	CT 영상을 이용한 부착형 생검 로봇 개발	국립암센터 의공학연구과
			Medical Imaging	고근배	9.4T 자기장에서의 고성능 PET/MRI에 관한 연구	서울대학교 핵의학과
				위 헌	60×60 배열전극의 Trans-admittance Mammography를 이용한 비정상 조직 검출 알고리즘의 평가	경희대학교 생체의공학과
				어태준	조직이완특성 기반 잡음제거를 이용한 R2* Map (MRI) 향상	연세대학교 전기전자공학과
		일반연제 2	Cardiovascular Engineering	박지은	맥동 유체 모델 기반 자기공명 위상 대조 영상 분석 연구	경북대학교 의용생체공학과
			Neural Engineering	임정환	정상 상태 시각 유발 전위 기반 BCI 시스템의 중증 ALS 환자에 대한 적용: 사례 연구	한양대학교 생체공학전공
				유상진	나노 금막대의 플라즈모닉스를 이용한 신경세포 발화 기능 조절	KAIST 바이오 및 뇌공학과
				이중훈	CNT/PDMS로 구성된 커널형 EEG 전극 개발	고려대학교 보건과학대학 바이오융합공학과
			Orthopedic and Rehabilitation Engineering	엄시내	점프운동 중 착지동작이 성장기 쥐의 뒷다리 성장에 미치는 영향	연세대학교 보건과학대학 의공학과 & 프라운호퍼 의료기기 공동연구센터
		일반연제 3	Tissue Engineering and Biomaterials	오민재	급속조형기술의 응용을 통한 나노섬유 기반 관형 지지체의 강화	인제대학교 의용공학과
			System Biology, Physiological Modeling	이현승	환자의 좌심방 모델을 기반으로 한 심방세동의 시뮬레이션 모델	강원대학교 기계의용공학과
			U-Health, e-Health.m-Health Technology	박혜정	태블릿PC를 이용한 인지재활 프로그램 개발	전북대학교 공과대학 대학원 헬스케어공학과
				심수영	비침습 및 무구속적 연속 체온 모니터의 정확도 평가	서울대학교 공과대학 바이오엔지니어링 협동과정
			Medical Nano and Microtechnology	오홍기	화학적 처리에 의해 패터닝된 그라핀과 신경세포 배양	금오공과대학교 IT융복합공학과

- 학회장소 : 구미코 컨벤션센터 (경상북도 구미시)

주 소 : 경상북도 구미시 산동면 첨단기업1로 49 (구미전자정보기술원 옆)
전화번호 : (054) 477-8000

- 구미코 컨벤션센터 대중교통안내

승차장	노선번호	경유지
일반버스	70번	송원육교 → 오성예식장(복편시 터미널앞) → 광평초등 →공단본부 → 향교 → 인동 → 옥계 → 4공단 → 외국인전용단지입구(GumiCo) → 임봉 → 하장
좌석버스	170번	송원육교 → 오성예식장(복편시 터미널앞) → 신평시장 → 비산네거리 → 비산동사무소 → 광평초등 → 산호대교 → 금오공대 → 외국인전용단지입구(GumiCo) → 임봉 → 하장
좌석버스	5200번	KTX 김천구미역 → 아포읍사무소 → 아포한마음A → 구미1대학 → 구미역 → 터미널앞(옆) → 신평시장 → 비산네거리 → 금오공대 → 4공단

● 구미코 컨벤션센터 평면도

2층 전시장

3층 소회의실, 대회의실, 중회의실

※ 참가비 납부방법

2013 춘계	사 전	당 일
일 반	10 만원	12 만원
학 생	5 만원	6 만원
비회원 일반	11 만원	14 만원
비회원 학생	7 만원	8 만원
학부생(참관)	2 만원	2 만원

- 학술대회 논문발표자는 반드시 학회 회원으로서 연회비 납부와 사전등록비를 각각 별도의 계좌번호 입금처리를 하여 주셔야만 하오니, 이점 착오 없으시길 바랍니다.
- 사전등록비 납부방법 : 국민은행 : 계좌번호 : 031-01-0420-215(예금주 : 대한의용생체공학회)
- 연회비 납부방법 : 국민은행 : 계좌번호 : 031-25-0006-795(예금주 : 대한의용생체공학회)

기조강연

좌장 | 문치웅 교수 (인제대학교)
최영빈 교수 (서울대학교)

『해외초청강연』

● **Microfluidic Tools to Model and Analyze the Body**

Prof. Shuichi Takayama
University of Michigan, Ann Arbor, USA

Microfluidic Tools to Model and Analyze the Body

Name : Shuichi Takayama
Job Title : Professor of Biomedical Engineering, Macromolecular Science and Engineering. Also, WCU Professor
Affiliation : University of Michigan, Ann Arbor, USA and Ulsan National Institute of Science and Technology

Abstract

There is much recent effort to create microscale, 3D, dynamic cell and tissue culture systems for biological studies and pharmacological assays. With many proof-of-principle demonstrations, the field is moving towards the next steps. To provide ever more complex systems, To provide higher throughput and user-friendliness, and To provide more biochemical analysis capabilities to help evaluate and understand responses from such microfluidic humans-on-a-chip to be able to understand mechanisms and relate chip response to patients. This presentation will give an overview of efforts in our laboratory to develop microfluidic systems with living cells that mimic different parts of our body. The seminar will also present technologies to perform biochemical analysis from small volume samples of microfluidic models of the body as well as real patients. Micro/nanofluidic topics to be covered include compartmentalized microfluidic systems, tunable nanochannels, fracture fabrication, and aqueous two phase systems. Specific biomedical topics that will be discussed include, lung-on-a-chip, engineered 3D micro-tumors, bone marrow transplant rejection, chromatin analysis, and protein biomarker analysis.

Brief Biosketch

Shuichi Takayama's research interests (B.S. & M.S. from the University of Tokyo, Ph.D. from the Scripps Research Institute) started with organic synthesis. Subsequently he pursued postdoctoral studies in bioengineered microsystems at Harvard University as a Leukemia and Lymphoma Society Fellow. He is currently Professor at the University of Michigan in the Biomedical Engineering Department and Macromolecular Science and Engineering Program. He is also a WCU Professor in the School of Nano-Bioscience and Chemical Engineering at the Ulsan National Institute of Science and Technology (UNIST). He constructs microfluidic models of the body such as the oviduct, lung, and cancer metastasis. He also develops aqueous two phase system micropatterning technologies, studies timing and rhythms of cell signaling, constructs self-switching fluidic circuits, and performs nanofluidic single strand chromatin analysis.

Symposium I

좌장 | 윤종인 교수 (대구가톨릭대)
임창환 교수 (한양대학교)

『Imaging Small Things』

- **Image-guided Cancer Surgery Using Biomedical Engineering**
  김현구 교수
  고려대학교 의과대학 구로병원 흉부외과

- **생체조직 미세환경 관찰을 위한 다중 광학영상기술 개발과 응용**
  김기현 교수
  포항공대 기계공학과/융합생명공학부

- **Tiny Plasmonic Nanoantennae for Future Imaging & Sensing Applications**
  강태욱 교수
  서강대학교 화공생명공학과

- **In Vivo Fluorescence Cellular Imaging by Intravital Microscopy**
  김필한 교수
  KAIST 나노과학기술대학원

Image-guided Cancer Surgery Using Biomedical Engineering

이름: 김현구
직위: 부교수
소속: 고려대학교 의과대학 구로병원 흉부외과

Abstract

The technique of sentinel lymph node (SLN) biopsy is a minimally invasive method of identifying the greater risk patients and facilitating the selective use of more aggressive surgical and systemic therapies to improve outcomes with little additional morbidity. It is currently regarded as the standard treatment method for malignant melanoma and breast cancer and applications are expanding to other malignancies, including lung cancer.

To be of practical use for SLN navigation surgery, the in vivo counting data before MLND must be accurate. The data from in vivo counting have been insufficient for SLN navigation surgery to be applied in lung cancer without ex vivo counting.

The real-time near infrared (NIR) fluorescence imaging system could offer the possibility to put the images right under the hands of the surgeons, warranting intra-operative image-guided surgery during cancer surgery. Furthermore, this technology would make it possible to discriminate between tumor and normal tissue and consequently determine an adequate tumor-free margin during surgery. It would bring new paradigm into the field of oncologic surgery in the future.

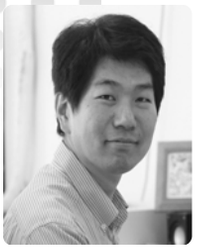
Bio sketch

- Education -

1) 1988. 3-1996. 2; M.D. & Bachelor in Medical Science
College of Medicine, Korea University, Seoul, Korea
2) 2000. 2; Master in Medical Science
Graduate School of Korea University, Seoul, Korea
3) 2004. 2; Ph.D. in Medical Science
Graduate School of Korea University, Seoul, Korea

- Major Interest -

1) Sentinel lymph node navigation surgery for lung and esophageal cancer
2) Minimal invasive thoracic surgery



생체조직 미세환경 관찰을 위한 다중 광학영상기술 개발과 응용

이름: 김기현
직위: 조교수
소속: 포항공과대학교 기계공학과, 융합생명공학부

Abstract

생체조직 내 미세환경 영상화는 조직 내 세포거동과 주변환경 관찰을 통해 병변 기작의 이해 및 진단, 그리고 치료에 대한 효과분석을 위해 중요하다. 본 발표에서는 이광자현미경 (two-photon microscopy)과 광간섭단층영상 (optical coherence tomography)을 기반의 영상기술 개발과 이들을 이용한 의생명 연구들을 소개한다. 이광자현미경은 이광자 여기라는 비선형 형광현상을 기반으로하는 3차원 형광 현미경기술로 조직 내 세포 및 분자 영상에 적합하다. 광간섭단층영상은 빛의 반사를 기반으로 하는 3차원 영상기술로 조직 내 구조 그리고 혈관분포 등 영상이 가능하다. 이 두 영상기술은 서로 다른 대비도를 기반으로하는 다른 스케일의 정보를 제공하므로 각각 또는 결합을 통해 생체조직의 다양한 응용연구에 적용할 수 있다. 이에 각각 또는 결합한 기술을 개발하였고 여러 생체조직 연구에 적용하였다. 이광자현미경 기반으로는 tryptophan 자가형광 기반 면역세포 관찰을 위한 개발, 안구 각막에서 wound healing 관찰, 그리고 소장조직 내 면역세포 관찰 등을 소개한다. 광간섭단층영상 기반으로는 지능형 금 나노입자를 이용한 광열항암치료 연구, 편광광간섭영상 기반 화상깊이 측정 등을 소개한다. 그리고 다중 광학영상 기술 그리고 다양한 형태의 영상 프로브 개발을 소개한다.

Brief Biosketch

김기현 박사는 포항공과대학교 기계공학과, 그리고 융합생명공학부 조교수로 재직하고 있습니다. 학사, 석사를 서울대학교 기계설계학과에서1994, 1996 년에 각각 획득하였으며, 박사는 미국 메사추세츠공과대학 (MIT)에서 Peter T. C. So 교수 지도하에 고속 이광자현미경 기술 개발 및 응용으로 2005년에 획득하였습니다. 이후 메사추세츠종합병원 (Massachusetts General Hospital) 내 Wellman Center for Photomedicine의 Johannes F. de Boer 교수 연구실에서 박사후연구원으로2008년 까지 재직하면서 광간섭단층영상 기술 개발 및 임상 전임상 연구를 수행하였습니다. 2009년에 포항공과대학에 부임하여 현재까지 재직하고 있으며 비선형현미경 및 광간섭단층영상 기술 기반 광학영상 기술 개발 및 응용을 연구하고 있습니다.
학술활동으로는 국내에서는 한국광학회, 기계학회, 가시화정보학회 회원이며, 미국 광학회 그리고 SPIE 의 회원으로 활동하고 있습니다.

Tiny Plasmonic Nanoantennae for Future Imaging & Sensing Applications

이름: 강태욱
직위: 부교수
소속: 서강대학교 화공생명공학과

Abstract

Owing to their novel optical properties, plasmonic nanoparticles have important implications, in terms of their potential use in future imaging and sensing applications. For this reason, extensive efforts have been devoted to the development and preparation of such particles with varying sizes, shapes, and compositions. In this talk, I will briefly discuss basics of nanoplasmonics and also introduce a few examples of plasmonic nanoantennae for the use in imaging and sensing applications. I will share our work on the synthesis of gold nanoantennae with a reduced symmetry and highlight recent achievements on ‘solid substrate-free liquid-state detection technique’ which utilize automonous orientations and motions of gold nanoparticles at an interface. Some issues on nanoplasmonics are also discussed.

Brief Biosketch

교육 : 서울대학교 공학사(2001) 공학박사(2006), UCBerkeley 박사후연구원(2006-2008)
경력 : 서강대학교 조교수(2006-2012), 서강대학교 부교수(2012-현재)
대표수상경력 : 교육과학기술부 장관상 Frontier Award (2011), 2012년 10대 과학기술 핵심성과 선정 by The Science Times (2012), 교과부 R&D 100선 (2010), 미래원천기술개발 우수성과 50선(2009), 신양 신진학술상 (2007. 12)
연구관심분야 : 나노플라즈모닉스, 바이오나노포토닉스
대표연구논문 : Nano Letters (2012), J. Am. Chem. Soc. (2012), Angew. Chem. Int. Ed. (2011, 표지논문), Chem. Commun. (2012, 표지논문), Small (2010, 표지논문), Nature Nanotechnology (2009), Nano Letters (2009)

In Vivo Fluorescence Cellular Imaging by Intravital Microscopy

이름: 김필한
직위: 조교수
소속: KAIST 나노과학기술대학원
기타: KAIST 바이오및뇌공학과, 물리학과, 의과학대학원, 겸임교수
KAIST Center of Optics for Health Science, 센터장

Abstract

Small animal, particularly mouse, has been an important test bed for basic and translational biomedical study. Recent advances in genomic technology have allowed a creation of animal model for human disease with genetically encoded biomarkers, notably such as green fluorescent protein (GFP). Combined with mature fluorescence-based probes, it has opened up new avenue to investigate complex pathophysiology of human disease in animal model with much greater details at cellular and molecular level. While all of major clinical imaging modality such as ultrasound, CT, MRI and PET has been modified and adapted, optical imaging, especially laser scanning confocal and multiphoton fluorescence microscopy, are the only one achieving cellular resolution of sub-micrometer in vivo. Over the recent years, these technologies enabled dynamic 3D visualization of various biological processes unfold in real-time in the living subject, which provides unprecedented insights those were impossible to obtain by traditional static 2D snapshots (e.g. histopathology and cytometry). In this talk, recent efforts based on the custom-built video-rate intravital microscopy system to dissect various dynamic cellular phenomena including interaction between circulating lymphocyte and endothelial cell of HEV in lymph node, transport of lipid and drug molecule in intestinal villi and time-dependent behaviours of blood circulating metastatic tumor cells will be introduced.

Brief Biosketch

Pilhan Kim received BS (2000), MS/Ph.D (2005) degree in electrical engineering at Seoul National University. Then he worked as a Research Fellow at Harvard Medical School and Massachusetts General Hospital from 2005 to 2010. He is a recipient of 3yr Cross-disciplinary fellowship from Human Frontier Science Program (HFSP) in 2006. At Nov. 2010, he was appointed Assistant Professor of Korea Advanced Institute of Science and Technology (KAIST) and established In Vivo Micro-Visualization Laboratory (http://ivmvl.kaist.ac.kr). Since Jun. 2012, he has been serving as a director of Center of Optics for Health Science, a newly established multi-disciplinary research center comprised of six faculty members, occupying over 9000 sq. ft in newly-built research building (KI) and holding annual budget of 500k USD funded by KAIST.

Symposium II

좌장 | 최연호 교수 (고려대학교)
문홍상 교수 (한양대학교)

『Small Biomedical Devices』

- **MEMS Technologies for Biomedical Applications**
  이종현 교수
  광주과학기술원 의료시스템학과

- **Neuron-on-a-Chip technology: Neurons meet small devices**
  남윤기 교수
  KAIST 바이오및뇌공학과

- **폐루프 뇌신경자극을 위한 실시간 신경전달물질 측정기술**
  장동표 교수
  한양대학교 의생명공학전문대학원 생체의공학과

- **진단과 치료를 위한 고성능 유연 바이오메디칼 소자**
  김대형 교수
  서울대학교 공과대학 화학생물공학부

MEMS Technologies for Biomedical Applications

이름: 이종현
직위: 교수(학과장)
소속: 광주과학기술원(GIST) 의료시스템학과(DMSE)
기타: 기전공학과 교수 / GIST 의료시스템연구소(IMSE) 소장

Abstract

의료진단 및 치료기술 고도화에 따라 의료기기 및 장비에 대한 의존성이 커지고 있으며, 최소침습 지향 및 진단/치료의 정밀화 경향을 고려할 때 MEMS (MicroElectroMechanical Systems) 기술이 향후 임상에 많이 응용될 것으로 예측된다. 이를 위해서는 현재 높은 수준의 국내 의료기술, 정밀가공 및 IT 기술의 융합되어야 하며, 최근 정부의 신성장 동력산업 및 기업의 동향에서도 이를 감지할 수 있다.

이번 발표에서는 본 연구실에서 그 동안 수행되어온 의료응용의 MEMS 기술을 소개하고자 하며, 여기에는 Physical marker (Electrical impedance, ultrasound)용 micro sensor를 이용한 cell/tissue 진단, Glaucoma 등 역류방지를 위한 polymeric micro check valve, micro-PCR 및 미세진동을 이용한 discography 등이 포함된다.

Brief Biosketch

1977.03. - 1981.02.	서울공과대학 기계설계학과	제어공학	학사
1981.03. - 1983.02.	한국과학기술원 기계공학과	음향진동	석사
1983.03. - 1986.08.	한국과학기술원 기계공학과	의료초음파	박사
1986.10. - 2000.05.	한국전자통신연구원 (ETRI)	책임연구원 / 실장	
2000.06. - 2008.01	광주과학기술원 기전공학과	부교수/ 교수 / 학과장	
2008.02. - 현재	광주과학기술원 의료시스템학과 (DMSE)	학과장	

Neuron-on-a-Chip technology: Neurons meet small devices

이름: 남윤기
직위: 부교수
소속: KAIST 바이오및뇌공학과
기타: KAIST 연구원 나노융합연구소

Abstract

뇌에 대한 일반적인 관심의 증대로 뇌를 이루는 신경세포가 형성하는 신경회로에 대한 인터페이싱 기술에 대한 연구도 매우 활발히 진행되고 있다. 전통적인 패치클램프나 금속미세전극을 이용한 활동전위 측정과 전기자극 기법은 이제 MEMS 소자, 능동 집적소자, 나노소자 등과 같은 극미세소자들을 이용해 공간해상도를 대폭 증대시키면서 여러 세포를 동시에 인터페이스 할 수 있는 다중채널 방식으로 발전해 가고 있다. 이 강연에서는 최근 각광받고 있는 Neuron-on-Chip 기술을 기반으로 개발된 신경세포 인터페이스용 미세소자들의 종류와 측정 원리 그리고 이를 통한 뇌신경 질환 진단 및 치료 전망에 대해서 알아보기로 한다.

Brief Biosketch

남윤기 교수는 1997년 서울대학교 전기공학부에서 학사학위를 받고, 미국 일리노이대(어바나-샴페인)에서 전자공학 석사 및 박사학위를 2003년과 2005년에 각각 받았다. 2006년 9월 카이스트 바이오및뇌공학과에 조교수로 부임하였고, 2010년 9월부터 현재까지 부교수로 근무하고 있다. 2007년에 설립한 신경공학연구실의 연구책임자를 맡고 있으며, 2012년에는 한국연구재단 중견연구자사업 도약연구에 선정되어 '생물학적 인공신경네트웍칩 개발 및 응용'에 대한 연구를 진행하고 있다. 2010년부터 2년간 제 18대 대한의용생체공학회 학술이사를 공동으로 맡아 4번의 학술대회 프로그램을 기획하였으며, 2011년에는 대한의용생체공학회에서 수여하는 솔거의공학상(젊은의공학자상)을 수상한 바 있다. 국내외 유관기관 학술지 3곳의 편집위원으로 활동하고 있으며, 국내외 전문학술지 연구논문 35편의 공동저자이며, 국내 특허 2건을 등록한 바 있다. 주요 연구관심사는 신경세포칩 기술, 신경인터페이스 계측시스템, 다채널신호분석, 신경조직공학 등이다.

폐루프 뇌신경자극을 위한 실시간 신경전달물질 측정기술

이름: 장동표
직위: 부교수
소속: 한양대학교 의생명공학전문대학원 생체의공학과

Abstract

뇌심부자극술이 파킨스씨병, 전증 등의 운동질환 치료에 널리 적용되고 있을 뿐 아니라, 최근 들어서는 우울증, 치매 등 치료영역으로 확대되고 있다. 하지만 장기간의 뇌자극 및 다양한 원인으로 인해 치료기간이 길어질수록 효과가 떨어지는 현상을 보이는데 이러한 문제점들을 개선하기 위해 뇌자극 시 일어나는 전기적, 화학적 변화를 측정하여 자극을 조절하는 폐루프 뇌신경자극 기술 연구가 진행되고 있다. 이미 뇌전증의 경우 발작이 일어나기 전 뇌의 전기적 신호를 측정하여 뇌자극에 사용하는 폐루브 뇌신경자극 기술은 상용화되어 있는데 반해 뇌신경자극에 의한 신경전달물질 변화를 피드백으로 사용하는 신경전달물질 기반 폐루프 뇌신경자극 기술은 아직 개발초기 단계에 있다. 본 발표에서는 폐루프 뇌신경자극술을 위한 실시간 신경전달물질 측정기술 중 고속스캔전압전류법(Fast Scan Cyclic Voltammetry)에 초점을 맞추어 발표하고자 한다. 고속스캔전압전류이란 미세탄소전극에 선형적으로 변화는 전압을 가하게 하고, 이때 특정 전압에서 신경전달물질이 산화 환원 반응에 의해 전자를 잃고 얻음으로써 생기는 미세한 전류의 변화를 측정하여 특정 신경전달물질을 검출하는 기술이다. 고속스캔전압전류법을 통해 도파민, 세로토닌, 에피네피린 등의 신경전달 물질의 변화를 실시간으로 측정할 수 있지만 여전히 신경전달물질간의 특징이 서로 비슷하여 구분하기 어렵거나, 여러 가지 노이즈에 민감하다는 한계를 가지고 있다. 따라서 이번 발표에서는 다양한 형태의 전압 패턴 및 분석기법을 통해 노이즈에 강하면서도 각 신경전달물질의 독특한 특징을 찾아내는 기술에 대한 소개를 할 것이다. 기존의 한계를 극복한 고속스캔전압전류법은 향후 폐루프 뇌심부자극술에 사용될 수 있을 뿐만 아니라 신경개발 등의 다양한 실경전달물질 관련 뇌연구에 널리 사용될 수 있을 것이라 판단된다.

Brief Biosketch

한양대학교에서 의공학으로 박사를 취득하였으며, 가천의대 뇌과학연구소에서 조교수로 뇌영상 기술을 연구하였으며 이후 미국 메이요클리닉을 거쳐 현재 한양대학교 의생명공학전문대학원 생체의공학과의 부교수로 재직 중이다. 현재 한양대학교에서 주로 동물을 대상으로 뇌신경조절 연구에 관심이 많으며, 이와 더불어 뇌기능영상, 뇌-기계인터페이스 기술을 개발하고 있다.

진단과 치료를 위한 고성능 유연 바이오메디칼 소자

이름: 김대형
직위: 조교수
소속: 서울대학교 공과대학 화학생물공학부
기타: 기초과학연구원 나노입자연구단

Abstract

가볍고 휘어질 수 있는 플라스틱 기판 위에 만들어진 고성능의 전자 소자는 현재까지 불가능하였던 많은 새로운 응용분야를 가능하게 한다는 점에서 많은 주목을 받고 있다. 본 초록은 이러한 고성능의 휘어지거나 늘릴 수 있는 전자 소자를 제조하기 위하여 단결정 무기 반도체 물질을 나노 구조 형태로 가공하고 다양한 유연 기판 위에 인테그레이션하는 공정 기술을 바탕으로 진단 및 치료에 적용할 수 있는 바이오 메디칼 전자 소자에 대한 연구를 소개한다. 휘어지거나 늘릴 수 있는 전자 소자의 주된 응용 분야로서 몸 안에 이식(implant) 할 수 있는 바이오메디칼 전자 소자를 예를 들 수 있다. 우리 몸 안의 주된 기관들은 매우 연약한 세포 조직으로 구성되어 있고 그 형태가 유선형으로 되어 있다. 따라서 장기에 기계적 손상을 입히지 않으면서 좋은 측정치를 얻어야 하는 바이오 메디칼 소자는 쉽게 휘어지거나 늘릴 수 있어서 장기에 가해지는 스트레인(strain)을 최소화면서 인체 기관의 표면을 따라 접촉을 잘 유지하여 노이즈를 최소화하는 것이 매우 중요하다. 첫 번째 바이오 메디칼 소자의 예로, 심장 표면에서 이식 되어 환자의 심장의 작동 상태를 모니터링 할 수 있는 센서가 있다. 고성능 실리콘 기반의 플렉서블 센서는 빠른 속도의 맵핑(mapping)을 통하여 몸 안에서 심장의 성능을 실시간으로 모니터링하여 심장 마비 등의 증세를 빠르게 진단하거나 예방할 수 있어 임상 측면의 활용도가 매우 높다. 또 다른 중요한 적용 분야로서 머리 안에 장치하여 뇌의 표면에서 뇌파를 실시간으로 측정하는 소자는 각종 뇌질환이나 간질과 같은 증세를 미리 예측하고 방지하여 많은 환자들의 고통을 덜어주는 데 큰 기여를 할 수 있다.

Brief Biosketch

1. 학력

-2000 : 서울대학교 공과대학 화학생물공학부 (공학사)
-2002 : 서울대학교 공과대학 대학원 화학생물공학부 (공학석사)
-2009 : 일리노이주립대학교 재료공학과 (공학박사)

2. 경력

-2002~2006 : 케이씨텍 선임연구원
-2009~2011 : 미국 일리노이주립대 재료공학과 / 펜실바니아대 뇌과학과 박사후 연구원
-2011~현재 : 서울대학교 공과대학 화학생물공학부 조교수

3. 연구분야

-Flexible and Stretchable Biomedical Devices

첨단복합단지 특별세션

좌장 | 김명남 교수 (경북대학교)

- **Activities in Medical Device Development Center of DGMIF**
  박종백 센터장
  대구경북 첨단의료기기개발지원센터

- **오송첨단의료기기개발지원센터 발전방향**
  김선일 센터장
  오송 첨단의료기기개발지원센터

- **Activities in LAC of DGMIF**
  김충용 센터장
  대구경북 첨단의료복합단지 실험동물센터

Activities in Medical Device Development Center of DGMIF

이름: JongBaek Park, Ph.D.
직위: President
소속: Medical Device Development Center of Daegu-Gyeongbuk Medical Innovation Foundation

Abstract

An overview of the Foundation, DGMIF(Daegu-Gyeongbuk Medical Innovation Foundation), is to be discussed including history and current status of setting up laboratories, research direction and its role within Korea. As a member of DGMIF, the medical device development center will be described in terms of its R&D topics, operation strategies and international collaborations. An observation on the market side for medical devices will be discussed as well to have more understanding on the background of the establishment of the organization.

Brief Biosketch

JongBaek Park is the president of the center for medical device development at DGMIF, which is a Korean government supported foundation established in Dec. 2010, to support and promote medical industry in Korea. He received B.S. from Electronic Engineering at Seoul National University in 1978, M.S. from KAIST in 1980, and Ph. D. from Computer Engineering at Syracuse University in 1993, respectively.

Before joining DGMIF, he had been involved in developing medical diagnostic equipments including ultrasound and digital X-ray, and therapeutic medical devices at Siemens company from 2003 through 2009, and at Alpinion Medical System after the period, both as vice president of the companies. He also worked at Samsung Electronics company from 1983 to 2000 with focus on multimedia system research for consumer/mobile devices. Currently, his R&D area includes imaging and medical surgery system mainly for practical and commercial applications.

오송첨단의료기기개발지원센터 발전방향

이름: 김선일
직위: 첨단의료기기개발지원센터 센터장
소속: 오송첨단의료산업진흥재단
기타: 세계의공학협회 이사, 한국한림원 공학부분 정회원

Abstract

세계 의료기기 시장은 저출산, 고령화, 소득수준 향상으로 수명이 연장됨으로써 건강하고 마음 편하게 살 수 있는 “삶의 질 향상” 실현, 과학기술 진보에 따라 첨단의료기기 시장 확대가 진행되고 있고 새로운 신성장동력 산업으로 발돋움하고 있습니다.
오송첨단의료산업진흥재단의 첨단의료기기개발지원센터는 첨단의료기기 제품 개발에 필요한 연구지원(설계·제작·평가)를 받을 수 있는 글로벌 수준의 종합적 연구공간 및 시스템 지원을 목적으로 2011년에 설립되었습니다.
본 발표를 통해 센터에서 추구하고 있는 특성화 품목인 “BT 기반의 입체삽입형 의료기기” 를 소개하고, 지금까지 진행된 센터 건립 및 인프라에 대해 소개하겠습니다. 또한 앞으로 집적화된 의료기기 개발 관련 시설(첨단의료기기개발지원센터, 실험동물센터 등)과 주변 인프라(식품의약품안전청 등)와의 연계 발전 방향을 발표하고, “첨단의료산업의 글로벌 비즈니스 허브”를 구현하여 국가 신성장 동력을 주도할 수 있는 공동연구 기반의 지원 시스템을 소개합니다.

Brief Biosketch

- 학력 : 서울대학교 전기공학과 공학사 및 공학석사,
  미국 Drexel Univ. 의공학박사
- 경력 : 한국과학재단 기초연구본부장 (2003～2005)
  한양대학교 생체공학과 교수 (1988～현재)
  오송첨단의료산업진흥재단 첨단의료기기개발지원센터장 (2011～현재)

Activities in LAC of DGMIF

이름: Choong-Yong Kim, DVM, Ph.D.
직위: President
소속: Laboratory Animal Center of Daegu-Gyeongbuk Medical Innovation Foundation

Abstract

The Medivalley project is a central government-led project proceeded since 2009, on the purpose of comprehensive support for the development and research on new drug and medical device. Particularly, we are focused on advanced molecular in-vivo imaging; therefore, the imaging unit is equipped with ultrasound, PET, micro-CT, micro-MRI as well as optical imaging system for exclusive use on laboratory animals. We intend to establish an animal experimental system on the global standard appropriated with '3Rs' principle (Replacement, Reduction and Refinement) that is heading to providing high quality of data from animal experiments for customized supporting system.

Brief Biosketch

Choong-Yong Kim is the president of Laboratory Animal Center (LAC) at DGMIF, which is a Korean government supported foundation established in Dec. 2010, to support and promote medical industry in Korea. He received B.S. from College of Veterinary Medicine at KonKuk University in 1983, M.S. from College of Veterinary Medicine in 1990, and Ph. D. from Environmental Health Science of School of Med. at Tohoku University in 1995, respectively.
He served as the director of the Primate Research Center or the director of Toxicology division as well as the chair of IACUC and AAALAC at KIT (Korea Institute of Toxicology). He also has experienced over a decade at KIT where is the first institute with full accreditation from AAALAC International in Asia (1998), carrying out a lot of GLP and Non-GLP non-clinical studies with laboratory animals such as mice, rats, dogs, and monkeys.

금오공대 IT의료융합기술사업단 세션

좌장 | 김상희 교수 (금오공대)

● **첨단 전자의료기기 부품 · 소재 산업화 기반구축사업**

김상희 교수
금오공과대학 전자공학부/IT 의료융합기술사업단장

첨단 전자의료기기 부품 · 소재 산업화 기반구축사업

이름: 김상희
직위: IT의료융합기술사업단 단장/금오공과대학교 전자공학부 교수
소속: IT의료융합기술사업단/금오공과대학교

Abstract

디스플레이, 모바일 및 반도체부품소재산업에서 세계적인 경쟁력을 확보하고 있는 구미산업단지 내 전자의료기기 부품소재 산업화 기반을 조성하여, 글로벌 의료클러스 터 및 생산단지로 육성하고자 하는 전자의료기기 부품소재 기반구축 사업을 소개한다. 본 전자의료기기 부품소재 기반구축사업은 전자의료기기 산업화기반 구축사업은 상용화 지원센터 구축 및 집적생산단지(생태계) 조성과 더불어 전자의료기기 전문 인력 양성 사업과 사업화지원 사업으로 구분하여 수행하고 있다. 이를 위하여 기업, 대학, 병원, 연구기관 등 관련기관과의 협력을 통해 미래형 첨단 전자의료기기 부품소재 산업의 글로벌 경쟁력을 확보하고 있다.

Brief Biosketch

2011 ~ 현재	IT의료융합기술사업단 단장(지식경제부 전자의료기기 부품소재 기반구축사업 과제책임)
2011 ~ 현재	경상북도 투자유치단 자문위원
2011 ~ 현재	경상북도 미래경북전략위원회 위원
2011 ~ 2012	식약청 의료기기분과 기획위원
2010	지경부 통합기술청사진 의료기기 분과 기획위원
2010	첨단의료복합단지 첨단의료기기연구센터 연구/시설기획위원
2008 ~ 현재	금오공과대학교 첨단의료기기연구소 소장
2005 ~ 2006	미국 MIT Boston Univ. Intelligent Robotic Lab Visiting Scholar
1993 ~ 현재	금오공과대학교 전자공학부 교수
1988 ~ 1992	미국 Texas A&M Univ. Dept. of Bioengineering 박사학위

2013년도 제47회 대한의용생체공학회 춘계학술대회

의료기기산업기술R&D 전략 특별세션

좌장 | 김법민 교수 (고려대학교)

● **의료기기산업동향 및 R&D 전략**

허영 박사
한국산업기술평가관리원

의료기기산업동향 및 R&D 전략

이름: 허영
직위: 신산업대표PD
소속: 한국산업기술평가관리원

Abstract

최근 고령화 사회로의 진행이 급속도로 빨라지고, 웰빙에 대한 선호도가 높아지면서 의료 및 복지기기에 대한 관심도 높아지고 있다.
의료 및 복지기기 연구개발의 조기 상용화를 위해서는 “의료기기기술 플랫폼”을 도입해 병원을 중심으로 다양한 업종의 관련 기업들이 협력하는 공동연구 개발을 활성화 시켜야 한다. 지식경제 R&D 정책의 성과 극대화를 위해서 기술중심의 R&D 지원방식에서 수요자 중심의 R&D 지원 방식으로 전환 함으로서 R&D 생산성을 크게 높이고자 한다. 특히 의료 및 복지기기는 고도의 신뢰성과 안정성을 반드시 확보할 수 있도록 현재 개발 지원 시스템을 획기적으로 개선해야 할 것이다.
본고에서는 최근 의료기기 산업동향에 대하여 알아보고 R&D의 성과 확산과 상용화를 촉진하기 위한 플랫폼의 기반의 새로운 R&D지원시스템과 전략에 대하여 소개한다.

Brief Biosketch

- 현, 지식경제 의료기기 PD (한국산업기술평가관리원)
- 한국전기연구원 의료IT융합연구 본부장
- 차세대 의료기기 기술위원회 위원장 (지식경제부)
- 산업원천기술로드맵 및 통합기술청사진위원장 (산업기술진흥원)
- 첨단의료복합단지 추진단 위원 및 의료기기 설계자문단장(보건복지부)
- 의료산업선진화 위원회 전문위원 (국무총리실)
- 정부정책과제 심의위원 (식약청)
- IEC TC 62(의료기기) 표준기술위원회 위원장 (기표원)

신진연구자

좌장 | 김필한 교수 (KAIST)
유형석 교수 (울산대학교)

- **Motion Correction in Positron Emission Tomography (PET) for Cancer Imaging**
  전세영 교수
  울산과학기술대학교 전기전자컴퓨터공학부소

- **세포구름분석기를 이용한 성체줄기세포의 동적부착능력분석**
  최성용 교수
  경희대학교 생체의공학과

- **Photocoagulation of Endometrial Cell Layers**
  강현욱 교수
  부경대학교 의공학과

- **Hybrid intra-arterial imaging for cardiovascular disease**
  유홍기 교수
  한양대학교 생체공학과

- **인공망막 시스템을 위한 화살촉 형상의 미세전극 어레이**
  구교인 교수
  울산대학교 전기공학부 의공학전공

Motion Correction in Positron Emission Tomography (PET) for Cancer Imaging

이름: 전세영 (Se Young Chun)
직위: 조교수 (Assistant Professor)
소속: 전기전자컴퓨터공학부 (ECE), 울산과학기술대학교 (UNIST)

Abstract

Positron Emission Tomography (PET) provides important information on malignant tumors by visualizing metabolism of glucose in tissue. Its spatial resolution is up to 4-5 mm for whole-body imaging, but this resolution cannot be achieved in clinics due to respiratory motion of patient. There have been many attempts to address this issue by reducing motion artifacts in PET, PET/CT, and, recently, PET/MR. In this talk, I will introduce motion correction problem in PET for cancer imaging, summarize a few approaches to address this problem, and present our recent work on motion correction in simultaneous PET/MR.

Brief Biosketch

Se Young Chun earned his BSE with honor in EE at Seoul National University and completed his MS in EECS/Mathematics and PhD in EECS at the University of Michigan - Ann Arbor. After PhD, he was a postdoctoral fellow at Harvard Medical School and at the University of Michigan – Ann Arbor. Now he is an assistant professor in ECE at Ulsan National Institute of Science and Technology (UNIST). He is broadly interested in biomedical image processing, computational imaging and inverse problems, and motion correction in medical imaging. He was a recipient of 2010 Society of Nuclear Medicine Computer and Instrumentation Young Investigator Award 2nd place.

세포구름분석기를 이용한 성체줄기세포의 동적부착능력분석

이름: 최성용
직위: 조교수
소속: 경희대학교 생체의공학과

Abstract

성체줄기세포를 이용한 세포치료제는 각종 난치성 질환에 효과적인 치료법으로 기대되고 있다. 순환계에 주입된 줄기세포는 조직재생을 위해 혈관내피세포에 부착하여 표적장기로 전이하는 과정이 필수적이다. 이를 위해 줄기세포도 면역세포와 유사한 구름부착(rolling adhesion)을 이용한다고 알려져 있지만, 정량적인 분석 방법의 부재로 인해 정확한 메커니즘은 아직 알려져 있지 않다. 본 강연에서는 성체줄기세포의 동적부착능력을 정량적으로 분석하기 위한 기술로써 세포구름분석기(cell rolling cytometer)를 소개하고, 줄기세포의 동적부착능력을 분석한 결과에 대해 토의하고자 한다.

Brief Biosketch

1. 학력

- 박사 [2006. 9 – 2009. 8] 한국과학기술원 바이오및뇌공학과 공학박사
- 석사 [2003. 9 – 2005. 8] 한국과학기술원 바이오스시템학과 공학석사
- 학사 [1999. 3. – 2003. 8] 한양대학교 기계공학과 공학사

2. 경력

- 2013. 4 – 현재 / 경희대학교 생체의공학과 조교수
- 2010. 9 – 2013. 3 / Department of Mechanical Engineering, MIT (Postdoc)
- 2009. 9 – 2010. 8 / 한국과학기술원 나노바이오공학실험실 박사후 연구원

3. 연구분야

- Micro-/nano-fluidics, BioMEMS, Nanobioengineering
- 해당분야에서 Small, Lab Chip, Anal Chem, APL 등 22편의 SCI(E) 논문 출간

Photocoagulation of Endometrial Cell Layers

이름: 강현욱
직위: 교수
소속: 부경대학교 의공학과

Abstract

Heavy menstrual bleeding (also called menorrhagia) is a common incapacitating problem in women of reproductive age, which can severely affect their quality of life. To treat excessive menstrual bleeding effectively and safely with laser light, a balloon catheter-based diffusing optical device was developed and evaluated for photocoagulation of an endometrium layer. Synthetic fused silica was micro-machined to create a diffusing tip for uniform 532-nm light distribution. Numerical simulation with COMSOL was performed to optimize the design of the laser balloon catheter device. Thermal modeling revealed temperature distribution and heat flux at the tissue-catheter interface in association with material type and catheter thickness. The degree of coagulative necrosis was theoretically assessed to predict the effect of photocoagulation during laser treatment. Experimentally, homogeneous and fast tissue coagulation as a result of rapid temperature rise was achieved with application of a balloon layer to the tissue. In vivo caprine studies demonstrated thermal coagulation thickness of less than 3 mm with no hemorrhage or coagulative necrosis in myometrium, which showed a goo agreement with the simulated results. The newly designed catheter-based diffusing optical device can be a feasible therapeutic tool to efficiently and safely photocoagulate an endometrial layer in uterus.

Brief Biosketch

. Conference Chair, Photonics in Urology, SPIE BiOS
. Program Committee, SPIE BiOS
. Sr. Research Scientist, Laser Therapeutic Research Lab, Endo Healthcare
. Research Scientist, Corporate Research, American Medical Systems

Hybrid intra-arterial imaging for cardiovascular disease

이름: 유홍기
직위: 조교수
소속: 한양대학교 생체공학과
기타: 한양대학교 의생명공학전문대학원

Abstract

심혈관 질환은 세계적으로 사망률 1위의 질환이다. 심혈관 질환을 관리하기 위해 혈관 내 병변의 상태를 정확히 영상화 할 수 있는 혈관 내 영상화 기술이 필수적이다. 특히 혈관의 구조적인 형태뿐 만 아니라 분자영상 등과 같은 포괄적인 영상화 기술을 통해서 병변의 발생기전, 치료에 대한 반응 등을 확인할 수 있다. 본 강연에서는 혈관 내부의 다양한 정보를 한 번에 획득할 수 있는 혈관 내 광학 영상 기법에 대해 소개하고, 이를 활용한 연구 결과에 대해 토의하며, 관련 최신 연구 동향 및 연구 방향에 대해 고찰한다.

Brief Biosketch

2007. 카이스트 기계공학과 박사
2007-2008. 카이스트 기계공학과 연수연구원
2008-2011. Harvard Medical School / Massachusetts General Hospital, Research Fellow
2011-2012. Harvard Medical School / Massachusetts General Hospital, Instructor
2012-. 한양대학교 생체공학과 조교수

Research interest at the Biomedical Optics and Photomedicine Lab. focuses on the development of new optical imaging techniques, and its application to medical problems. We work on developing novel optical instrumentations and methods based on advanced optical techniques. We are putting a lot of effort into developing novel optical instrumentations and translating these new technologies into preclinical and clinical studies. Our research will improve patient care by providing advanced diagnostic and therapeutic methods.

인공망막 시스템을 위한 화살촉 형상의 미세전극 어레이

이름: 구교인
직위: 교수
소속: 울산대학교 전기공학부 의공학전공

Abstract

세계적으로 약 백만 명의 환자들이 망막 변성 질환으로 인한 후천성 성인 실명의 위험에 놓여 있다. 이 질병으로 실명한 환자들을 위하여, 질환의 영향을 덜 받은 정상 망막 세포에 인공 신호를 전달하는 망막 보철 시스템을 개발하는 연구가 세계적으로 진행 중에 있다.
지금까지의 미세 전극들은 2차원 형상으로 개발되어, 자극 목표 세포에 밀착할 수 없었다. 세포에서 멀어지면 그 만큼 자극에 필요한 에너지가 늘어나며, 이에 의한 발열이 주변 조직들을 손상할 수 있을 뿐만 아니라, 전극 자체의 수명도 단축시킬 수 있는 문제점이 발생되다.
2차원 형상의 미세 전극의 문제점을 극복하고자, 화살촉 형상의 3차원 미세 전극을 제작하고 평가하였다. 제작된 미세 전극은 토끼 안구 이식 시험, 전기적 특성 시험 및 기계적 특성 시험에서 인공망막 시스템에 응용 가능한 것으로 평가되었다.

Brief Biosketch

- 2013.3. ~ 현재 울산대학교, 전기공학부, 의공학전공, 교수
- 2012.5. ~ 2013.2. Massachusetts of Institute Technology, 박사후 연구원
- 2011.2. ~ 2012.4. Harvard University, Brigham and Women's Hospital, 박사후 연구원
- 2009.9. ~ 2010.12. 서울대학교, 자동화연구소, 선임연구원
- 2009.8. 서울대학교, 전기컴퓨터공학부, 공학박사

식품의약품 안전평가원 특별세션

좌장 | 성종환 교수 (홍익대학교)
민세동 교수 (순천향대학교)

● **전기기계적 안전에 관한 보조규격 기준설정을 위한 연구**
강범선 책임연구원
KTL

● **약물방출 스텐트의 평가가이드 라인 개발**
맹은호 팀장
KTR

● **의료기기 허가 심사의 이해**
정진백 연구관
심혈관기기과

● **첨단의료기기의 현황과 전망**
허영 박사
한국전기연구원

전기기계적 안전에 관한 보조규격 기준설정을 위한 연구

이름: 강범선
직위: 책임연구원
소속: 한국산업기술시험원

Abstract

IEC는 2005년 이전에 발행한 국제규격의 요구사항이 현재 생산제품들의 기술수준에 미흡하다고 판단하여 IEC 60601-1(3판)을 2005년 12월에 발행하고 보조규격 등 관련규격 (2판)을 지속적으로 제정·개정·폐기하고 있으며, IEC 60601-1(3판)의 주요변경사항은 위험관리프로세스를 이용하여 제조자 스스로 제품의 위해요인을 파악하고 이를 허용 가능하도록 설계를 하는 것이다. 본 연구에서 다루게 되는 “전기·기계적 안전에 관한 보조규격”은 IEC 60601-1(3판)을 보완하는 것으로 진단용 X선기기의 방사선방어, 사용적합성, 경보시스템, 환경친화설계 및 생리학적폐루프제어기의 개발 등 신기술을 포함하여 공통규격에서 다루지 못한 안전사항을 다룸으로써 의료기기 안전성 향상시키는데 기여하자는 것이다.

Brief Biosketch

2000, 건국대학교 전기공학과 졸업
2002 ~ 2007, 전자의료기기 국제상호인증기반구축과제 수행 (산업자원부)
2001 ~ , 한국산업기술시험원 의료기기평가센터 해외인증팀장 (책임연구원)
2011 ~ , IEC TC62/SC62D 전문위원 (기술표준원)

약물방출 스텐트의 평가가이드 라인 개발 (Study of development of evaluation guideline for drug-eluting stents.)

이름: 맹은호(MAENG EUN HO)
직위: 팀장 (Team Leader)
소속: 한국화학융합시험연구원 의료기기본부 (korea Testing and Research Institute, KTR)

Abstract

본 연구의 목표는 인체에 이식하는 약물방출스텐트의 물리화학적 특성,기계적 특성, 생물학적 안전성 평가에 대한 가이드라인을 개발하는 것이다.
약물방출스텐트의 물리화학적 특성 평가에서는 약물 성분, 약물 용량, 약물 밀도, 약물 방출율, 불순물, 잔류용매, 원자재 성분, 부식성능에 대한 분석을 수행하였고, 기계적 특성 평가에서는 가속내구성, 탄성회복, 급성코팅무결성, 압축강도, 방사선 불투과성 시험에 대한 분석을 수행하였다. 또한 생물학적 안전성 평가에서는 세포독성, 감작성, 피내반응, 급성독성, 발열성, 유전독성, 이식, 아만성, 용혈성 시험에 대한 분석을 수행하였다.
위의 분석 결과를 바탕으로 약물방출스텐트의 물리화학적 특성, 기계적 특성, 생물학적 안전성 평가에 대한 국제 표준과의 부합여부를 확인하고 객관적이고 표준적인 가이드라인을 제시하였다.

Brief Biosketch

2001년	단국대학교 생물학과 바이러스/면역학 전공 박사학위 취득
2004년-현재	KOLAS(ISO 17025) 평가사 (기술표준원)
2007년-현재	의료기기 KGMP 심사원 (식품의약품안전처)
2012년-현재	첨단 융복합 의료기기 외래 전문가(식품의약품안전처)
2012년-현재	맞춤형 기술지원 전문가(의료기기정보기술지원센터)
2012년-현재	대한 환경 위해성,보건과학회 교육인증 위원장(학회)

의료기기 허가 심사의 이해

이름: 정진백
직위: 공업연구관
소속: 식품의약품안전평가원 의료기기심사부 심혈관기기과

Abstract

1. 최신 개편된 의료기기 관련 조직 및 인력 현황 소개
2. 의료기기 허가 심사 실무 과정 설명
3. '13년 의료기기 심사 제도 소개
4. 의료기기분야 채용정보 소개

Brief Biosketch

1. 건국대학교 대학원 물리학과 석사 졸업('95.2.)
2. 식품의약품안전평가원 의료기기심사부 심혈관기기과('13.3.23-현재) – 연구관
3. 식약청 의료기기심사부 허가심사업무('11.1-현재)-연구관
4. 식품의약품안전평가원 방사선안전과 근무('09.12.9- '11.1.)- 연구관
5. 식약청 의료기기심사부 허가심사업무('05-'09.12.8) – 연구관
6. 우리나라의 두부 엑스선검사에서의 환자선량 권고량 발표(대한방사선방어학회, Vol.35 No.3, 2010,9)

첨단의료기기의 현황과 전망

이름: 허영
직위: 의료기기 PD (신산업대표PD)
소속: 한국산업기술평가관리원

Abstract

의료기기는 전기, 전자, 기계, 재료, 광학, 통계학 및 바이오와 의학 등이 융합되는 다 학제간(interdisciplinary)의 응용기술로, 궁극적으로 인간 삶의 질 향상을 목표로 하며, IT·BT·NT 기술이 융합된 신개념의 첨단의료기기 산업은 미래 국가 성장동력 산업으로서 그 중요성이 크게 부각되고 있다. 기술적 측면으로는 신개념의 융합형 의료기기에 필요한 핵심원천기술 확보와 첨단 IT·BT·NT기술의 발달로 인해 의료기기의 응용범위가 확대됨에 따라 관련 기술의 퓨전화가 필요하며 융합을 통한 의료기기 산업의 역량 강화가 요구 되고 있다. 특히 고품위 의료서비스를 위한 진단치료의 일체화, 소형화, 네트워크 연동, 비침습 및 모바일화가 급속히 진행되고 있다. 본고에서는 최근 의료 복지서비스의 트랜드에 따른 첨단의료기기의 현황과 전망에 대하여 소개하고자 한다.

Brief Biosketch

- 현, 지식경제 의료기기 PD (한국산업기술평가관리원)
- 한국전기연구원 의료IT융합연구 본부장
- 차세대 의료기기 기술위원회 위원장 (지식경제부)
- 산업원천기술로드맵 및 통합기술청사진위원장 (산업기술진흥원)
- 첨단의료복합단지 추진단 위원 및 의료기기 설계자문단장(보건복지부)
- 의료산업선진화 위원회 전문위원 (국무총리실)
- 정부정책과제 심의위원 (식약청)
- IEC TC 62(의료기기) 표준기술위원회 위원장 (기표원)

일반연제 1, 2, 3

일반연제1 좌장 | 전상범 교수(이화여대), 변경민 교수(경희대학교)
일반연제2 좌장 | 허동은 교수(서울대학교), 박중열 교수(중앙대학교)
일반연제3 좌장 | 천홍구 교수(고려대학교), 장동표 교수(한양대학교)

『일반연제 1: Biomedical Optics, Robotics and Medical Imaging』

- Biomedical Optics
  이형오
- Biomedical Robotics
  김민태
- Medical Imaging
  고근배, 위헌, 어태준

『일반연제 2: Cardiovascular, Neural, Orthopedic and Rehabilitation Engineering』

- Cardiovascular Engineering
  박지은
- Neural Engineering
  임정환, 유상진, 이중훈
- Orthopedic and Rehabilitation Engineering
  엄시내

『일반연제 3: Biomaterials, Physiological Modeling, U-Health & eHealth, and Medical Nano and Microtechnology』

- Tissue Engineering and Biomaterials
  오민재
- System Biology, Physiological Modeling
  이현승
- U-Health, e-Health, m-Health Technology
  박혜정, 심수영
- Medical Nano and Microtechnology
  오홍기

일반연제 1

Biomedical Optics

레이저 흉터 치료에서의 광감응 리보플라빈의 효과

이형오, 윤종인
대구가톨릭대학교 의료과학대학 의공학과

Non-ablative laser scar remodeling has been recently proposed as an alternative to CO2 and Er:YAG laser treatments. These methods lead to convert new collagen structures in dermis and epidermis from the original scar structures. Since riboflavin and ultraviolet A (RFUVA) treatment has been used for the collagen tightening method in keratoconus treatment, this treatment was applied to non-ablative laser scar remodeling in this study. The results showed that RFUVA treatment affect to the collagen cross-linking in epidermis of porcine skin samples. Therefore, RFUVA treatment could assist non-ablative laser scar remodeling through enhancing collagen cross-linking in the desired region.

Biomedical Robotics

CT 영상을 이용한 부착형 생검 로봇 개발

김민태[1], 정현철[1], 손재범[1], 김성천[1], 김영재[1], 박창민[2], 김광기[1]
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The rapid growth of the medical robot surgery is proceeding actively. However, medical robot has been limited because of the size, price and sensitive environment. In particular, the biopsy procedure has many practitioners of radiation exposure. In this paper, we developed a distantly controlled biopsy robot which is radiation to reduce. Biopsy robot is nonmetallic material to minimize noise and interference with computed tomography. This platform provides at least three degrees of freedom, which orientates and drives an attached instrument in tasks such as real-time computed tomography biopsy and using a 3D image based simulator.

Medical Imaging

9.4T 자기장에서의 고성능 PET/MRI에 관한 연구

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Here, we'd like to present the improved design and physical performance evaluation of PET insert for simultaneous PET/MR acquisition. The PET insert consists of 64 LYSO-SiPM detectors arranged in 4 rings of 16 detectors to yield the ring diameter of 62 mm and axial fields of view of 55 mm. To evaluate the performance of PET insert, several physical performance parameters were measured and several phantom images were acquired. The results indicate that the new SiPM PET/MR system has reasonable performance for small animal imaging and the simultaneous PET/MR imaging with the insert is encouraging. Further studies on the interferences between PET and MRI are now under way.

60×60 배열전극의 Trans-admittance Mammography를 이용한 비정상 조직 검출 알고리즘의 평가

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Electrical impedance imaging has a potential to detect an early stage of breast cancer due to higher admittivity values compared with those of normal breast tissues. We applied the anomaly detection algorithm to the frequency difference admittivity images obtained by the high density trans-admittance mammography system for estimating the size and position of breast cancer. We tested 4 different size of anomaly with 0.2 S/m conductivity at 5 different depths. From a frequency difference trans-admittance map, we can readily observe the transversal position and estimate its size and depth. However, the size estimation was dependent on the admittivity contrast between anomaly and background. It requires the robust detection algorithm regardless of the conductivity contrast.

조직이완특성 기반 잡음제거를 이용한 R2* Map (MRI) 향상

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Multiple-echo images are a series of magnetic resonance (MR) images acquired at different echo times. These images are acquired for various purposes such as quantification of myelin contents, T1 mapping, R2* mapping, etc. But these images tend to have a low SNR because high sampling rates are used to reduce the scan time. Conventional filters can effectively reduce noise, but introduce spatial artifacts. To obtain high-quality images which do not introduce artifact, we developed new denoising method based on tissue relaxation properties. As a result, we could obtain high-SNR and high-contrast R2* map.

일반연제 2

Cardiovascular Engineering

맥동 유체 모델 기반 자기 공명 위상 대조 영상 분석 연구

박지은, 김정훈, 이나희, 안도현, 권주영, 정민영, 이종민
경북대학교 의용생체공학과

In the Present study, development of a pulsatile flow model which could control its output volume and pulsatility was conducted. The pulsatile flow model was produced to control total output volume(designated to cardiac output), frequency(heart rate), and duty ratio(time phases of systole and diastole). The pulsatile flow model was validated using Flowmeter. Time-velocity curve charactreristics of MR phase contrast imaging were analyzed using validated pulsatility.

Neural Engineering

정상 상태 시각 유발 전위 기반 BCI 시스템의 중증 ALS 환자에 대한 적용: 사례 연구

임정환, 황한정, 한창희, 이준학
한양대학교 생체공학전공

The aim of this study was to verify whether a steady-stated visual evoked potential (SSVEP)-based brain-computer interface (BCI) system could be successfully applied to a patient with severe amyotrophic lateral sclerosis (ALS). To this end, we implemented a four-class SSVEP BCI system, and applied it to a severely locked-in ALS patient. In the online experiment, EEG signals were acquired while the patient was gazing each designated stimulus, and then his intentions were classified in real time. The classification accuracy of our online experiment was 72.22 %, demonstrating the possibility of the application of SSVEP-based BCI system to patients with severe ALS.

나노 금막대의 플라즈모닉스를 이용한 신경세포 발화 기능 조절

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KAIST 바이오 및 뇌공학과

Optogenetics provides exciting opportunity to study the brain function by activating or inactivating genetically modified neurons using visible light. However, viral integration of exotic gene and low penetrability of visible light can lead to cell damages. In this study, we developed a simple and unique neuromodulation technique using nanotechnology. We used plasmonic property of gold nanorod to stimulate neurons. The firing rate of neurons was decreased during the plasmonic stimulation without cell damages. This technique is a genetic transfection-free method and it has great potential to be applied in neuroscience researches.

CNT/PDMS로 구성된 커널형 EEG 전극 개발

이중훈[1], 이승민[1], 변항진[1], 김정훈[1], 홍정숙[2], 이상훈[1]
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Current Electroencephalogram(EEG) monitoring system is generally needed lots of electrodes and exact position of electrodes on the scalp. This system makes it difficult for a patient ambulatory EEG monitoring or record EEG by oneself. Our study here is to develop a small sized, friendly, easy to use electrode for EEG monitoring. We fabricated a carbon nanotube polydimethylsiloxane (CNT/PDMS) composite canal typed ear electrodes for EEG recording. We focused on to record EEG in the ear canal by using new type electrodes. Electrode performance on EEG was evaluated by alpha rhythm detection. We observed the successful recording of alpha rhythm. This electrode could be used for monitoring EEG in U-health care and BCI field.

Orthopedic and Rehabilitation Engineering

점프운동 중 착지동작이 성장기 쥐의 뒷다리 성장에 미치는 영향

엄시내, 박지형, 서동현, 김한성
연세대학교 보건과학대학 의공학과 & 프라운호퍼 의료기기 공동연구센터

Jump exercises have been verified as an effective stimulus for bones. We separated the motions into leaping up and landing motion to evaluate which stimulus occurring in jump exercises has more remarkable influences on bones in the growing rats. One of the two motions, landing motion, was emulated by free-fall motion from 20cm and 40cm height to investigate the effect of landing motion. RCON were not dropped and R20cm and R40cm were named after the height they dropped from. Rats were dropped 10times/day, 5days/week for 6 weeks at the age of 6 weeks. After 6 weeks of free-fall stimulus, BMD and the length of right tibiae were measured using in-vivo micro-CT. Free-fall stimulus had an effect on BMD of the trabecular bone between RCON and R40cm. On the other hand, there were no significant differences in the length of tibiae. These results indicate that the landing motion in the jump exercise has a beneficial effect on BMD but not on the longitudinal growth of the bone.

일반연제 3

Tissue Engineering and Biomaterials

급속조형기술의 응용을 통한 나노섬유 기반 관형 지지체의 강화

오민재[1], 박수아[2], 박소희[1], 강윤경[1], 현진숙[1], 신정욱[1,3]
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[3]First Research Team/고령자라이프디자인연구소/UHRC/심혈관 대사질환 연구센터

Various types of tube-shaped scaffolds have been developed to mimic morphological and functional properties of blood vessel. In this study, combinational method to reinforce biomimetic tubular scaffolds was devised. Electrospinning technique was utilized to fabricate polyurethane (PU) tubular scaffolds, which are composed of nanofibers. In order to improve its mechanical properties, poly(ε-caprolactone) (PCL) was plotted over PU tubes via rapid prototyping (RP) process. This study was focused on investigation of the potential of RP technique as a stable method for fortifying tubular scaffold.

System Biology, Physiological Modeling

환자의 좌심방 모델을 기반으로 한 심방세동의 시뮬레이션 모델

이현승[1], 권순성[1], 홍승배[1], 지윤철[1], 윤용현[2], 박희남[3], 심은보[1]
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The purpose of this study is to propose a patient-specific model of atrial fibrillation (AF) and to apply ablation to the virtual test model to terminate AF. We use the bi-domain model coupled with the Courtmanche model of human atrial cell to simulate the 3D electric waves on left atrial surface. S1-S2 stimulation protocol is applied to induce AF in the model. To create a realistic model, patient-specific geometry obtained from CT data is used.

U-Health, e-Health.m-Health Technology

태블릿PC를 이용한 인지재활 프로그램 개발

박혜정[1], 조종현[2], 여정진[1], 임윤호[1], 유문호[2], 양윤석[2]
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[2]전북대학교 공과대학 바이오메디컬공학부

This study aims to develop a touch pad-based application for cognitive rehabilitation of brain-diseased patients. Touch-based interaction of the device is expected to provide easy and effective training of cognitive ability. Its greater mobility, convenience, and functional affordance over similar computational approaches based on desktop will increase the continuity and consistency of the training. Training content for 5 cognitive areas were developed based on concurrent researches and clinical guidelines. Field test is being arranged to ensure clinical validity as well as the usability of the prototyped application. The test results demonstrate the

significance of the program.

비침습 및 무구속적 연속 체온 모니터의 정확도 평가

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[2]서울대학교 의과대학 의공학교실

Body temperature is one of the important physiological signals and temperature monitoring is useful in checking the overall health condition, detecting hypothermia in patients under anesthesia, and acquiring information on infection. We invented the noninvasive necklace-typed deep body thermometer and verified its performance through simulation works. In this study, we measured body temperature from human using the necklace-typed thermometer. Two young, healthy subjects participated in this study and the accuracy of the thermometer was compared with the infrared thermometer. The accuracy was 0.35 ± 0.21 ˚C and we will proceed to evaluate the performance of the thermometer with varied temperature range of subjects. We expect that this study can be used for patient monitoring, anesthesia management, daily health care, and cancer treatment.

Medical Nano and Microtechnology

화학적 처리에 의해 패터닝된 그라핀과 신경세포 배양

오홍기[1], 남효근[1], 조다애[2], 지광환[2], 김민혜[1], 김대훈[1], 송광섭[1]
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Since graphene has the unique physical/chemical properties, it has been demonstrated in tissue/cell engineering. In this work, we use graphene sheet to culture the neuroblastoma cell. And the surface is treated by plasma in oxygen and fluorine gas environment. The exposed area of the metal mask is partially oxygen-terminated and otherwise area is fluorinated. Cell growth is depending on the surface treatment by hydrophilic and hydrophobic. As a result, cells are adhered on the hydrophilic surface and the adhesion of cells does not occurred on the hydrophobic surface. In order to evaluate the cell morphology, we check the fluorescent/optical microscope.

POSTERS I

- Biomedical Engineering Education and Career
- Biomedical Optics
- Biomedical Robotics
- Cardiovascular Engineering
- Medical and Bio-informatics
- Medical Imaging
- Medical Nano and Microtechnology
- Neural Engineering
- Orthopedic and Rehabilitation Engineering
- System Biology, Physiological Modeling
- Tissue Engineering and Biomaterials
- U-Health, e-Health, m-Health Technology

Biomedical Engineering Education and Career

P1-01 다중생체 신호를 이용한 Biometric 알고리즘 개발

정재훈, 박성윤, 김성재, 김성민, 이상준
동국대학교 의생명공학과

This paper is about the personal identification algorithm using an ECG and PPG. For gathering multi bio signal, we designed a new hardware for acquiring ECG and PPG. Proposed algorithm automatically analysis 21 features during one hearts beat from gathering bio signal. For personal classification, we adapt to the SVM pattern recognition method. Proposed algorithm has been tested 33 person's bio signal data. The algorithm performance is shown 99.28% recognition rate, 0.88% FRR, 0.85% and FAR 1.28% EER. This experiment result is shown the greatest recognition rate.

P1-02 조영제 투여 부작용 감지 시스템 개발 연구

김홍래[1], 김성천[1], 김광기[1], 고영환[2]
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In this study, we propose a miniaturized alarm system for prevent accidents due to the side effects of the contrast medium. For this purpose, we were tested the sensitivity of the sensor for the suitability of the sensor. By this test we chose the flex sensor. And we were developed real-time monitoring sensing device. Also, we were tested reliability testing. We were installing balloon in a certain area and we were attached sensing devices to this area. And we were detection that the balloon is inflated. Measurement found to detect the 5 step. By this system, we can prevent accidents due to the contrast medium was expected.

P1-03 전도자극절제술 후 발생할 수 있는 혈종 감소 활동

김진만1, 박홍철1, 이상률1, 김종순1, 신동익1, 허수진1,2, 주세경1,2
1서울아산병원 의공학과
2울산대학교 의과대학 의공학교실

In this paper, we show several activities for reducing hematoma occurred after radiofrequency catheter ablation in patients with atrium fibrillat. To find the main cause of hematoma occurrence, analysis on the cases of RF catheter ablation within 5rcent years was performed. The analysis cleared out that one reason is the time interval of sheath removal after the last heparin injection and the other is malfunction of the device measuring activated clotting time(ACT). The minimal sheath removing time is 3 hours after last heparin injection. Regular check of the ACT device and user education was done to reduce error in using ACT device. With this activities, no hematoma occurred so far.

P1-04 응급환자의 MRI 검사 시 정전기 방지 활동을 통한 기기 관리 방안개선

조성범[1], 사은식[1], 진경원[1], 김종순[1], 허수진[2], 주세경[2]
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Magnetic resonance imaging (MRI) system is widely used in finding cerebral hemorrhage, stroke, and brain tumor. In emergency room (ER), quick diagnose of patients is essential issue, and thus is not enough time for change clothes of the patients with hospital gown before MRI scan. Accordingly, patients with normal clothes can produce static electricity discharge when the patient was laid in the MRI system and this makes problems in surface coil of the MRI scanner.
In this paper, we analyzed causes of the failure through the ERP (Enterprise Resource Management Program) records to utilize the data in maintenance of MRI system. In addition, several methods for preventing further failure due to static electricity shock were also introduced.

P1-05 병동 및 외래 의료기기의 사용자 및 환자 안전 예방활동

김승훈[1], 유환동[1], 김만기[1], 김종순[1], 허수진[1,2], 주세경[1,2]
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[2]울산대학교 의과대학 의공학교실

Reducing potential dangers by medical equipment is very important task for the safety of patient and users. In this study, to assure the safety of medical equipment, risk factors of the equipment were analyzed at first by utilizing the repair records. Problem related with power cable was the most frequent risk factor and fall/drop of equipment and noise from equipment were the second most and the third most risk factors, respectively. Safety assurance activities were done according to the analysis result.

Biomedical Optics

P1-06 1064nm Nd:YAG 레이저 조사 시 피부 노화 치료를 위한 최적의 극저온 냉매 분사 조건 예측 연구

조수현, 조정호, 이주환, 김성민
동국대학교 의생명공학과

The objective of this study was to find optimum cooling conditions for skin aging under the transmission of the 1064nm Nd:YAG laser. For this purpose, we transmitted the therapeutic laser into pig skin samples with the Fluence condition of 26 J/cm2 and the pulse duration of 50ms. We measured internal-external temperatures during/after the application of various CSC (Cryogen Spray Cooling) conditions. Cooling conditions were classified into 200, 250, and 300ms, and applied to skin surface before the laser transmission. Experimental results suggested that the cooling conditions of 200ms and 250ms were beneficial to prevent thermal-injury of epidermis.

P1-07 1064 nm Nd:YAG 레이저 조사 시 CSC (Cryogen Spray Cooling)의 분사 시간에 따른 피부 표면 온도 분석

조정호, 조수현, 이주환, 김성민
동국대학교 의생명공학과

In this study, we analyzed internal-external skin temperatures for the different CSC (Cryogen Spray Cooling) conditions to obtain optimum cooling conditions for skin rejuvenation. We transmitted the 1064nm Nd:YAG laser into pig skin sample for varying fluence conditions. Fluence conditions were divided into 26, 30, and 36 J/cm2, respectively, and the pulse duration was set to 50ms. The CSC conditions were classified into 50, 100, 150, and 200ms, and sprayed on skin surface before laser irradiation. As a result, we found that the CSC condition of 200ms minimizes the epidermal damage most effectively among all employed laser conditions.

P1-08 $LaBr_3$:Ce 섬광체를 이용한 광섬유 감마프로브의 제작

전다영[1], 신상훈[1], 홍승한[1], 심혁인[1], 유욱재[1], 장경원[1], 박병기[2], 이봉수[1]
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In this study, a fiber-optic gamma probe was fabricated using a LaBr3:Ce scintillator crystal and a plastic optical fiber to accurately measure gamma-ray. We measured the scintillation efficiency which is changed according to the length of the LaBr3:Ce crystal. Also, the energy spectra were obtained to discriminate gamma-ray source.

P1-09 Schlieren 기법을 이용한 초음파 가시화 장치 구현

원종호, 조용준, 박동희, 박진감, 신운철, 손정우, 서종범
연세대학교 보건과학대학 의공학과

This study is to visualize the fields of ultrasound in transparent liquids using schlieren method. The schlieren system in this study visualizes the fields of pressure provided by 1.1Mhz transducer. For visualization of wave fields, a light source, two focusing lenses, a collimating lens, a pinhole and a knife edge are needed. Presented result is image subtracting image without ultrasound exposure from image with ultrasound exposure. Because the different pressures are required, given the proper pressure according to the system ultrasound fields can be visualized.

Biomedical Robotics

P1-10 실내용 승마운동기기를 이용한 고령자의 기초체력 효과 분석

김의령[1], 강승록[1], 정구영[2], 문동안[3], 권대규[4]
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[4]전북대학교 바이오메디컬공학부

The purpose of this study was to analyze exercise effect of horse riding for estimating basic physical fitness of the aged. Subjects performed horse riding exercise using SRider(Neipplus, Co., korea) for form of indoor exercise equipment type. We measured trunk flexion, sit up, whole body reaction, leg strength and maximal oxygen uptake in basal physical fitness. The result showed that in basic physical fitness, leg strength only increased significantly. That is continuous movement of figure

eight of horse riding is lead to isometric muscle contraction in lower limbs. Our study found that horse riding exercise using indoor instrument could improve leg strengths and three meter walking ability in lower as exercise effect.

P1-11 경사각도별 체중부하 감소률에 따른 근육활성변화 분석

강승록, 김의령, 정구영, 문동안, 정호춘, 권대규
전북대학교 헬스케어공학과

This study was to analyze muscular activation according to reduction ratio of unweight in the angle of gradient. The subjects were ten adults who were healthy. Experiments were conducted after subjects adapted enough and we analyzed into muscular activity of lower limbs during gait according to reduction ratio unweight(0%, 20%, 40%) in the angle of gradient (0°,15°). The result showed that there is inclined the muscular activity according to weight which are supported by harness apparatus. Grade: 15°, it did not show any markable difference. however, activity signals of Muscles are significantly different in each phages(it also showed that similar patterns related in ground level) Normally, Body Weight Support System uses in order to rehabilitation but it was hard to adapt to use in inclination level not on the ground. As a result, it is likely to wrong that current securing a subject in a harness system applying to sloping places. In a conclusion, harness research needs to progress to applying in any condition whether inclination level is ground or not.

Cardiovascular Engineering

P1-12 KCNQ1 gene inhibition에 의한 서맥 세포모델에서의 전기생리학적 변화와 세포-세포간 전도에 관한 기능적 연구

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The slowly activating delayed rectifier current Iks contributes to repolarization of the cardiac action potential. The K+ channel loss of function can lead to arrhythmia. The purpose of this study is electrophysiology and cell-cell communication research in terms of drug treatment or KCNQ1 gene inhibition on atrial cell. In this study, we evaluated that drug treatment restored cell-cell communication during abnormal conduction in HL-1. Conduction velocity, voltage and cycle length were significantly higher in isoproterenol combined with magnesium sulfate treatment group than in those only isoproterenol and only magnesium sulfate treatment group. These data suggest that isoproterenol combined with magnesium sulfate represents an important regulator of repolarizing K+ currents in HL-1 cell.

P1-13 침습형 혈압측정방식 기반의 혈압시정수를 통한 심박출량 추정

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It is important parameter what heart failure patient's Cardiac Output. Cardiocvascular disease patients in intensive care unit need to be monitored continuously to detect and treat urgent additional heart diseases. Conventional diagnostic method is arterial blood pressure measurement to evaluate cardiac function, but arterial blood pressure doesn't show the exact evidence of cardiac function deterioration due to the effect of cardiovascular system. In this study, we have tried to estimate the patient's cardiac output by arterial blood pressure using by invasive blood pressure method. These estimation is compared to the measured cardiac output parameters those were obtained ultra sound flowmeter and pulsatile pneumatic pump.

P1-14 심실보조장치용 ventricular ECG를 이용한 Ventricular Ectopic Beat의 검출

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There are possibilities that the use of VAD can cause the load changes of heart and dangerous arrhythmias such as VT and VF. At the animal experiment with 3porcine models, v-ECGs were measured using electrodes that were installed in ventricular muscle and these data were compared and analyzed with the ECG that measured at the same time. When the PVC happened, the waveform of v-ECGs showed specific changing patterns that could be measured with analyzing algorithms. The observed

patterns at v-ECG can be useful to measure the abnormal heart beat and to analyze the effect of LVAD on heart's conditions.

Medical and Bio-informatics

P1-15 지지 벡터 기계를 이용하여 중년 여성의 무릎 골관절염 예측을 위한 계단 오르기의 움직임 해석

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The aim of this study was to investigate the association between movement changes during stair ascent and pain and radiographic severity of knee osteoarthritis (OA) in the elderly women using machine learning (ML). Kinematic data for stair ascent were analyzed based on one of the popular ML methods, support vector machines (SVM). SVM was used to search kinematic predictors associated with pain and radiographic severity of knee OA. SVM showed accuracy of detection of knee OA (97.4%), prediction of pain (83.3%), and radiographic severity (83.3%).

P1-16 무릎 골관절염 위험도 예측을 위한 인공신경망 모델

최수범[1,2], 유태근[3], 김성권[1,4], 김덕원[1,2,4]
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The aim of this study was to develop an artificial neural network (ANN) model for knee osteoarthritis (OA). KNHANES V-1 data were used to develop ANN for radiographic knee OA. A logistic regression analysis was used to determine the predictors which were inputs of the ANN. The ANN were built using the independent predictors including sex, age, body mass index, educational status, hypertension, moderate physical activity, and knee pain. ANN predicted radiographic knee OA with an area under the curve of 0.81. The ANN model may be useful for identifying the adults at high risk for knee OA.

Medical Imaging

P1-17 EF-TEM을 이용한 초음파 조영제의 구조 분석

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This study is to evaluate the structure of microbubble of ultrasound contrast agent(UCA). The UCA fabricated in this study utilize conventional lipid for shell formation and perfluorobutane as the internal gas. We had the negative staining using uranyl acetate and phosphotungstic acid to get energy-filtered transmission electron microscope(EF-TEM) image. As a result, Our experiments indicate that UCAs composed of spherical microbubbles and the shape of the UCA bubbles were verified liposome structure. Also, external of liposome has phospholipid bilayer and hydrophobic.

P1-18 삼차원 입체프린터를 이용한 대퇴골 제작

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충북대학교 의용생체공학과

Femur shaft has long pipe shape and almost no spongy bone inside. Therefore, when the fracture occurs, it does not regenerate. The highest frequency of femoral fractures occurs at the shaft. Its surgical treatment is IM (intramedullary) nailing, where long nail is inserted into the bone-marrow cavity. If it does not follow the centerline during the operation, the patients suffer the risk of secondary fracture. In this study, three dimensional models was calculated from several tens of femoral CT images and made by three-dimensional printer with the same size for IM nailing simulation. It is expected to increase the precision of IM nailing and prevent a secondary damage and shorten the operating time.

P1-19 Node betweenness centrality 분해를 이용한 자폐증에 대한 뇌 네트워크 분석에 관한 연구

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We constructed the brain network from fiber tracks which are obtained from the diffusion tensor MRI tractography, using the ε−neighbor construction method. The ε−neighbor method used two endpoints of the fiber tracts. To analyze the connectivity of the brain network, we used the betweenness centrality decomposition for the 14 autistic subjects and 17 control subjects. The control subjects show significant increase of connected components compared to autistic subjects by removing nodes. When the numbers of removed nodes were between 9 and 17, the p−values were less than 0.05.

P1−20 자궁경부 세포의 세포학적 진단을 위한 영상 전처리 알고리즘 개발

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This study is the image preprocessing of cervical cell image. Microscope images of 10 cases were used a 400 magnification the preprocessing of the image taken. Image preprocessing algorithm has been implemented using the NI Vision Development. Images are converted to a gray color because RGB true color image acquired and through the median filter, convolution filter and the converted image 3x3 sobel edge filter processing. As a result, most of the images in the cytologic diagnostic criteria prominence to the edge of the nucleus and the cytoplasm, but also unnecessary in the diagnosis of inflammatory cells tended to be as prominent. In the future to modify these parts of the liquid cell, and further diagnosis will be required to implement the algorithm.

P1−21 4D CT 영상 재구성을 위한 호흡 모니터링 시스템 개발

송윤선, 노형욱, 장용원, 이수열

한국전자통신연구원 의료영상연구실

Dose delivery error minimization is a serious problem in radiation therapy, and patient's respiration can cause a movement of tumor and peripheral organs. 4D computed tomography(4D CT) and respiratory−gated radiotherapy(RGRT) has been proposed to provide the stable image data and to reduce the errors. The purpose of this work is a development of respiratory monitoring system through the acquisition of respiratory signal for a 4D CT reconstruction and RGRT. Respiratory signal is acquired through the piezo−type belt around the patient's abdomen and the signal is analyzed to provide the retrospective sorting and prospective gating.

P1−22 다목적/다기능 디지털 엑스선 촬영 시스템 개발

이인범[1], 이수열[1], 이정원[1], 송윤선[1], 최광윤[2], 고종민[2], 장태효[2]

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Multi−purpose digital X−ray system which can be operated as tomosynthesis imaging and cone−beam computed tomography(CT) as well as traditional 2−D radiography is developed. Multi axis−controlled gantry is designed for CT and tomosynthesis imaging. GPU reconstructs projection images for high performance. The system can be applied for simple lung cancer diagnosis with lower dose level and higher sensitivity.

P1−23 워터쉐드 알고리듬을 이용한 치아 영상 분할을 위한 전처리

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In this paper, tooth image segmentation is improved by contrast−stretching function and Watershed algorithm at RGB color image. Step of watershed algorithm is boundary appointment, assignment seeds and detecting individual image segmentation. We proposed first step method by applied contrast−stretching function and Otsu's thresholding. Images are improved tooth intensity value by contrast−stretching function and contained tooth data more than before applied contrast−stretching function. So this method is improving individual segmentation by watershed algorithm. According to simulation result, the proposed method is better than before adaptive image at color image.

P1−24 초음파펄스진단장치의 성능평가 방법 연구

김산, 이재원, 황윤수, 장무영, 차지훈, 김수연, 조은정, 김혁주

식품의약품안전처 식품의약품안전평가원 의료기기연구과

Diagnostic ultrasound imaging system is the high−tech medical device, and it accounts for many portions

(occupying about 20.4 %) in production and export markets of domestic medical diagnostic system and it tends to be expanded continuously. However, currently, it is our actual state that domestic guidelines to evaluate the safety and effectiveness were not prepared yet. Accordingly, it is urgently needed to prepare test methods to evaluate the performance of ultrasonic pulsed echo imaging system. This study reviewed domestic and foreign standards to evaluate the performance of ultrasonic pulsed echo imaging system, and proposed test items, criteria and methods. Through it, it is expected that we may contribute to secure international competitiveness for the high-tech domestic medical imaging device industry at the same time to enhance the quality and safety of ultrasonic pulsed echo imaging system.

P1-25 동공대광반사 검사를 위한 스마트폰 앱 개발

신지윤[1], 조동현[2], 이세희[2], 문성용[1], 배진호[3], 이태수[1]

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The pupillary light reflex (PLR) test is the method of examining the immediate reaction of the pupil by light stimuli, and dysfunctions in autonomic nervous system can be evaluated quickly and easily through this method. The proposed system in this study utilizes the flash LED of the smartphone to provide light stimuli to the patient's pupil, and the resulting reactions are recorded as images and videos to be analyzed. In case of video recording, the user can turn the flash on or off at the desired moment and data acquisition time was set to be 6 seconds. For the image mode, the system was designed to acquire one image prior to light stimulation and 4 images after light simulation, so that temporal changes in pupil sizes with passing of time can be compared. The system developed in this study utilizes smartphones so that anyone can easily utilize the tool conveniently without restrictions of time and location. Further, other strengths include the fact that light stimulation can be provided using the flash function built within the smartphones, as well as the fact that patient data could be saved and managed easily, and shared using the email transmission function.

P1-26 가역적 방사성리간드 결합의 정량화를 위한 비침습적 이중도표분석법

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We propose a noninvasive bi-graphical analysis for reversible radioligands, and applied to human [18F]FP-CIT PET data while comparing with conventional graphical analysis methods using a reference region. The proposed method provides accurate parameter estimation for both ROI and voxelwise quantifications, improving drawbacks of the conventional techniques.

P1-27 고양자효율 광전자증배관을 이용한 비정시간 측정 가능 전신용 양전자단층촬영장치의 회로 개발

손정환, 이재성

서울대학교병원 핵의학과

Recently, there has been a growing interest in the time-of-flight positron emission tomography (TOF PET) which can enhance the quality of images by reducing the statistical noise in the field-of-view (FOV). The timing information can be measured more precisely by using photo detectors with lower timing resolution. Generally, photo detectors with high quantum efficiency (HQE) have low timing resolution. In this research, a whole-body TOF PET will be developed with HQE photomultipliers (Hamamatsu H10966A-100) and 15 X 15 LYSO arrays of 3 mm × 3 mm × 20 mm crystals. Front-end electronics such as amplifier boards, power boards which generate various voltages to ICs and photomultipliers, and multiplexing boards are designed and developed.

P1-28 분리가능자취법과 거리주도법을 적용한 PET 재구성 영상 비교

김경윤, 이재성

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To improve the image quality of reconstructed PET images, system matrix in statistical iterative reconstruction should be modeled with more realistic parameters. The separable-footprint (SF) approach, which was originally introduced for 3D cone-beam CT reconstruction, is a recent method for accurate system modeling with small calculation burden. The aim of this study was the implementation of SF method for PET reconstruction with real system geometry and comparison of the results with those obtained using

conventional distance-driven (DD) method.

P1-29 SPECT에서 총변이 영상 재구성을 위한 기하비선형과 비등방성 확산 필터의 결합

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Total-variation image reconstruction can reduce artifacts of the reconstructed images from low angular sampled SPECT data. In this study, a combination of geometric nonlinear and anisotropic diffusion filters was used in order to reduce the noise in the projection domain before TV image reconstruction. The combined filter was proven to be effective in reducing noise while preserving edges when the measurement data set has a high level of noise, which will be beneficial for improving the quality of clinical nuclear medicine images.

P1-30 초음파, 일주기 리듬이 골분화에 미치는 영향

박민형[1], 서동현[2], 손정우[2], 김한성[2], 서종범[2], 배기호[1]
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Low intensity pulsed ultrasound is used bone fracture healing. Ultrasound induced bone cell proliferation and differentiation. One of the circadian clock components Per2 is related osteoblastic function. Per2 mutant mice show high level of BV/TV(%) in tibia. In this study, ultrasound(77mW/cm2, duty cycle 1%, 20min)was treated WT and Per2 mutant mice right tibia on 4weeks. Interestingly WT mice tibia show high level of BV/TV compared to lift tibia but Per2 mutant mice did not changed. It indicate Per2 is important factor for signal transduction of ultrasound induced bone differentiation.

P1-31 최대우도추정법을 이용한 단일출력 다중픽셀 PET 검출기의 연속적 상호작용깊이 정보 추정

이민선, 이재성
서울대학교 의과대학 방사선응용생명과학 전공

We have presented new depth-of-interaction(DOI)-encoding method to extract continuous-DOI information with a single-layer pixelated scintillation crystal and single-ended readout using triangular shape reflector. To improve DOI positioning accuracy by more precisely modeling the detector response function, we investigated the maximum-likelihood(ML) estimation method to decode DOI information. As a result, ML-based DOI estimation was feasible for the novel continuous DOI encoding detector based on single layer pixelated crystal and single-ended readout: average DOI positioning accuracy for 5-step DOI classification in 20 mm crystal was 82% and the ML-estimated DOI positions for almost all events were included in 'true' ±1 DOI position.

Medical Nano and Microtechnology

P1-32 디클로페낙 제어 전달을 위한 체내 이식형 마이크로칩

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To allow controlled delivery of an anti-inflammatory drug, diclofenac sodium, we prepared a microchip embedded with precisely-designed micro-channels and -wells, serving as diffusion wall and drug reservoir, respectively. As we adjusted the length and cross-sectional area of the channel, the drug release profiles could be accurately tailored, following the Fick's 1st law of diffusion. Thus, by properly combining multiple pairs of micro-wells and channels of different geometry, a single microchip could release the drug in a zero-order pattern. The microchip herein also demonstrated continuous, long-term exposure of the drug in vivo.

P1-33 약물 전달용 실리카 나노로드

주영호[1], 이상현[1], 박성범[1], 류원형[2], 박용일
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In this study, we suggest pH-sensitive silica nanorods for effective drug delivery into various cell condition including cancer cells which is reported to make relatively acidic circumstances inhibiting biodegradability of drug carriers. By incorporating sodium into the silica network, corrosion is concentrated on sodium point among the silica network in acidic solution, and this phenomenon enables us to control biodegradability of drug carriers (silica nanorods in this study) in various pH conditions

by changing sodium content. Silica network structure which is seriously deteriorated by addition of Na2O was also investigated by observing non-bridge oxygen using Raman.

P1-34 미세 유동장치를 통한 난자 내로의 냉동보존제 주입 궤적 최적화 연구

김정아, 우민지, 김보현, 김윤년, 박희준, 구정훈, 이종하, 김민수, 손창식, 허윤석

계명대학교 의과대학 의용공학과

Oocyte cryopreservation has become an essential tool in the treatment of infertility by preserving the ability of oocytes for women undergoing chemotherapy. However, despite recent advances, pregnancy rates from cryopreserved oocytes are still very low. To address limitations of current protocols and to rationally design protocols that minimize the exposure to cryoprotectant, a microfluidic device has been developed as a biophysical tool. In this review article, we summarize the existing microfluidic platform, which spatially secured a single oocyte, created precisely controlled continuous cryoprotectants profiles (step-wise, linear and complex) for the addition of CPA to oocyte and measured the oocyte volumetric responses to each profile.

P1-35 지르코니아 세라믹에 대한 치과용 교정용 브라켓의 접착

곽지영

경북대학교 대학원 의용생체공학과

Direct bonding in orthodontics has improved esthetics, decreased gingival inflammation and enamel decalcification, and made the placement of orthodontic appliances more comfortable for patients and doctors. With the increase in adult orthodontic treatment, clinicians must now contend with bonding to many unnatural surfaces, e,g., amalgam, porcelain, gold, stainless steel, and other restorative materials. The current in vitro study suggests that adequate pre-treatment methods combined with the use of primers for improved adhesive bonding of orthodontic brackets to dental zirconia ceramic.

P1-36 두 기질의 농도기울기를 생성 가능한 미세유체칩의 개발

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Most biological reactions occur based on multiple substrates. But conventional methods are not suitable to quantify reaction kinetics, because numerous repetitive experiments lead to unwanted time delay between experiments, and large amount of reagents are needed to repeat similar experiments. PDMS microfluidic chip can be a good tool for this use. It has numerous merits such as, biocompatibility, ease of fabrication, optical transparency, and oxygen permeability. In this study, multi-layer PDMS microfluidic chip was suggested which is capable of generating 36 concentration gradients of two substrates. Using this, reaction kinetics of various biological experiments can be analyzed by single chip experiments.

P1-37 표면의 단차를 평탄화하여 액적의 속도를 높인 전기습윤 장치

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EWOD (electrowetting on dielectrics) device can facilitate chemical and biological analysis with much simpler system than conventional microfluidic devices, because it can manipulate droplets with electrical signals. Performance of the EWOD device can be greatly affected by surface condition of device. Defects and irregularity of EWOD device can hinder droplet movement. As a result, threshold potential is increased. In this study, an EWOD device, treated with flattening process, was fabricated to compare its performance with conventional EWOD device.

P1-38 DC 임피던스에 기반을 둔 순환종양세포 비표지 검출법

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Quantification of circulating tumor cells (CTCs) in blood samples is believed to provide valuable evidence of overall state of cancer progression and biomarker based CTC detection method has been one of the most standardized way of detecting CTCs. However, as it recently became controversial in regard to dependability, label-free CTC detection methods are getting great attention worldwide. Here, we describe a label-free DC impedance-based microcytometer for CTCs by exploiting the difference in size between CTCs and blood cells. We were able to count the cells using the developed system with 88% efficiency without both labeling and a dilution process. The validity and efficiency of the system was further verified by examining blood samples from breast cancer patients.

Neural Engineering

P1-39 동심 링 타입 MEA 기반의 신경신호의 측정과 자극을 위한 다채널 시스템

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We have developed a multichannel system using a concentric multielectrode array, which involves placing one electrode on or near the neuron to give the maximum electric field at that location, for 64-channel 20kHz multi recording and the stimulation from a single neuron. This simulated the effect of a concentric MEA to intensive stimulation.

P1-40 Adaptive Multi-scale Entropy (AME) 를 통한 마취 심도 평가

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The accurate estimation of the depth of anesthesia (DoA) is challenge for anesthetists. For estimating DoA, several methods based on the electroencephalography (EEG) have been proposed. Multi-scale entropy (MSE) is widely used for evaluating the dynamics of physiological signals; however, it is not suitable for nonlinear/non-stationary signal such as EEG because this algorithm is linear operation. In this study, we applied adaptive multi-scale entropy (AME) using empirical mode decomposition (EMD) to the EEG recordings during the induction of general anesthesia. As a result, the difference between the AME of awake and anesthesia was statistically significant ($p<0.05$).

P1-41 실시간 움직임 발생 시점 검출 알고리즘

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Voluntary trigger signal is needed for finding movement onset in EEG-based asynchronous BCI. For this, EMG generated by movement can be used as a trigger signal. Therefore, we established a real-time movement onset detection algorithm on the basis of EMG signals. The algorithm classified 4 types of movement situations - left hand movement, right hand movement, both hand movements, and both leg movements - and detected the movement onset. Before applying to the real time algorithm, calibration step was needed for finding thresholds. The result showed 100% accuracy for two subjects.

P1-42 적외선을 이용한 뇌세포 자극 시의 온도변화 측정

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GIST 의료시스템공학과

In the last decade, optical stimulation using near infrared light has been increasingly reported to alter electrophysiological activities of the nervous system. The basic mechanism to elicit neuronal behavioral modulations has recently been understood as temperature increase by light energy exposure in a targeted area[1]. In this study, we investigated temperature increases during optical stimulation using near infrared stimulation which elicits neuronal behavioral modulations in globus pallidus and subthalamic nucleus regions. We found linear relationships among the power intensity of stimulation, the amount of temperature increase, and the degree of neuronal behavioral modulations, which indicate causal links interconnected to one another.

P1-43 Neurogram을 이용한 CIS방식 자극설정 평가 연구

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Neurogram is a spectrogram that appears spectral information of neural response to electrical stimulation. We assumed that the similarity between a neurogram and an input-sound spectrogram could signify how effectively a stimulus strategy for cochlear implant works. In this study, we assessed electrical stimulus configuration of CIS strategy using the computational model. The computational model contains stochastic property and anatomical features of cat auditory nerve fiber. To assess similarity between a neurogram and an input-sound spectrogram, we computed Structural Similarity Index. The results show that the number of electrode and the stimulation rate per channel could influence stimulus strategy.

P1-44 3차원 달팽이관 유한요소 모델을 이용한 청신경 반응 연구

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Several research groups have simulated the auditory nerve fiber (ANF) responses of electrically stimulated cochlear using 3-dimensioinal (3D) finite-element models to to describe ANF responses to electrical stimuli. However, the models could not produce several properties, such as stochasticity and neural adaptation. In this study, we built the 3D FE model based on a histological section of the typical cat cochlea to predict electric stimulus field and incorporated the stochastic ANF model . To evaluate our work, we placed five electrodes along the scala tympani in the 3D model and simulated ANF responses to electrical stimulation. We could conclude that more realistic computer model could be used to understand ANF responses and develop auditory prosthesis.

P1-45 신경병증성 통증모델 쥐의 전대상피질(ACC) 전기자극을 통한 감각시상(VPL)의 비정상적 신경활동의 억제효과 관찰

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It is known that hyperactivity of spontaneous activity and somatosensory-evoked response in ventral posterolateral nucleus (VPL) are representative characteristics of neuronal activity in neuropathic pain model rats. In this study, we investigated whether electrical stimulation of anterior cingulate cortex (ACC) for therapeutic purposes can modulate the abnormal neuronal activity in VPL and how the VPL activity is affected by stimulation parameters such as stimulation frequency.

P1-46 다목적 유무선제어 신경자극 시스템 개발

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The neural stimulation system is used for various animal studies in neuroscience. Although diverse neural stimulation systems are commercially available, there are few which can meet the various needs for different purposes. For example, user has to personally control to finish the stimulation. In the present study, based on a microprocessor and an ASIC (application specific integrated circuit), we develop a neural stimulation system which can deliver precise stimulation waveforms comprised of various ranges of amplitude, pulse rate, pulse width, and stimulation duration. The system can operate in either continuous mode or pulse mode for the stimulation only for the preset time period. In the pulse mode, the stimulation pulses can be triggered manually or by an external trigger signal. For large scale animal experiments, multiple stimulation systems connected to the animals can be wirelessly and simultaneously controlled via Zigbee protocol.

P1-47 이식형 코일기반 자기자극시스템의 인가 전압 파형에 따른 전자기 및 열 특성 해석

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Micro magnetic stimulation has been recently suggested as a novel method to overcome the limitations of existing electrical stimulation method. The strong point of this stimulation method is that the current for stimulation can be induced by time varying magnetic fields without direct electrical contact with the target tissue. Therefore, neural stimulation would be sustainable for a long time, even if fibrotic encapsulation layer is formed around the

micro-coil. In this paper, we investigated electrical and thermal effects of micro coil-based magnetic stimulation according to applied current waveform in the brain tissue.

P1-48 삼각파자극 조건과 선형증가 또는 선형감소램프 자극 조건에 의해 유발되는 *rd1* 마우스의 망막신경절세포 반응 비교

안근노, 이왕우, 김주연, 구용숙
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For extracting optimal electrical stimulation parameters for retinal prosthesis, we have been investigating retinal ganglion cell responses in rd1 mice using different stimulation parameters. We compared different pulse shape - square, triangle, ramp pulse- effects on evoked retinal ganglion cell spikes. Both in amplitude and duration modulation, Triangle Pulse with Intensity Doubled is the more efficient than Triangle Pulse with Duration Doubled and Square Pulse. With ramp pulse, in higher amplitude (>40 μA), linear decrease shape is more efficient than linear increase shape.

P1-49 자극 특성 추가와 의식적 집중을 이용한 시각 자극 유도 신경 전위 검출

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Current brain-computer interface is viewed as 'dependent' due to requirement of eye gaze at the stimulus. Attention arising with eye gazing is called overt attention which uses central focal point. Contrary to overt attention, covert attention uses periphery focal point and cognitive focusing. Most recent brain-computer interface used covert attention by using two stimulus to apply on serious ALS patients and others who are unable to move eye. In this paper, we introduce feature added 3-stimulus to induce SSVEP by using covert attention. The power spectrum is analyzed and compared to SSVEP evoked with eye movement. As a result from 2 subjects, the amplitude of SSVEP evoked by covert attention lowered in amplitude yet possible to discriminate from other two stimulus.

Orthopedic and Rehabilitation Engineering

P1-50 흡수성 골고정용 플레이트의 X-선 진단을 위한 황산바륨 레이어 코팅

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Orthopedic fixation devices made of bioabsorbable polymer have attracted a great deal of interest nowadays. However, X-ray invisibility of such implants often posed limitation on inability of postoperative examination. Therefore, we developed an X-ray visible layer composed of a radio-opaque material, barium sulfate, to coat a bioabsorbable bone plate in this work. The radio-opaque layer was fabricated separately by the mold casting method, which was then attached on a bioabsorbable fixation plate, already in clinical use. According to the in vitro test, the X-ray visibility of the radio-opaque plate herein could be continued for more than a month, which was long enough to monitor proper positioning of the plate. Furthermore, the cytotoxicity study of the radio-opaque plate revealed no severe toxic effect, thereby safe formulation.

P1-51 근육경직 완화를 위한 상하지 전동기

박광신, 권기범, 송요창, 오세원, 김명진
G&B 메디텍 기술전담연구소

A medical instrument was devised for a therapeutic care in which expansion of the joint-movement range according to passive rehabilitation of shoulder joint, elbow joint, waist, hip joint, knee and so on, spasticity relaxation and preventing myoatrophy are included, Also, a cost-effective DC motor which is better than servo motor was used. In the result, it is assured that a therapy effect through rehabilitation exercises will be enhanced by adding the function for patients who have spasticity and neurological damage.

P1-52 복부비만 관리용 저주파 기기 개발 및 개선효과 검증

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This study investigated the improvement effect of obesity by treatment with a low frequency electrical stimulation system for the establishment of usable objective data. Fifteen female in their 20's as experiment subjects divided 3 groups(control, commercialized device, developed device) were treated with electrical stimulation on abdomen for 4 weeks. The body weight, BMI, WHR, muscle force, muscle(TrA, IO, EO), fat thickness and body surface temperature were measured by EMG, ultrasound, Body Fat Analyzer and DITI. In conclusion, the developed low-frequency electrical stimulation is useful for management of abdominal obesity.

P1-53 낙상시 발생하는 신체 움직임 측정을 위한 무선 센서 모듈 개발

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As fall is an accident being taken place ordinarily to the elderly, it is important to prevent fractures as a result of fall by detecting fall behavior in advance. The objective of this study is to development wireless sensor module for the measurement of body movement during fall. Previous studies measured movement of body with accelerometer, but they couldn't measure accurate body movement during fall because sensors were connected with cable. In this study, we intended to develop a wireless sensor module which can measure accurate body movement without disturbance of behavior during falls using bluetooth module and 3-axial acceleration sensor including tilt sensor.

P1-54 가속도 신호를 활용한 편향 보행 검출에 관한 연구

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This study was performed in order to detect biased gait being occurred due to vestibular abnormality by using a data of acceleration being generated at foot during gait. Characteristics of acceleration being generated during gait was observed by comparing movement analysis data that was collected in a process of performing biased gait and general gait through induction of galvanic vestibular stimulation with acceleration data and biased direction and degree could be inferred through cumulative value of acceleration data by integrating it. As a result, it could be inferred that detecting gait bias after analyzing gait trajectory by using acceleration of left, right direction would be a feasible method.

System Biology, Physiological Modeling

P1-55 ESTIMATION OF THE OPTIMIMAL SIZE OF NON-INVASIVE ELECTRODE TO DETECT THE GLUCOSE LEVEL FROM THE AQUEOUS HUMOUR OF THE EYE

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These days the most common technique for the measurement of blood glucose level is done by the analysis of a blood sample. Since this method is invasive, it becomes inconvenient for many patients, especially patients with blood disorders. In this paper, a simulation has done to find the optimal size of non-invasive stimulation electrodes used for the measurement of glucose through the aqueous humour of the eye. The electrical impedance plethysmography technique is used to measure the level of glucose. The simulation result shows that the optimal size of electrodes would be 0.4 mm. These electrodes could be placed on the contact lens in order to record the glucose level from aqueous humour.

P1-56 박출량과 박동의 특성 조절이 가능한 맥동 LabView 시스템 개발

김정훈[2], 박지은[1], 이나희[3], 정민영[1], 권주영[1], 안도현[1], 박철우[4], 김덕규[2], 이종민[1,5]
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In this study, development of a pulsatile pump which could control its output volume and pulsatility was conducted for application of this system on atherosclerosis studies. The pulsatile pump system was produced to control total output volume (designated to cardiac output), RPM (heart rate), duty ratio (time phases of systole and diastole) and Control (Labview). Based on these functions, the pump could generate various forms of pulsatile flow. The pump consists of cylinder and piston, crank, ducts, check valve, DC motor, power supply, and CompactRIO. Rotational motion of motor transmits to crank. And then the crank imbibe/discharge fluid by converting up and down motion of piston. To validate the pulsatile flow pump, the flow evaluation using both a pressure gauge and flow meter were conducted.

P1-57 식염수가 주입된 간조직의 유효 전도도와 고온 괴사 범위의 예측

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In radiofrequency ablation (RFA), saline infusion is beneficial for enhancing electrical conductivity, which allows more energy dissipation into target tissue, resulting in increased lesion size. For the reason that computational simulation is not used effectively for saline-infused RFA, for lack of methods to address the conductivity properties of saline-tissue mixtures, we propose a microscopic mixture model to derive the effective temperature-dependent conductivities with different mixing conditions (2:1 and 1:2 of saline to liver tissue). The proposed model is customizable in constructing mixtures of multiple components, and can thus be expanded to include the effects of various anatomical microstructures.

P1-58 3D 가상심장을 이용한 심방세동의 complex fractionated atrial electrogram (CFAE) 및 dominant frequency (DF) 분석

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In this study, complex fractionated atrial electrogram (CFAE) and dominant frequency (DF) are analyzed for atrial fibrillation patient. For this purpose, we implement the virtual method pf catheter measurement methods in the simulation model, and FIR filtering and window method are used to analyze the measured pattern of electric signals. Then, based on voltage and frequency values of the map in 3D virtual heart we find the ablation targets of atrial fibrillation patient by CFAE and DF values.

Tissue Engineering and Biomaterials

P1-59 전안부 거주시간 향상을 위한 나노형상 친점액성 마이크로입자

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Topical drug administration is widely used to treat various eye diseases due to ease of administration, which, however, is still limited in short residence time and low bioavailability of drug. To resolve this, we fabricated mucoadhesive nano-structured microparticles of large surface area in a dry table to increase the retention time of microparticles on the eye surface as a potential drug carrier in this study. In vivo animal study revealed that a comparable amount of NM with PEG in a tablet form resided on the preocular surface for up to 90 min while the other types of microparticles and their formulations were cleared away.

P1-60 마이크로 패턴된 3차 구조물에서의 군집된 세포의 이동에 관한 연구

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고려대학교 의과대학 의공학교실
고려대학교 한국인공장기센터

Hyaluronan-based hydrogels mixed with fibroblasts, mouse endothelial cells, or human mesenchymal stem cells (hMSCs) were patterned using a 3D moving axis bioprinter and cellular migration was monitored in culture for up to 16 days. The cells in patterned hydrogel revealed differential cell-cell interactions depending on the cell type, which results in a morphological changes in 3D.

Especially, the aggregation of hMSCs was affected by the Rho kinase and cadherin. Angiogenic-specific gene expression profiles showed that expression of CD105 decreased to 22% in the ROCK inhibitor group compared to control group.

P1-61 혈관생성인자가 포함된 주사형 지지체를 이용한 심근조직재건 및 심근기능의 회복과 만성심근경색 모델의 적용

송명진, 장환석, 이재연, 선경, 박용두

고려대학교 의과대학 의공학교실
고려대학교 한국인공장기센터

Regeneration of chronic heart failure using therapeutic agents such as cells or growth factors is one of the challenging issues due to its limited regeneration activity. Delivery of angiogenic factors into the heart showed the limited effects on the cardiac function in chronic heart failure models. In this study, regeneration of chronically infarcted myocardium was carried out using injectable biomimetic hydrogels containing dual growth factors; stromal-derived factor-1 and Ac-SDKP for stem cell homing and angiogenesis. Combination of two angiogenic factors in hydrogel showed the synergistic regeneration effects. This could be one of the promising strategies treating chronic MI patients for the clinical application.

P1-62 약물의 국소, 서방전달에 의한 실리콘 임플란트 주변 피막구축 억제

박수빈[1], 박민[2], 이지은[1], 박효진[3], 이승호[2], 박천권[2], 허찬영[4] , 최영빈[1,2]

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Capsular contracture caused by fibrosis formation around the silicone implant has been one of the most serious complications. TGF-ß is known to play a critical role in fibrosis and thus, we hypothesize that local, sustained exposure of an inhibitor of TGF-ß can reduce fibrosis formation around the silicone implant in this work. To test this hypothesis, we employed a drug, tranilast as a TGF-ß inhibitor and prepared two different kinds of silicone implants, which were coated with tranilast only and a blend of poly(lactic-co-glycolic acid)(PLGA) and tranilast, which were enabled with a short and long term release of the drug, respectively.

P1-63 초음파 조영제를 이용한 초음파 피부 약물 전달의 조건 최적화

손정우, 박동희, 손태윤, 박진감, 신운철, 원종호, 조용준, 정병조, 서종범

연세대학교 보건과학대학 의공학과

Transdermal drug is hard to transfer the drug through the skin effectively. Glycerol which is optical clearing agent prevents from light scattering so it can use for optical therapy and diagnosis. Ultrasound and ultrasound contrast agent(UCA) can improve transdermal drug delivery. In this study, two kinds of UCA and two different center frequency(1.1Mhz, 2.47MHz were used to optimize the ratio of UCA and glycerol such as 1: 1000, 1: 10000, 1:100000. The ultrasound parameter was 1Mpa, duty 1%. To analyze the result, measure reflection and compare the reduction rate. At the most case 1:1000 ratio shows high reduction rate.

P1-64 충격파 펄스를 이용한 방광내압 측정

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A noninvasive monitoring of urinary bladder internal pressure is useful for the diagnosis and treatment of urination related diseases. We proposed a novel noninvasive approach, based on a physical phenomenon that a shock pulse generates cavitation in the urinary fluid and the dynamic properties of the cavitation are related to the static pressure of the fluid. The study presents the preliminary experimental validation of the novel method. It is expected that the suggested ultrasonic urinary bladder internal pressure monitoring is non-invasive and resolves the limitations of the existing methods.

U-Health, e-Health, m-Health Technology

P1-65 수면 중 무자각 코골이 신호 모니터링

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Snoring is the breathing with harsh sounds during sleep due to obstructed air movement. Polysomnography (PSG) is inevitable for snoring diagnosis but it needed long set up time and specially trained sleep experts. For unconstrained snoring monitoring, eleven males participated in this study. Snoring signals were collected non-intrusively by a PVDF film-based sensor installed bed. Estimated total snoring events during sleep and self-devised snoring index were obtained. The estimation results were compared with reference snoring severity from PSG. The correlation coefficients between PSG and estimated total snoring events was 0.865 (p-value < 0.001).

P1-66 Cubic smoothing spline을 이용한 근전도에서의 ECG noise 제거

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Surface electromyography (EMG) is used to rehabilitation and clinical treatment for muscle disease. These recordings are critically contaminated by cardiac artifact. Our objective of this study was to develop noise cancellation filter for removing electrocardiogram (ECG) noise from surface EMG using cubic smoothing spline method. The cubic smoothing spline algorithm enabled the filter to effectively remove ECG noise without reference signal. This filter procedure proved a reliable and efficient tool to remove ECG artifact from surface EMG.

P1-67 변기 장착형 무선 요속계 개발

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Uroflowmetry is a convenient non-invasive clinical test to screen benign prostate hyperplasia(BPH). This study applied pressure measuring technique to develop a uroflowmeter incorporated with the toilet in house bathroom. High enough correlation coefficient>0.9999 was obtained between pressure and volume, and the volume measurement error was less than 5%. The present device can be easily installed in the toilet, thus would be of great advantage for self home care of the diseases with urinary symptoms.

P1-68 웨이블렛 패킷 영역에서의 엔트로피 분산을 이용한 음성 검출 알고리즘

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Voice activity detection (VAD) plays an important role in the performance of the overall system. In this paper, we propose a novel VAD algorithm to effectively distinguish speech from nonspeech in noisy environments. We present a new feature parameter for VAD which is entropy variance in Wavelet packet domain. Performances of the proposed VAD algorithm are evaluated by objective test under white noise environments.

P1-69 주파수 범위에 따른 성문전도 스펙트럼 기울기 변화

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동아대학교 의과대학 의공학교실

In this study, electroglottographic spectral tilt (EST) was investigated for characterization of vocal cords vibration. EST was analyzed from the power spectrum of electroglottographic signals by dividing frequency analysis range as full range (0~4 octave), low range (0~2 octave), and high range (2~4 octave). EST of high frequency range was higher than that of low range. These results suggest that EST has at least two components and dividing frequency range in analysis of EST is effective for investigating characteristics of vocal cords vibration.

P1-70 독립성분분석을 활용한 심박변이율 기반의 깊은 수면 추정 방법

윤희남[1], 황수환[1], 정다운[1], 이원규[1], 이유진[2], 정도언[2], 박광석[3]
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Although many researches have been accessed to sleep stage estimation with heart rate variability (HRV), it is still difficult to distinguish between slow-wave sleep

(SWS) and other sleep. In this paper, we introduce a new method to estimate SWS with HRV using independent component analysis (ICA). We applied ICA to a set of HRV measures including conventional and newly developed parameters which show significant difference between SWS and non-SWS. Adaptive threshold was applied for the feature chosen from the ICA output. As a result, the mean epoch-by-epoch accuracy between our method and PSG was 0.87 and Cohen's kappa was 0.61 for 11 healthy subjects.

P1-71 Android OS 기반의 유/무선 혈당 관리 모니터링 시스템

김치곤, 차민석, 원동연, 임선희, 오병도
㈜올메디쿠스

Recently, interest in diabetes management through mobile healthcare has been increased due to rapid dissemination of smart phone. However, existing conventional methods have many problems and cause utilization to be lowered owing to inconvenience from direct data input and use of expensive Bluetooth glucose meter.
In this study, we report development of a novel Android OS-based diabetes management application (LinkDr App), which has integrated system of wired and wireless methods and enable user's own meter to be continuously used without any change. LinkDr App provides various opportunities to users as well as increases accuracy of measurement transmission.

P1-72 Smartphone 카메라를 활용한 Photoplethysmograph 측정에 관한 연구

정재훈, 박성윤, 김성재, 김성민, 이상준
동국대학교 의생명공학과

In this study, we proposed a method for measuring photoplethysmographic using a smartphone camera. A development algorithm is consists 6 procedures. The first is to convert RGB to Gray level from a camera image, the second is to detect ROI from image, the third is to extract photoplethysmography signal from a camera image, the fourth is to filter baseline, and the last is to oversample procedure using cubic spline interpolation. The proposed algorithm has been tested using several smartphone with a person and which can effectively acquire person's PPG signal at any situation. We supposed that the proposed algorithm can easily adapt for smartphone m-health system.

P1-73 Cardiac 신호의 Autocorrelation을 이용한 심박수 추출 방법

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[2]GIST 의료시스템학과

Bio-signal contains health conditions. Specifically, cardiac signal such as ECG (electrocardiogram) and PPG (photoplethysmography) is used for HR (heart rate) detection. There are many algorithms developed to reduce noise and extract information. Autocorrelation is well known mathematical tool and it can be used for extracting fundamental frequency from periodic signal. In this study we research heart rate detection using autocorrelation method.

P1-74 Photoplethysmography(PPG) 센서를 이용한 Real-Time 데이터 수집 및 Heart Rate Variability 측정

조동래[1], 김종인[2], 박찬기[1], 이보름[1,2]
[1]GIST 기전공학부
[2]GIST 의료시스템학과

Either photoplethysmograhy (PPG)signal or electrocardiogram (ECG)signal represented the cardiac disease as well as the human's health. Using those of signals, We can calculate the Heart Rate Variability (HRV). HRV represents one of the most promising such makers. The data which acquits by the PPG sensor process in the real-time environment. And then we can find the problems of patient as soon as possible.

P1-75 골프 드라이버 헤드 임팩트 강도에 따른 소리의 특성

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Impact sound of golf driver varies according to hit points of its face. In order to identify the changes of peak frequencies, we dropped the ball onto the head face of driver in different height and hit the ball, acquired the sound data was analyzed with FFT moving average. The values of the result showed that as the strength of impact was increased, sound pressure level and diameters of

impact areas increased, but the peak frequency of the impact sound was not changed.

P1-76 Double Sensor를 이용한 일반 환경온도에서의 심부 체온 측정

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Body core temperature is one of the important vital signs of the human body. Although it is easier to be measured than other vital signs are, measuring the body core temperature non-invasively is still not fully developed. Many studies have tried to measure the core temperature non-invasively and 'Double Sensor' is one of recently developed measurement method. In this study, we used double sensor and calibrated the thermometer under different normal ambient temperature: 20, 25 and 30 ℃. The K-values that we obtained from this study can be used to estimate the body core temperature non-invasively under normal circumstances.

P1-77 뇌파와 심전도 신호를 이용한 수면상태분류

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Sleep occupies a very large proportion in person's life, and many people have disease about sleep. It is important to measure sleep stage correctly to diagnose disease about sleep, so there is lots of research in this field. Generally, EEG signals are used to classify sleep stage. The purpose in this paper is sleep stage analysis using combinations of EEG signals and ECG signals. Sleep stage is classified using a SVM classifier based on frequency domain features and time domain features. As a result, we can know that the combinations from ECG signal have better performance to analysis each of sleep stage.

POSTERS II

- Biomedical Optics
- Biomedical Robotics
- Cardiovascular Engineering
- Medical and Bio-informatics
- Medical Imaging
- Medical Nano and Microtechnology
- Neural Engineering
- Orthopedic and Rehabilitation Engineering
- Respiratory Engineering
- System Biology, Physiological Modeling
- Tissue Engineering and Biomaterials
- U-Health, e-Health, m-Health Technology

Biomedical Optics

P2-01 라만분광기를 이용한 소동물 유방암의 치료효과 관찰

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[2]고등광기술연구소
[3]정보통신공학부

Breast cancer is one of the most dominant cancers in female cancer group, but its treatment efficacy is visualized by monitoring tumor volume change after treatment using a mammography or MRI which can take 2-4 weeks to see the effectiveness. In this research, we used Raman spectroscopy to see breast cancer treatment efficacy in rats due to its advantages; fingerprint and qualitative analysis. Treatment of breast cancer induced rats was investigated by Raman spectroscopy for 9 days during chemotherapy. The result of the research shows us a high potential of Raman spectroscopy as a monitoring tool for cancer treatment.

P2-02 GafChromic RTQA Film을 이용한 광역학적 치료용 레이저의 선질 측정

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[2]코카엘리 대학교 물리학 교실

The purposes of this study were to measure the dose and distribution of PDT(Photodynamic therapy) laser with 635 nm wavelength using GafChromic film, and to evaluate the uniformity of the dose according to the distance from end of optic fiber catheter and the dose in the target radiation field according to the angle between the end of catheter and film surface.
In this study, we could identify the stability according to changes in laser beam modes, changes in output according to distance, changes in uniformity according to angle, and beam profiles using GafChromic film, and we could also get two-dimensional isodose curve. It was found that GafChromic film could be utilized for the purpose of QA of PDT laser beam.

P2-03 컴퓨터 마우스를 이용한 스트레스 레벨 측정

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Stress is a reaction to stimulus that disturbs our physical or mental condition and has detrimental effects on our health. Although stress management is important for our health in the ordinary life, most existing diagnostic methods are able to be performed only in the hospital and it sometimes depends on subjective evaluation by medical teams. In this study, a stress measurement device based on a computer mouse was designed that can be easily accessed to the public on a daily basis. The prototype model was constructed with a red LED and a photodiode embedded in an optical mouse to obtain the heart pulse-wave signals from the fingertip of a human subject. The results showed that the difference between normal and stressed state was clearly observed from five healthy subjects.

P2-04 실시간 공초점 현미경 기반 생체 내 혈중암세포의 고감도 정량화

서호원, 황윤하, 최기백, 안진효, 송은주, 김필한
KAIST 나노과학기술대학원

The presence of circulating tumor cells (CTC) in blood is a strong indication of cancer. For early diagnosis, precise staging and prognosis during the course of treatment for cancer, the quantitation of CTC can provide invaluable insights. In this study, we implement custom-design real-time confocal microscopy platform in capable of direct visualization of individual CTCs in great saphenous vein (GSV) in vivo. Subsequently, we established a novel quantitation technique for CTCs by extracting a calibration factor through hemocytometric analysis of intravenously injected red blood cells.

Biomedical Robotics

P2-05 기구설계의 측면의 NOTES 기술에 관한 요구사항과 내시경 장비

주백석
금오공과대학교 지능기계공학과

Though NOTES (Natural Orifice Transluminal Endoscopic Surgery) technology theoretically guarantees a minimally invasive surgery, there exist a lot of problems for current endoscopic devices to be utilized in complex and difficult operation. This paper

provides basic endoscope design requirements and limits for NOTES application and several commercial endoscopic devices which are designed for NOTES.

P2-06 최소침습수술용 ER 햅틱 마스터의 힘 반향 제어

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[2]금오공과대학교 기계설계공학과

In this research, a new type of haptic master device using electrorheological (ER) fluid for minimally invasive surgery (MIS) is devised and control performance of the proposed haptic master is evaluated. The proposed haptic master consists of ER spherical joint for 3-DOF rotational motion (X, Y, Z) and ER piston device on the gripper for 1-DOF linear translational motion (Z). A sliding mode controller which is robust to uncertainties is then designed and empirically realized. It has been demonstrated via experiment that the proposed haptic master associated with the controller can be effectively applied to MIS in real field conditions.

Cardiovascular Engineering

P2-07 심실후벽 및 우심실질환을 재현할 수 있는 15-리드 심전계용 시뮬레이터의 개발

강성민, 강유민, 최성욱
강원대학교 기계의용학과

It is known that 15-Lead ECG can measure disorder of the ventricular posterior wall and right ventricle, whereas 12Lead ECG cannot measure. But it is difficult for evaluate 15Lead ECG`s accuracy because of absence of new 15Lead ECG simulator. The purpose of this work is to develop the device which can predict ECG on body surface using heart-electrical conduction model and heart-body surface electrical conduction model which consider action potential and ionic current.

P2-08 Evaluation and comparison of SAR of Recently-Proposed Medical Lead with Conventional Medical lead for 1.5 T, 3 T and 7 T MRI Systems

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The RF antennas in magnetic resonance imaging (MRI) systems interact with the patient's tissues, resulting in the absorption of RF energy by the tissues. The presence of an electrically conducting medical implant concentrates the RF energy and causes tissue heating near the implant. In this paper, specific absorption rate (SAR) as an indicator of heating, is calculated and compared for both conventional (Medtronic designed lead) and recently-proposed medical lead (medical lead with nails) by using Remcom XFDTD. The results of the calculation showed that, SAR values are much lower for recently-proposed design compared to Medtronic design for different MRI systems.

P2-09 목걸이 형태의 심박수 모니터링 장치 개발

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Heart rate (HR) is an important biological signal used to detect cardiovascular diseases or evaluate the efficacy of exercise. Most HR monitoring devices are divided into chest strap model and wrist sensor model. However, chest-type products are less comfortable and wrist-type are not as accurate as chest strap. So we developed novel necklace-type devices measuring HR to resolve the problems. In this study, we compared two signals acquired from our devices and reference module regarded as gold standard. Also we verified the accuracy of peak detection rate by calculating sensitivity and error rate.

P2-10 급속 혈액/수액 가온기의 성능평가 방법연구

신연수[1], 안치범[1,2], 송승준[3], 박재한[4], 허몽도[4], 손호성[1,5], 선경[1,2,5]
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Fluid warmers are devices used to warm saline and blood, allowing for a rapid transfusion of fluids into a patient with trauma or in surgery. While developing a fluid warmer, flow rates and output temperatures are

measured to ensure that the fluids remain at safe temperatures. In order to measure such parameters, there was a need for a program that can measure both flow rate and temperatures in real time. Thus, a program was developed to measure flow rate and temperatures while saving them separately for detailed analyses to aid in assessing the performance of a newly designed fluid warmer.

Medical and Bio-informatics

P2-11 확률 모델을 이용한 시간 표현 인식

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[2]서울대학교 의용생체공학연구소
[3]서울대학교 의과대학 의공학교실

Clinical events and their occurrence time describe a medical state in a patient's medical history. To informationize clinical narratives in electronic medical record system, key information such as temporal expressions, patient's problem and treatment should be extracted into any structure. In this paper, we described our proposed method for extraction of Korean temporal expression from Korean clinical narratives. We adopted conditional random field and we studied its adaptability to detect information from Korean clinical texts automatically. Our proposed method achieved best F1-measure of 0.919, and outperformed the previous research using news articles.

P2-12 어휘 자원을 활용한 의학 문헌 검색 효과성 증대에 대한 고찰

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Medical literatures are medium for storing and communicating medical knowledge, which is acquired from medical researches. To build effective information retrieval system, query terms should be matched to relevant documents. However, term mismatch problem occurs because document author does not use same term as search user, because of nature variability of language. By using lexical resources such as MeSH, we hope to overcome those limitations imposed on current search systems.

Medical Imaging

P2-13 실시간 보정기능을 갖춘 다채널 시간-디지털 변환기 개발

원준연, 권순일, 윤현석, 고근배, 이재성
서울대학교 핵의학과

Measuring TOF information of photons enhances the quality of images from PET through improving SNR. TDC is a widely used to measure TOF information and it can be implemented using ASICs and FPGA boards. Contrary to TDC in ASICs, TDC using FPGA has significant bin width variations due to PVT changes. Thus, a code density test, a statistical real-time calibration method, was applied to this research. Six TDC channel was implemented in one clock region of virtex-6 board, which has 12 clock regions. Average bin width of each channel ranges from 17.87 to 22.73ps. DNL of most taps were within ±1.5LSB and INL came in -5.89 ~+4.35LSB.

P2-14 Multiphase level set 방법을 이용한 PET/MR 감쇠보정

안현준[1], 김중현[1], 송인찬[2], 이재성[1], 이동수[1]
[1]서울대학교 핵의학과
[2]서울대학교 영상의학과

Attenuation correction is a mandatory procedure in quantitative PET imaging. For brain PET/MR scans, ultra-short echo time (UTE) sequences were proposed to parcel the bone tissues in MRI. However, the current approach to bone segmentation using region growing method shows limited accuracy. We suggest UTE MRI segmentation that is based on multi-phase level set method. New approach using multi-phase level set method was feasible to generate attenuation maps from Dual UTE MR images, and more accurate and robust than region growing method.

P2-15 스캔 궤적에 따른 금속인공음영 특성 분석

김영욱, 황도식
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Metal artifact correction is one of the important issues in Computed Tomography (CT). Metal artifact degrades the quality of image and obscures the shape of the true object. While there have been a lot of efforts to reduce

metal artifact, their performances are not perfect. Dual-Energy Scanning is one of the remarkable solutions in metal artifact reduction, since it can overcome the limitation of conventional scanning method. As the basic study for Dual-Energy Scanning, we analyzed the patterns of metal artifact for different scan trajectory. The result shows that metal artifact can be reduced for different scan trajectory.

P2-16 CT에서 복부 비만의 정량적 평가를 위한 3차원 체지방 자동 검출 방법

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The number of obese population has been increasing all over the world. Ever since the facts were revealed that obesity causes various diseases such as hypertension, diabetes mellitus, and degenerative arthritis, the prevention of obesity has grown in importance. In this study, we newly developed an automatic detection method for body fat by the CAD scheme. Firstly, our method generates two segmentation masks automatically based on the anatomical structures in abdominal CT images. In addition, to evaluate the validity of the proposed method, we manually measured the subcutaneous and visceral fat content using CT images from 10 patients by two clinicians. Then, we performed the comparative study of measurements on CT images by manual and proposed methods. Consequently, the numerical results we obtained showed a significant superiority of the proposed method.

P2-17 초음파 BI-RADS를 이용한 유방암 보조 진단 시스템 개발

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In this paper, we propose novel feature extraction techniques which can provide a high accuracy rate of mass classification in the computer-aided lesion diagnosis of breast tumor. In this paper, totally 290 features were extracted based on the breast imaging-reporting and data system (BI-RADS) lexicons. To demonstrate the performance of the proposed features, 4,107 ultrasound images containing 2,508 malignant cases were used. The clinical results demonstrate that the proposed feature combination can be an integral part of ultrasound computer aided diagnosis system to help accurately distinguish benign from malignant tumors.

P2-18 DTI 기반 인슐라 - 대뇌 피질 연결성 분석 방법론 개발

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The incidence of dementia is steadily increasing. Alzheimer disease (AD) is one of the most common causes of dementia in elderly persons. Frontotemporal Lobar Dementia (FTLD) is as common as AD under the age of 60 years. Using FSL-FDT Toolbox, we constructed a tractography from insular cortex to cortical cortex. Therefore, we constructed a 4 x 94 matrix. We have analyzed Normal-AD and Normal-FTLD correlation by analyzing permutation test and FDR.

P2-19 HIFU의 pre-targeting 모니터링을 위한 directional filter의 적용 연구

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HIFU(High Intensity Focused Ultrasound) is non-invasive ablation therapy that applies high-intensity focused ultrasound beam to destroy damaged tissue. Clinical HIFU procedures are typically performed with an image equipment to monitor. Especially, USgHIFU(Ultrasound-guided HIFU) has many benefits such as cheap cost and providing real time monitoring. In this paper, directional filter is used in detecting HIFU focus in pre-targeting algorithm, which is confirming region of treat. Conventional Gaussian low-pass filter smooths out the details of images like small structures and edges. On the other hand, directional filter effectively highlights beam-path because it can consider the angle of HIFU's irradiation.

P2-20 피질 두께 연결성 기반의 네트웍 무질서도 분석 방법 : 노인우울증 연구

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Brain pattern analysis using Magnetic Resonance Imaging (MRI) is useful method for diagnosis of various diseases. We can assist Major Depressive Disorder (MDD) diagnosis using comparison of brain pattern between MDD group and Normal Control (NC) group. In this paper, we organize region feature vectors and edge feature matrices from cortical thickness data, and analyze the group difference using statistical method in order to search significant regions and edges. These significant regions and edges play important roles in advancement of disease.

P2-21 속도 조정 빔포밍 알고리즘을 적용한 초음파 영상 분석

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'Beamforming algorithm' is used when implementing ultrasound image. General algorithm does ultrasonic image processing, defining ultrasound velocity as 1540m/s (average speed of ultrasound inside the human body) assuming that the interior of the human is uniform tissue. But, human organism to be observed for medical purpose is a heterogeneous tissue that has the various tissues. It is possible, when applying the beamforming algorithm used adaptive speed of the ultrasonic wave for the non-uniform partial, that entire organizations are be accurately visualized. This paper suggests and simulate beamforming algorithm with adaptive region-Specific sound speed for homogeneous and heterogeneous area.

P2-22 웹캠 기반의 동물행동분석장치 개발

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In this paper, a platform for locomotion analysis of animals was developed. To offer as many as analysis methods to researchers in cost-effective way, our system was consisted of a webcam, which can record full HD video with 30 frame per second and a cage with a dimension of 100cm◈100cm◈55cm. To verify the performance of the developed system, movements of ICR mice was recorded and analyzed with a custom software developed in LabVIEW. After the analysis one can achieve data about velocity, direction, and total moving distance. In addition, the analysis software can be easily modified to meet any request from researchers.

P2-23 Medipix2 디텍터를 이용한 스펙트럴 CT시스템의 개발

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A conventional x-ray tomography system has a broad energy spectrum and the detector is a digital integrating sensor whose output is proportional to the energy fluence. Although attenuation is dependent on the object material and the incident photon energy, the conventional x-ray detector loses some of the attenuation information. The recent development of Medipix2 detector allows discrimination of energy information. In this paper, we have applied Medipix2 detector to develop a multi-energy micro-CT system. The projections were reconstructed by using standard FDK algorithm. For each energy bin data, we have performed principal component analysis (PCA) method. Material separation was observed in the eigenspace. Using the energy-discrimination property, we could acquire not only 3-dimensional data but also material-selective information.

P2-24 파킨슨 병 환자의 선조체와 대뇌 피질 및 해마체 간의 기능적 연결성의 변화

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It is known that dopamine depletion in the striatum in patients with Parkinson's disease (PD) alters the spatial patterns of the cortico-striatal functional connectivity. Also, there is evidence that dysfunctional mesocortical dopaminergic system leads to abnormal changes in the activity of limbic system. In this study, we performed resting state fMRI to examine the changes in the spatial connectivity patterns of the striatum in patients with PD.

P2-25 수술영상에서 위험상황 회피를 위한 수술 도구 위치 추적 기법

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Robot-assisted surgery, specially, minimal invasive procedure has been growing over the past years rapidly. However, there are still several problems in the robotic surgery. By providing preventive caution to surgeons, which is an advanced universal vision technique for tool tracking, resolving this issue. The methods that color and morphological information are used to segment the features, and a Kalman filter is applied for robust tracking of the object locations to reduce error are proposed in the study. Performance for surgical instrument localization was estimated by root mean square error comparisons and instrument trajectory comparison. Therefore, this study could minimize medical injuries during the robot-assisted surgery.

Medical Nano and Microtechnology

P2-26 Micro-CT 영상을 이용한 귀의 유한요소모델

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The injury caused by the blast overpressure is called the primary blast injury (PBI). The ear is the most easily damaged organ by the blast overpressure. The purpose of this study is to make an ear model that can predict the PBI of ears. The ear model for PBI estimation should be able to simulate movements of the tympanic membrane and the auditory ossicles according to the blast overpressure. So the ear model of this study includes ear canal and middle ear. And the ear model was validated its dynamical movements by comparing the vibration modes of stapes footplate and tympanic membrane with the experimental data.

P2-27 쿠커비투릴을 이용한 호모시스테인의 화학적 검출법

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Plasma homocysteine concentration level in human is important because the level of homocysteine has been reported as an independent risk factor of cardiovascular diseases. The simplest method is using Ellman's reagent (DTNB) which can binding with thiol group of homocysteine. However DTNB also reacts with cysteine which occupies high concentration in plasma. Therefore, selective assay method for homocysteine is essential. We found cucurbit[7]uril (CB7) can act as a host by binding effectively with homocysteine. The decreasing rate was proportionally dependent with CB7 concentration increasing. The free -SH group of cysteine did not binding with CB7.

P2-28 항체를 이용한 쿠커비투릴과 호모시스테인의 결합력 측정

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A condition with elevated Hcy concentration in blood may be one of the risk factors responsible for the development of several vascular diseases. In previous work, we found a new method for the assay of homocysteine using supramolecule, cucurbit[7]uril (CB7). Here we confirm the binding affinity between CB7 and Hcy using Hcy monoclonal antibody. When we preincubated Hcy with CB7, antibody did not give the immunological signal. Our data suggest that CB7 can specifically bind with Hcy. From the decreasing of the immunological signal, we could calculate the association constant between Hcy and CB7.

P2-29 Multifunctional Core-Shell Mesoporous Silica Nanocomposites for Biomedical Applications

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Multifunctional mesoporous silica nanocomposites (MSNs) are attractive carriers for targeted drug delivery in nanomedicine. Although promising developments have been made in the fabrication of multifunctional MSNs, the design and mass production of novel multifunctional carriers is still a challenge. This paper reports the facile one-pot fabrication of a multifunctional inorganic composite composed of superparamagnetic Fe3O4 nanoparticles and coated dye-functionalized

mesoporous silica with a high specific surface area. The resulting composite particles had a tunable particle size, special open pore channels with high specific surface area, which is quite favorable for drug loading and release properties, as well as luminescent and superparamagnetic properties suitable for targeted drug delivery and tracking. This composite exhibited low toxicity, suggesting potential biomedical applications.

P2-30 쿠커비투릴과 시스타치오닌 생합성 효소를 이용한 호모시스테인 정량

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Recently, we discovered cucurbit[7]uril (CB7) can effectively discriminate the structurally similar thiol-containing amino acids, homocysteine and cysteine. We here report the specific homocysteine assay using the enzyme reaction of human cystathionine gamma-lyase (hCGL). hCGL can catalyze homocysteine as a substrate to produce hydrogen sulfide (H2S). When we preincubated homocysteine with CB7, hCGL can no longer catalyzed homocysteine because of the concentration of available free homocysteine was decreased by formation of CB7-homocysteine complex. By assaying the homocysteine with and without CB7, we determined the precise homocysteine concentration without interruption of cysteine.

P2-31 메틸렌 블루가 함유된 금 나노막대/실리카 코어/쉘 나노입자를 이용한 암 세포의 SERS 분자영상 이미지와 광열치료 요법

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Methylene blue embedded Au nanorod/SiO2 (MB-Au NR/SiO2) nanoparticles are successfully synthesized as SERS molecular imaging probe and therapeutic agent for cancer. Raman signal of methylene blue is remarkably enhanced by free-electron transfer from the Au nanorod that allows us to detect Raman signal from the MB-Au NR/SiO2 transfected cancer cells. Moreover, cancer killing ability of the MB-Au NR/SiO2 nanoparticles is excellent due to not only photothermal effect of the Au nanorods but also photosensitizing effect of the methylene blue. It is indicating that the present MB-Au NR/SiO2 nanoparticles could be the new theragnostic agent for cancer.

P2-32 암실 조건에서 다양한 ZnO Nanoparticles의 항균 효과

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In order to study of antibacterial effect of ZnO crystal, we are successful synthesizing ZnO nanoparticles, nanoplates, and methylene blue embedded ZnO nanoparticles through soft-solution process. Transmission electron microscopy (TEM) and scanning electron microscopy (SEM) are utilized to characterize particle size and morphology. Among the above different ZnO nanoparticles, the nanoplates have the largest (0001) plane due to crystal growth direction control that could lead to increase efficiency of bacteria transfection. Consequently, antibacterial effect of the ZnO nanoplates is superior to that of the others.

P2-33 금 나노막대를 이용한 전기화학적 암 치료법

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Monodispersed Au nanorods with high aspect ratio above 5 are synthesized from binary surfactant solution process. Morphology variation of the resulting products is systematically observed by transmission electron microscopy and UV-Visible absorption spectroscopy. The resulting Au nanorods are further utilized for in-vitro experiment of cancer treatment. Thanks to high aspect ratio of the present Au nanorods, electric field could be effectively localized to the Au nanorods in cancer cells. Eventually, we observe perfect destruction of the Au nanorods transfected tumor through necrosis.

Neural Engineering

P2-34 착용식 fNIRS을 위한 저발열 광검출기 개발

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In the paper, the improvement of the photodetector for the portable fNIRS was described. The in-house fNIRS system was developed for comfortable monitoring of cerebral blood flow and brain-computer interface (BCI)

application. The focus of the improvement was to restrain the heat from the amplifier in the photodetecting circuit. Controlling the temperature of the instrument was the important step because the safety is essential for daily monitoring in U-healthcare or BCI system. After the development, monitoring temperature was conducted for comparison between the former photodetector and the improved photodetector.

P2-35 금 나노입자를 이용한 다중 전극 어레이의 신경 신호 기록 성능향상

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We have fabricated the Au multi-electrode array (MEA) based on bi-layer lift-off resist technique and modified the Au electrode with gold nanoparticles by electrochemical deposition. The performance of MEA was tested by electrochemical impedance measurement and neuronal signal recording.

P2-36 관성센서 신호를 이용한 파킨슨 트레머와 본태성 트레머의 스펙트럼 분석

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Hand tremors are manifested by various reasons for which essential tremor and parkinsonian tremor have the most part. It is clinically difficult to discriminate between them accurately. The aim of this study is to analyze the spectral characteristics for parkinsonian tremor and essential tremor. Ten patients with tremor participated in this study. Postural tremor was measured by three axis accelerometers and gyro sensors which were attached at the middle fingertip and wrist while subjects were asked to hold their hands to be stretched out to the front for thirty seconds. The ratios of the sum of the powers of five harmonic frequency bands to the fundamental frequency band power were significantly higher in the parkinsonian tremor than in the essential tremor. Therefore, it could be possible to distinguish between parkinsonian and essential tremor by using the harmonic frequency band power.

P2-37 무구속 능동 건식 뇌파 전극의 형태별 성능 비교: Flat, Foam, Finger Type

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Various kinds of non-invasive active dry electroencephalogram (EEG) electrodes have been developed. However, they have not been able to be standardized electrodes because of their poor performance compared to wet electrodes. Each study suggests a novel dry-EEG electrode, though so far no research has been performed which is better or not in a quantitative or qualitative way among the dry electrodes. The purpose of this paper is to compare the performance of a various kinds of contemporary active dry-EEG electrodes. We conducted experiments that could verify the performance of different kinds of active dry-EEG electrodes: flat, foam type, finger type. Each electrode has their advantages a nd disadvantages in measuring EEG. We analyzed the attributes of each dry-EEG electrodes and suggest a direction for each type of electrodes to solve their basic problems.

P2-38 자극 모양에 따른 이중 주파수 안정상태 시각유발전위 비교

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In this study, three different shapes of visual stimulus—a concentric circle, checkerboard, and a square— were employed to evoke dual-frequency steady-state visual evoked potentials (SSVEPs). Electroencephalogram was acquired at O1, O2, P3, and P4, then two bipolar EEG signals (O1-P3 and O2-P4) were further analyzed. Signal-to-noise ratios (SNRs) were estimated at fundamental and second-harmonic frequencies and six different non-multiple harmonic components of dual-frequency SSVEPs. As a result, SNRs were significantly different according to the shapes of stimulus; dual-frequency SSVEPs showed the highest SNRs to the high-frequency-stimulus centered concentric circle.

P2-39 근적외선분광 기반 뇌-컴퓨터 접속을 위한 다양

한 인지 과제 조합의 분류

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The goal of this study was to investigate the most suitable combinations of mental tasks for the development of practical NIRS-based brain-computer interface (BCI) systems. To this end, we recorded concentration changes of oxygenated [oxy-Hb] and deoxygenated [deoxy-Hb] hemoglobin while eight participants were performing eight different mental tasks. Four different feature sets were extracted from the recorded NIRS signals ([oxy-Hb], [deoxy-Hb], [total-Hb], and a combination of [oxy-Hb] and [deoxy-Hb]), and classification accuracies were estimated for all possible pairs of the eight mental tasks. A combination of right hand motor imagery and mental rotation task showed highest classification accuracy, when the features were extracted from [total-Hb] dataset.

P2-40 P300과 SSVEP를 동시에 유발할 수 있는 BCI 스펠러 구현 방법에 관한 연구

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Hybrid brain-computer interface is emerging paradigm among BCI society recently. The hybrid system combines more than two paradigm sequentially or simultaneously to enhance overall BCI speller performance. In this study, we introduce a stimulation design of BCI speller for simultaneous P300 and SSVEP response. With proposed BCI speller, we could observe P300 on at parietal lobes and SSVEP response at occipital lobes with EEG measurement. The proposed stimulation design is promising to be adapted to online hybrid BCI system for enhanced performance.

P2-41 칼슘 이미징 기반 다채널 신경신호 분석 소프트웨어 개발

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Calcium imaging techniques have been widely used to measure collective activities of neurons at the single cellular level. In this work, we developed the software package for multichannel signal processing and analysis of calcium signals measured from cultured neural networks. Automated analytical functions such as cell body detection, calcium signal extraction, spike detection, and pair-wise cross-correlation were implemented. Using these algorithms, the activities of about 500 neurons in the field-of-view were automatically extracted and the correlation between all possible pairs of two neurons was analyzed. The alteration of activity patterns by pharmacological treatment was demonstrated by using this software.

P2-42 파킨슨병 환자의 뇌심부자극을 위한 피드백 제어 알고리즘

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Deep brain stimulation (DBS) is an effective surgical treatment for Parkinson's disease and other neuropsychiatric disorders. The existing DBS uses only a fixed stimulation parameter and is not considered the progression of the disease. Feedback control of DBS has potential to improve efficacy, reduce side effects and decrease power consumption. The firing rate appears to be most promising source of feedback and is changed with the progression of the Parkinson's disease. In this paper, we developed an algorithm for feedback control of DBS by manufactured hardware and software. This algorithm will be used to improve the weaknesses of the existing DBS system.

P2-43 다중파형 고속 전압전류법 스캔법을 이용한 도파민의 절대농도 추정 기술연구

오윤배, 김도형, 최정봉, 윤성훈, 조재성, 김인영, 장동표
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Neurotransmitters are endogenous chemicals that transmit signals between neurons and cell across a synapse. This neurochemical substance became significant biomarker by unraveling its neuro-functional role in brain along with electrophysiological signal. Fast-Scan Cyclic Voltammetry(FSCV) is one of methods to measure neurotransmitters by detecting fine current occurring in brain by applying voltage through carbon fiber microelectrode(CFM). It is experimentally utilized to measure chemical fluctuation within mille seconds in mammals. Nonetheless, because the background signal in FSCV is relatively large and unstable, undistinguishable complex environment limit its application when it comes to clinical approach. In this

research, we propose Multi-waveform Fast-Scan Cyclic Voltammetry(Multi-waveform FSCV) based on adsorption, desorption reaction within CFM double layer to extract characteristic value of each solution.

P2-44 신경인터페이스용 흑백금 미세전극의 물리적 안정성 향상 기법 연구

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Platinum black is a widely used material for microelectrodes because of its excellent electrical properties. The porous structure of platinum black enables such a high electrical sensitivity. However, the structure is vulnerable to external stimuli so it breaks down easily and electrical properties are also decreased. In this study, we developed a method which can improve the mechanical stability of platinum black microelectrodes by electrochemical deposition of polydopamine. When the polydopamine layer was deposited between platinum black layers, the initial impedance was retained after harsh ultrasonication treatment. The developed method is expected to extend the availability of neural sensors.

Orthopedic and Rehabilitation Engineering

P2-45 파킨슨병 환자와 젊은 성인의 보행중 상지 가속도 감쇄 비교

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건국대학교 의학공학부

The purpose of this study is to investigate whether patients with Parkinson's disease (PD) and healthy young adults have differential control of the upper body accelerations during level walking. Three PD patients (71.7±4.7yrs) and three healthy young adults (23±0.0yrs) participated in this study. Accelerometer of three axes was used in order to measure accelerations of head, shoulder and pelvis. All subjects walked 10m at comfortable speed. As analysis parameters, Cps (pelvis to shoulder attenuation) and Cph (pelvis to head attenuation) were calculated. Cph and Cps of PD were greater than those of young adults in both ML (medio-lateral) and AP (antero-posterior) directions. The result indicates that pelvis acceleration is less attenuated at shoulder and head in PD than in normal subjects during level walking.

P2-46 상지 Cycling 운동시 다양한 속도에 따른 근전도 패턴 분석

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The purpose of this study was to analyze EMG (Electromyogram) pattern during upper limb cycling exercise with different speeds in normal subjects. Four young men (23 yrs) participated in this study. EMGs of biceps and triceps muscles were measured with 20, 40 and 60 RPM. Both muscles showed earlier onset of muscle excitation and increased amplitude with increase in cycling speed. These results indicate that the cycling speed is important in the stimulation pattern for upper limb FES (functional electrical stimulation).

P2-47 모바일 게임 기반 상지 재활프로그램의 유용성 평가에 대한 예비연구

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In this paper, we developed a mobile upper extremity rehabilitation program for patients with upper extremity hemiplegia after stroke. A 3D virtual reality based exercise program was implemented, which responds to user's motion detected by sensors bulit in the mobile device to track user's motion and transferred via Bluetooth communication. This preliminary study was performed with four patients with stroke using a questionnaire asking the usefulness. As a result, they answered they are willing to exercise with the mobile device and positively expected on treatment effect and motivation of exercising with efficacy. The mobile rehabilitation program developed in this study is expected to overcome user's lack of interest, spacial and temporal limitations which the conventional rehabilitation exercise paradigms have. It is strongly expected to be efficient paradigm, when the status of user's performance could be shared with medical doctor

through internet.

P2-48 실시간 눈 사이점 추적을 이용한 비구속적인 e-Book 제어 프로그램

김현우, 박주용, 이정직, 윤영로
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This study is about developing e-Book program based on Human-Computer Interface(HCI) system for physically handicapped persons. We decided "Between-Eyes" as a characteristic point by analyzing facial image. And then we used the point to control e-Book in real-time. After it was detected, we copied a small area image around the point to make template and traced the image using template matching method. By using this technique, we developed e-Book program controlled by rotation of head. To test its usefulness we conducted three experiments. As a result, we got 96.5% rate of success for controlling e-Book under proper condition.

P2-49 MSP430과 관성센서 기반 모션 캡처 시스템 개발

강신일, 조재성, 김동환, 조현성, 이종실, 김인영
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The Hanyang IMU(H-IMU) system is an easy-to-use, cost efficient system for full-body human motion capture. Hanyang IMU system is based on unique, state-of-the-art miniature inertial sensors, 3DS Max biped models and sensor fusion algorithms. Hanyang IMU does not need external cameras, emitters or markers. It does not suffer from problems of occlusion or missing markers. In addition, Hanyang IMU unique for inertial motion capture technology: the captures any type of movement, joint angle calculation including rehabilitation.

P2-50 실시간 환경 변화 피드백을 적용한 전정전기자극의 멀미 감소 효과

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We examined feasibility of using machine for decreased motion sickness. This study goal is that offsetting frequencies send to passengers for decreased motion sickness. As the low frequency vibration seems to lead motion sickness, during 50 minutes sailing on the sea. After passengers appears a motion sickness, research a questionnaire survey analysis. This study expects that offsetting frequencies use to motion sickness for decrease. These results indicate that the machine for decreased motion sickness is a promising machine to decrease motion sickness during sail in boat.

Respiratory Engineering

P2-51 수면 중 혈압 변화를 이용한 수면 무호흡 분류 가능성 연구

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This pilot study describes the feasibility of sleep apnea classification based on a blood pressure (BP) during overnight sleep. Our basic premise was that a systolic BP is correlated with sleep states: hypopnea, obstructive sleep apnea or central sleep apnea and also with arousals. Invasive BP signals in the MIT-BIH Polysomnographic Database are employed for analysis of relationship between variations of blood pressure and sleep states. The results showed that the variation of BP in OSA is larger than one in hypopnea or CSA and the variation of BP in arousals is bigger than one in non-arousals.

System Biology, Physiological Modeling

P2-52 가상심장 시뮬레이션을 활용한 심실 제세동 연구

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We propose a new computational model of virtual defibrillation. For this purpose, 2D cardiac tissue and realistic 3D geometries of canine ventricles are used. The ventricles are in the middle of sides with virtual electrodes to simulate external defibrillation. Using this model, we test truncated-exponential monophasic and biphasic shocks with varying strength and time interval. Then, we compare effectiveness of monophasic shock

with biphasic one. Also electric propagation waves during defibrillation are observed on ventricular model.

P2-53 가상심장을 이용한 심근경색모델의 15리드-심전도 분석

류아진, 최성욱, 심은보
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It is known that 12-lead ECG has its limitations in the prediction of the ventricle posterial wall ischemia. On the other hand, the 15-lead ECG consists of the 12-lead ECG with three additional leads. It's detecting the posterior ischemia of left ventricle. In this study we assessed the effectiveness of 15-lead ECG for the ischemic tissue in ventricle posterial wall. To do this, we developed an electrophysiological model of the heart coupled with a torso model and the local ischemic tissue model in posterial wall.

P2-54 ESTIMATION OF THE THERMAL EFFECT OF TRANSDERMAL ELECTRODES USED TO DETECT HEART RATE AT TEMPORAL ARTERY THROUGH EIP

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In the paper a model of the skin with temporal artery is design and a simulation is carried out to find the minimal voltage to stimulate the electrode without generating the heat in the skin, temporal artery or electrodes. The simulation result showed that at 1 voltage the temperature change on the surface of the skin was 0.01 OC and on temperature change was observed at temporal artery.

P2-55 뇌파 지표 변화를 이용한 마취제 효과의 정량적 측정

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This study was aimed to investigate the quantitative parameters for the effect of the opioid analgesics which are administered to a patient during the operation. In order to evaluate the previously proposed electroencephalographic (EEG) parameters such as ApEn, CUP and SEF, one channel EEG signal of a patient was acquired when varying the doses of the opioid analgesic. Each parameter was calculated in different doses of the opioid analgesic and their variation trends were analyzed. The results show that monitoring the variation trends of those parameters has the feasibility to measure the effect of the opioid quantitatively.

Tissue Engineering and Biomaterials

P2-56 미세혈관과 융모구조를 모사한 장기 온 어 칩

최애림, 김시현, 조일주, 최낙원, 성종환
홍익대학교 화학공학과
한국과학기술연구 뇌과학연구소
바이오마이크로시스템연구단

The unique structure of intestinal villi makes it difficult to replicate. Accurately mimicking the microscale tissue structure can recreate physiologically realistic microenvironment for cells cultured in vitro. In this study, we have developed novel technique for creating cylindrically-shaped structures in a silicon wafer, mimicking the blood vessels structure, and finger-like projections mimicking the intestinal villi in collagen to create intestine-on-a-chip device. Intestinal epithelial cells (Caco-2) and blood vessel cells (HUVEC) were cultured inside the device.

P2-57 코일구성에 따른 자기장 발생 효율에 대한 시뮬레이션 연구

홍상표, 김형식, 최미현, 윤희정, 김현주, 이인화, 유나래, 정순철
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In the study, we simulated an efficiency of coil to generate a magnetic field using computer simulation.A three type of coil were used: circular coil, figure-8 coil, and figure-8 coil with a magnetic material.we evaluated a

magnetic field strength at 5 cm from outside of each coil. A figure-8 coil with a magnetic material shows better efficiency than other type of coil.

P2-58 Multi-organ-on-a-chip을 이용한 Flavonoid의 간 대사와 항암효과 평가

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Organ-on-a-chip technology combines microtechnology and cell culture technique to reproduce in vivo microenvironment more closely than conventional in vitro systems. In this study, we have developed multi-organ-on-a-chip, where liver-originated cells (HepG2) and tumor cells (HeLa) are cultured on a single chip, separated by fluidic channels mimicking blood vessels. Using this device we evaluate the anti-cancer activity of quercetin, a plant-derived flavonoid commonly found in onions and broccoli. And we developed protocols for building multi-layer chip for culturing multiple cell types on a chip, and optimized culture conditions for the cells.

P2-59 조영제를 이용하여 죽상동맥경화증에 대한 진단

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Atherosclerosis is the main cause of death and cardiovascular diseases. Atherosclerosis is accompanied by inflammation reaction and recruitment and proliferation of macrophages and endothelial cells, leading to the formation of plaques inside the blood vessel wall. Atherosclerosis is mainly detected by computed tomography(CT) and magnetic resonance imaging(MRI), but it is generally difficult to elucidate the detailed process of plaque formation. In this study, we develop atherosclerotic blood vessel on a chip, which mimics the internal structure of blood vessel with plaques. Using this device, we observe and mathematically analyze the diffusion-convection process of fluorescence markers inside the hydrogel plaque.

P2-60 열 자극에 의한 암 세포주의 세포 생존율 비교

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The purpose of this study is to evaluate the cell viability by heat stress according to cell lines and stress conditions. The cell viability depending on target cells(A549 and MG-63), temperature(39℃, 41℃, 43℃, 45℃), heat exposure time(1hours and 24hours) and incubation time after heat stress(2hours and 24hours) was measured by MTT assay. The highest cell viability was shown at 41℃. Longer time of heat stress and incubation after heat stress resulted in decreased cell viability. MG-63 had more sensitivity to heat than A549. It is necessary to perform cancer cell necrosis for each cell line. In case of MG-63 and A549, longer than 1 hour of 41℃ heat is needed.

P2-61 그래핀과 다이아몬드 표면에서의 인간신경세포의 성장

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Graphene and diamond thin film have electrical properties, low background current, biocompatibility, wide potential window, and physical-chemical stability. Here, we investigate the cell culture conditions, which are exposed to graphene and diamond thin film using human nerve cell, SH-SY5Y. We check the MTT, LDH, caspase-3/7 activity, cell adhesion, optical microscope image and fluorescence microscope image stained with Hoechest 33342 and calcein AM. Our results showed that graphene and diamond thin film can be very good candidates for the application to the fabrication of biological sensor and study of cell-surface interactions.

P2-62 TSP가 세포의 아가로스젤 3차원 배양 시 세포 생존에 미치는 영향

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Magnetic Resonance Spectroscopy (MRS) has been being used to identify cell metabolite and differentiation with reference material (TSP). The purpose of this study is to evaluate cell viability of TSP in 3D agarose gel cell culture. MG-63 were selected and cultured at varied TSP concentration in 3D agarose gel. Our results indicate

that the increased concentrations of TSP effect the reduction of cell viability. However, there was no significant difference in low concentrations of TSP (0~5mM). We concluded that low concentration of TSP still can be used for MRS in 3D cell culture.

U-Health, e-Health, m-Health Technology

P2-63 응급상황 모니터링을 위한 스마트폰용 어플리케이션 개발

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Today, field of Ubiquitous Systems is rapidly progressing. In addition, because the smart phone has become generalization, it gradually revitalize study about wireless healthcare system.
In this study, smart phone app development based bio-signal meter for monitoring the emergency situation of the elderly living alone.

P2-64 제세동기와 연동을 위한 실시간 12채널 심전도 계측 시스템 개발

이정직, 허정현, 고현철, 최우혁, 윤영로

연세대학교 보건과학대학 의공학부

In case of deaths by cardiac diseases, Arrhythmia such as ventricular fibrillation takes the high ratio. The most effective way to stop arrhythmia is to defibrillate the heart. To avoid unessential repetition of defibrillation and to know an effective timing to do it, it is important to observe statues of a heart. In this research, it is studied that the 'real-time 12chanel ECG Measurement System' which is able to be co-operated with defibrillator to detect exact moment of arrhythmia occurrence and so that effective treatment of defibrillation can be possible.

P2-65 임베디드 블루투스 통신이 가능한 자가발전 줄넘기

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Jump-rope is a simple and effective exercise, but its intensive exercise load and monotonous pattern make it difficult to do consistent workout. This study aims to develop a prototype of jump-rope which can convert its kinetic energy into electricity and supply an embedded Bluetooth device to link it with a smart phone App for motivation of exercise activity. The developed prototype showed an output of 0.49W generated during normal exercise and successful data communication with a smart phone through the embedded Bluetooth link. Further study will develop Apps connected with the self-powered jump-rope to help people enjoy more exercise.

P2-66 자전거 에르고미터를 이용한 간편하고 실용적인 무산소성 운동능력 평가 방법

장대근[1], 장재근[2], 신성훈[2], 박승훈[3], 한민수[1]

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In this paper, we propose a simple and practical method for physical fitness assessment using the bicycle ergometer. One of practically used physical fitness assessment methods is a leg-press based repetition maximum (RM) estimation method. However, the conventional leg-press based method is risky for inactive people and requires expertise in dealing with test equipment. Further there is a limitation for applying it into ubiquitous applications. In order to cope with these problems, we use the rating of perceived exertion (RPE) and the simple linear regression analysis for the RM estimation. The new method first applies different exercise loads for 10 seconds according to subject's sex, and then asks him/her about his/her RPEs at each test phase. The scatter plot is then constructed by assigning exercise loads to Y axis and the RPEs to X axis. The RM can finally be estimated by applying maximum RPE (=20) to the linear prediction equation, which is derived from the linear regression analysis. From the experiment, we can notice that the estimated RMs are significantly correlated with real ones ($r=0.860$, $p<0.001$). The new method is safe, fast, easy as well as feasible for ubiquitous applications beyond fitness centers.

P2-67 인체 운동에너지의 손쉬운 활용이 가능한 휠 형태의 휴대용 자가 발전 장치

임윤호[1], 여정진[1], 박혜정[1], 조종현[2], 최영재[2],
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Recently a lot of portable IT devices are being deployed all over the world. The limited battery capacitylead to the use of portable self-generating devices, dynamo. However, conventional dynamo such as crank and pedal requires continuous motion of specific limb muscles to obtain reasonable electric power output. This significantly limits the usage of self-generator technology. This study propose a prototype development of wheel-typed portable dynamo which can be more easily driven by whole body human motion than concentrated muscular force The developed dynamo showed max. 400mW output power. Further study will focus on improving its portability and compatibility with various digital devices.

P2-68 수직축 풍력발전기를 이용한 자전거에서의 에너지 수확

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Recently, the increasing interest for health and energy, eco-friendliness, has increased the value of the bicycle. This trend also includes the combination of portable electronic devices such as smartphone and the bicycle. However, in outdoor activity, the portable electronic device is facing with the problem of power supply. Therefore, there have been many attempts to produce electrical energy through a bicycle which has a variety of energy source available. Most of conventional wind generators mounted on a bicycle utilize head wind, which increase the pedaling load and reduce its range of directional output. This study proposed an application of vertical axis wind turbine onto bicycle to harness ambient energy in the turbulent flow rising behind the rider. It can generate energy without extra increase in pedaling load. The developed technique will help to promote leisure life and lay the foundation of outdoor mobile environment.

P2-69 평균이동 알고리즘을 이용한 뎁스 바디 파트 인식 영상으로부터의 3D 인체 관절 포즈 추정

남상범, 전현재, 한희석, 임명준, 김태성
경희대학교 생체의공학과

In this work, we present a 3D human skeletal pose estimation method from body parts labeled depth silhouettes using the mean shift algorithm. Our method utilizes random forests trained with a synthetic 3D human depth map database to recognize human body parts. Then the mean shift algorithm was utilized to identify the body joints. Finally, 3D human skeletal pose was estimated using the identified body joints. The experimental results are presented, showing the feasibility of our proposed methodology.

P2-70 평균이동 집단화를 이용한 RGB-Depth영상에서의 얼굴과 손 검출

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경희대학교 생체의공학과

In this study, we propose a face and hands detection methodology from RGB and depth images using mean-shift clustering. Our proposed method utilizes skin color detection and mean-shift clustering to detect the face and hands utilizing RGB and depth information simultaneously. The experimental results show the recognition rate of 90% over 400 test images. Our proposed method should be useful in smart HCI applications such as facial expression and hands gesture recognition.

P2-71 뎁스 실루엣의 측지선 거리를 이용한 3차원 인체 포즈 인식

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In this paper, we present an approach to recover a full-body 3D human pose from a depth silhouette of a human body captured by a depth camera. The depth points of a human silhouette are represented in the form of a graph to get geodesic distances among the body parts. Then the anatomical landmarks are identified using the information of geodesic distances. From the identified landmarks of the body parts, the joint directions of the body parts are estimated and mapped into a kinematic model of a 3D human body, resulting in a recovered 3D human pose. We present some demonstrative examples of 3D recovered body poses from depth silhouettes.

P2-72 BePatch: 필름형태의 통합 생체신호 센서

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[2]서울대학교 의학연구원 의용생체공학연구소
[3]서울대학교 의과대학 의공학교실

Design of physiological sensors that meet both the fidelity of signal quality and user's compliance is an important issue for the embodiment of daily healthcare. Patch-type sensors have been regarded as good alternatives for this purpose. however, complexity of their hardware is ever increasing to incorporate multiple sensors. In this paper, a film-based single sensor that can concurrently measure the electrical and mechanical sources human physiology is proposed. The electrodes of the normal piezoelectric sensor were engineered to have multiple sections thereby enabling acquisition of two distinct physical quantities. Two representative electromechanical signals of human, ECG and BCG, were measured for the demonstration and showed 60 percent of amplitude of the referenced signals.

P2-73 U-Care를 위한 웹 프로그램 개발

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This paper is about web program for an emergency monitoring system for elderly people living alone and the underprivileged. This program is sought the convenience of Managers and users. The existing monitoring system is expected to be replaced by this program.

P2-74 감성 측정을 위한 무선 포터블 16채널 EEG 시스템의 구성

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[2]연세대학교 의과대학 의학공학교실

In this study, in order to measure the brainwave without spatial constraint for emotion experiment, 16 channel compact brainwave measurements system using a wireless communications were designed. It was designed with a 16 channel to classify the various brainwave patterns that appear and for estimating the location of the nerve cells that triggered the brainwave. Also, in order to transmit the brainwave data within the channel without loss, a high-speed wireless communication must be possible, therefore 802.11 compliant Wi-Fi communication methods was used to transfer the data to the PC. In addition, by using an analog front-end IC having a one-chip configuration with real-time digital filters, the miniaturization of the system was implemented.

P2-75 일상생활 중 Cardiopulmonary fitness 측정 방법 사전 연구

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의용생체공학연구소

Cardiopulmonary fitness(CPF) has been spotlighted recently as a critical index related with a individual health. Despite the importance of the CPF, current method for measuring CPF needs special equipment and operation by an expert. Also it overburdens subjects with physical load. So we suggest that method for measuring CPF using accelerometry and heart rate monitor in daily life. Our research provides subjects with health information conveniently.

POSTERS III

- Biomedical Optics
- Biomedical Robotics
- Cardiovascular Engineering
- Medical and Bio-informatics
- Medical Imaging
- Medical Nano and Microtechnology
- Neural Engineering
- Orthopedic and Rehabilitation Engineering
- System Biology, Physiological Modeling
- Tissue Engineering and Biomaterials
- U-Health, e-Health, m-Health Technology

Biomedical Optics

P3-01 DUAL LED를 이용한 범용적 피부질환 치료기기

오창현
충남대학교 의공학과

Dual led skin medical care system used on microprocessor and dual led. Wavelenth of dual led is 660nm and 940nm, optical output power is 15mW and 5mW. CPU used microprocessor Atmega128 each other mode is continuous and that can change energy. Application in skin care line is wound, acne, wrinkles improvement, falling-out of hair as well as necrosis cancerous cell. The skin care medical system used dual led diod and change led according to skin care. Besides it can change led module. It is probe type contact skin because skin don't healing effect. On the contrary led heat generator thermotheraphy effect.

P3-02 심혈관 질환을 위한 광단층 영상의 혈관 내강 자동 검출 기술

김창수[1], 남형수[1], 김진원[2], 유홍기[1]
[1]한양대학교 전기.생체공학부 생체공학전공
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Intra-coronary optical frequency domain imaging (IV-OFDI) is an emerging diagnostic technology that acquires comprehensive 3-dimensional image of coronary segment within a few second. We can segment the blood vessel lumen on 2-dimensional cross-sectional images of IV-OFDI images and it can be used for various clinical indicators. Until now, the segmentation is done manually by OFDI image expert. To reduce time and labor that are needed to process, we made automatic lumen detection algorithm in MATLAB. Also, we compared automatic results with manual results and validated.

P3-03 이중 검출 방법을 적용한 공초점 현미경의 3차원 이미징에 대한 연구

이동령[1], 김영덕[1], 유홍기[2], 권대갑[1]
[1]KAIST 기계항공시스템학부 기계공학전공
[2]한양대학교 생물의공학과

A new Dual detection confocal fluorescence microscopy(DDCFM) is proposed for depth scanning of fluorescent particles. Comparing to the conventional confocal microscopy, DDCFM has the advantages of short measurement times and small system size because no mechanical depth scan is needed. In this paper, DDCFM divides a confocal detection system into two parts and obtains the axial response curve through the ratio of intensity signals received from the two PMTs with different size of pinholes. Each PMT signal with objective of low NA draws the curve which shows relation length from focal point and intensity.

P3-04 의료 바이오 연구를 위한 멀티모달 현미경

김영덕[1], 도덕호[1], 유홍기[2], 권대갑[1]
[1]KAIST 기계공학과
[2]한양대학교 생체공학전공

There are many of microscopes for researches on bio-medical imaging. Confocal, Multi-photon, SHG (Second Harmonic Generation) and FLIM (Fluorescence Lifetime Imaging Microscope) are most popular imaging technique for bio-medical imaging. Because each microscope has its own functionality to obtain information from the sample, it is possible to better understand about a metabolism of the sample when researchers got more information with many of microscopes. In this research, we propose a multi-modal microscope to obtain more information from the sample with same FOV (Field Of View)

P3-05 형광영상진단을 위한 다파장 여기광원장치의 신(新)설계

아민 밀자가시[1], 네즐라 케나르[2], 임현수[1]
[1]충남대학교 의학전문대학원 의공학교실, 코자일
[2]자연과학대학 물리학과 (터키)

The study presents the new designing of the excitation light source with high power output that can stably generate light with wavelengths of 340nm, 410nm, 450nm, 530nm, and 632.8nm for auto-fluorescence and fluorescence (photodynamic) diagnosis for both open and endoscopic applications. The light source consists of Xenon Lamp, light guide module including motorize filter wheel, motorize iris and filters with corresponding to wavelength bands.

Biomedical Robotics

P3-06 전도성 폼을 이용한 헤드밴드 타입의 이마 안전도 측정장치 개발

허정[1], 박광석[2]

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The aim of this study is development of conductive foam based headband type forehead EOG measurement system. For practical Human-Computer Interface system, dry electrode is more suitable than wet electrode. But dry electrodes which have stiff surface can cause skin contact problem. In this study, we used conductive foam as electrode to cover irregular forehead topography. Four foam electrodes were implanted in headband.

P3-07 시린지 펌프 분석기의 개발

박근철, 이상훈, 장우영, 전아영, 노정훈, 전계록

부산대학교 의학전문대학원 의공학교실

In this study, it is to develop the simulator for prevention and inspection of the syringe pump which has been using for medicine injection with precise volume. Preventive inspection of the syringe pump, the pressure within the syringe, flow rate, occlusion should be monitored in real time. it is identified that the developed syringe pump simulator has accuracy and reliability through divers experiments. In addition, it shows pressure degree in the case of flow occlusion. it is needed to solve problems of accuracy of occlusion pressure and injecting volume which a syringe pump simulator has.

Cardiovascular Engineering

P3-08 혈류역학 에너지를 이용한 인공판막의 안전성 연구

이종태[1], 안치범[1,2], 이성호[3], 손호성[1,3], 선경[1,3]

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Artificial heart valves help maintain normal heart function when a patient's natural heart valves fail to do so. However, patients with artificial heart valves suffer from increased possibility of thromboembolism and are required to undergo regular anticoagulation therapy for the rest of their lives. Mechanical artificial valves have been shown to suffer a greater increase in thromboembolism; a difference that may be caused by the different hemodynamic characters of the two types of artificial valves. In this experiment, the hemodynamic effects of the two types of artificial heart valves were assessed via measurement of energy equivalent pressure.

P3-09 나이에 따른 혈관 경직도와 혈압 변화 간의 상관성 분석

임서현[1], 김도현[1], 김동환[1], 오윤배[1], 이종실[1], 이경민[2], 김인영[1]

[1]한양대학교 의공학교실
[2]서울대학교 의과대학 신경과

The arterial stiffness is the one of features that affects blood pressure. As being concerned with the elasticity of blood vessels, if it is increased, blood pressure (BP) is also increased according to aging. Therefore, we investigated the analysis of Pearson's correlation between the pulse transit time (PTT) as a parameter of arterial stiffness and continuous BP. As a result, it was confirmed that the correlation between PTT and BP, also variability of PTT and BP was remarkably low. In conclusion, PTT is not suitable feature for representing the arterial stiffness in continuous BP analysis.

P3-10 폐동맥 고혈압 평가에 사용하는 단순화한 베르누이 정리의 정확도에 대한 고찰

노정훈[1], 전아영[1], 박근철[1], 이상훈[1], 장우영[1], 신교원[1], 전계록[1], 백승완[2]

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[2]마취통증과학교실

Assessment of pulmonary hypertension has been performed non-invasively using Doppler echo tricuspid regurgitation (TR) velocity measurement with simplified Bernoulli equation (SBE). The Doppler echo based measurement is generally considered to underestimate pulmonary arterial systolic pressure (PASP) in patients with severe TR. To produce an exact pressure gradient matching the varying sizes and flows of TR, we have developed a heart model using an air-pressure-based regulator with an electric motor to pump water through changeable panels with

various-sized orifices (2 to 21 mm in 2-3 mm intervals). We recorded the orifice area, the exact pressure generated, and trans-orifice continuous wave Doppler signals (a GE Vivid I platform). The pressure controlled pump heart model revealed a significant underestimation by SBE in the setting of severe TR (larger orifice, higher flow), and shorter application duration.

Medical and Bio-informatics

P3-11 휠체어 경사로 이동 중 인체 접촉면에서 발생하는 압력/전단력 측정 실험

조영근[1], 고창용[2], 김성국[1], 류제청[2], 김한성[1]
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Pressure sores remain a significant problem for anyone who is confined to a wheelchair. When sitting in a chair or wheelchair, the patient should be encouraged to shift position every 15-30 minutes. Researchers investigated pressure sores caused by high pressure value at the bony-prominences contact area likewise buttocks, knees, angles. There were only few studies to measure or analyze the value of the pressure and shear forces when climbing a slope with a wheelchair. In this study, the goal is to measure the pressure and shear forces at between the subject's body and wheelchair-seat interface during slopes climbing.

P3-12 항문직장 내압검사 데이터 분석 프로그램의 개발

장다솜[1], 권정훈[1], 정기욱[2], 허수진[1,3], 주세경[1,3]
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[2]서울아산병원 소화기내과
[3]서울아산병원 의공학과

In this paper, a 3D volumetric analysis program for anorectal manometry data was developed. High-resolution anorectal manometry (HRAM) is a widely-using technique as anorectal physiologic test. There are anal canal radial sensors that measures the pressure of the anal sphincter's inside on the probe of HRAM. Those sensors are located at the 5 cm region from anal verge to rectum at every 1cm and there are 4 sensors on the surface of the probe at every position. Previous analysis software only provided the average value of the 4 sensors. However, it does not provide enough data to extract physiological parameters. The developed program can display 3D plot of the data by utilizing the 4 sensor values and provides 3D animation of the 3D plot data.

P3-13 청진위치에 따른 심전도 파형에 대한 분석

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The features of Electrocardiogram (ECG) and phonocardiogram (PCG) are highly correlated on the timeline. Most of the researches have been preceded using the ECG measured at each of the conventional locations for analyzing PCG, but ECG can be obtained at different locations such as auscultation sites. This paper describes the characteristics of the ECG at the each auscultation sites, and compares the similarities between the conventional lead 1 ECG and the ECG measured at the auscultation sites.

Medical Imaging

P3-14 심근영상 신 추적자 18F-FPTP 의 심근허혈 소동물 모델에서의 동역학 분석

김지후[1], 김현식[2], 김동연[2,3], 범희승[2], 이동수[1], 유국현[3], 민정준[2], 이재성[1]
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[3]동국대학교 화학과

(18F-fluoropentyl) triphenylphosphonium salt (18F-FPTP) is a promising myocardial PET imaging agent that highly accumulates cardiomyocytes mitochondria which is the similar uptake mechanism to 99mTc-sestamibi. The aim of this study was to establish the kinetic model of 18F-FPTP and compare the estimated kinetic parameters between normal and acute myocardial infarction (MI) regions. Dynamic 18F-FPTP PET images were acquired in 12 myocardial infarction rats. Two-compartment model (K1 and k2; 2C2P) and three-compartment models with irreversible uptake (K1-k3; 3C3P) were compared in terms of goodness-of-fit for time-activity curves (TACs; 10- and 20-min duration) in the myocardium. The 2C2P was the most suitable model for describing 18F-FPTP in both the MI and normal myocardium. The average K1, k2, Vp

and K1/k2 obtained from the 2C2P curve fitting on 20-min TACs in normal myocardium were 4.4, 1.4, 0.44 and 3.2, respectively. Those in MI region were 0.9, 1.3, 0.34 and 0.7. Normal and MI regions in rat were well discriminated based on the kinetic parameters for 18F-FPTP uptake (K1) and distribution volume (K1/k2).

P3-15 류마티스 관절염 쥐 모델에 대한 보행 패턴 정량 분석 자동화 시스템

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Mouse models of rheumatoid arthritis exhibits abnormal walking patterns. Thus, by quantitatively evaluating curative value via a walking pattern analysis, we are able to demonstrate the performance of the treatment. Quantification of a walking pattern analysis was evaluated using mouse models of rheumatoid arthritis through a Catwalk system. Walking patterns were analyzed using a chain of image processing techniques and a parameter analysis on mouse foot movement. We found that multiple parameters are altered in mouse models of rheumatoid arthritis. The automated quantitative gait analysis may be a useful tool to evaluate state of rheumatoid arthritis.

P3-16 급성 에탄올 섭취 Rat에서의 Hippocampus 뇌신경대사물질 변화

이도완[1,2], 김상영[1,2], 정진영[1,2], 송규호[1,2], 최보영[1,2]
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The cerebral metabolite changes were quantitatively assessed in binge ethanol-intoxicated rats by using 4.7-T proton magnetic resonance spectroscopy. Thirteen 8-week-old, male rats were used and divided into 2 groups. 7 binge-ethanol group rats received an initial dose of 5 g/kg, followed by a maximum dose of 2 g/kg every 8-h for 4 days. 6 control group rats simultaneously received equal volumes of normal saline. Our results showed that tCho concentrations and tCho/tNAA ratios were significantly lower in binge ethanol group than that in control group. We provide quantitative in vivo evidence that binge-ethanol exposure causes cerebral metabolites changes in rats.

P3-17 3 T 자기공명영상시스템에서의 마이크로스트립을 이용한 RF 공진기

손혁우[1], 조영기[1], 유형석[2]
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[2]울산대학교 전기공학부 의공학전공

Magnetic Resonance Imaging (MRI) systems have good intrinsic SNR (signal-to-noise ratio) and are used an important instrument for diagnosis. In high field MRI systems, the RF field shows greater inhomogeneity. To mitigate inhomogeneous RF field, a multi-channel coil with RF resonators has been prepared for parallel imaging. In this paper, RF resonators are designed for a multi-channel coil and parallel imaging. A stepped impedance with four arms among RF resonators shows greater penetrated RF field. The RF resonator is effectively applied to the multi-channel coil for parallel imaging after obtaining greater penetrated RF field.

P3-18 MRI 시스템에서 compressed 방법을 사용한 다채널 RF 코일의 빠른 제어 방법

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울산대학교 전기공학부 의공학전공

In high field MRI systems (more than 3 T), the RF field shows greater inhomogeneity. Multi-channel RF coils employed in the parallel imaging may mitigate the non-uniformity in the B_1^+ field and each element can be independently controlled by adjusting the phase and amplitude of the excitation. The convex optimization method has been used to obtain the most suitable excitation parameters for homogeneity in a field of view (FOV). In this work, convex optimization for homogenization can be effectively controlled by adjusting inputs of each coil element. The simulation results for 3 T MRI systems are discussed in detail.

P3-19 선별 유방촬영술 영상을 위한 비선형 필터를 이용한 대비향상 방법

이원창, 전금상, 김상희
금오공과대학교 IT융복합공학과

The unsharp masking used in image contrast enhancement is simple to implement, but it is sensitive

to noise and causes overshoot effect. This paper presents a method to enhance contrast of the image using a nonlinear filter with reducing the noise and overshoot effect. The high pass filtered image in the proposed method was obtained by the Michelson contrast weighted nonlinear filter. The enhanced image was obtained by combining the filtered image and the input image. Experimental result validates effectiveness and performance of the proposed method.

P3-20 Rest state fMRI를 이용한 근섬유통 환자의 pregabalin 약물 효과에 따른 신경 연결성 평가

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In this study, we tried to confirm the difference of neuronal connectivity before/after medication therapy of pregabalin using rest state fMRI. 21 patients participated in our research and underwent baseline fMRI in rest state. only 7 of 21 patients were conducted MRI scan after drug treatment. Pre-treatment had greater connectivity between the default mode network and left insula. in addition, frontal pole, middle frontal, hippocampus and postcentral gyrus had greater connectivity within default mode network. Our findings suggest that pregabalin has an influence on the aspects of the pain matrix. We propose that these results could validate chronic pain symptoms by objective markers.

P3-21 알츠하이머 질환의 백색질 특성 분석을 위한 신경망 기반 분석

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We aimed to compare the fractional anisotropy of fourteen major white matter bundles between the Alzheimer's disease(AD) and normal control (NC) subjects. We extracted fiber tracts from diffusion MRI data with tractography, grouped the fiber tracts according to their shape similarity and automatically labeled each group. We selected the representative fibers, and projected every point's FA value onto the samples of the representative tracts. We implemented group analysis between AD and NC. And we found out decrease of FA values in few bundles.; Left hemisphere/Right hemisphere IFO, LH/RH ILF , LH/RH SLF, LH/RH UNC, and RH Cingulum.

P3-22 Egg white 팬텀의 구성 비율 변화에 따른 음향학적 특성 평가

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Acrylamide phantom containing egg white has been widely used as an evaluation phantom for therapeutic ultrasound because it is easy to observe formation process of coagulation. In this study, concentration of acrylamide component of egg white phantom was controlled and acoustic properties of manufactured phantom were measured. In case of increasing acrylamide and polymerization reactants, acoustic properties containing sound speed and attenuation coefficient increased linearly depending on acrylamide concentration. The purpose of this study is database of properties of phantom and roll of each component to product phantom suitable for the purpose and application.

P3-23 다목적 PET 데이터획득장치 개발

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A multi-purpose data acquisition (DAQ) system for positron emission tomography (PET) is developed. For multi-purpose DAQ system, modular system was introduced for easy configuration to receive different types of output signal from various PET systems. Maximum of 1 Mcps system count rate was achieved with FPGA signal processing and Gigabit Ethernet network.

P3-24 이형파킨슨 질환에 대한 체적 위축과 철 침착 사이의 국소해부학적 상관관계

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본 연구에서는 퇴행성 뇌질환과 관련한 이형파킨슨 질환 중 다계통 위축증과 진행성 핵성 마비 환자에서 철의 침착 정도와 체적의 위축 정도 간의 국소 해부학적 상관관계를 조사하고자 한다. 3T 자기공명영상장치를 이용하여 체적 측정을 위한 T1 강조영상과 철의 침착 정도를 위한 다중에코경사자장에코 영상을 획득한 뒤, 전처리 과정을 거쳐 복

셀기반의 통계적인 분석을 실시하였다. 다계통 위축증 환자에서는 주로 피각(putamen)과 담창구(globus pallidus)의 뒤쪽부근에서 위축정도와 철의 침착간의 상관관계를 보였으며, 진행성 핵성 마비 환자에서는 주로 피각과 담창구의 앞쪽부근에서 상관관계를 나타냈다. 반면 시상(thalamus)에서는 광범위한 위축 정도에 비해 유의하지 않은 철의 침착정도를 보였다. 결국 위치에 따라 위축이 심한 부위에 철이 많이 침착되는 경향이 나타나지만, 본 연구에서는 철의 축적 자체가 퇴행성 과정의 부가현상일 수도 있다는 것 또한 암시한다.

P3-25 Gd2O3:Eu 형광체 소결 분위기에 따른 발광 및 영상 선예도 평가

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Research for X-ray detection, Phosphor of high resolution and high effectiveness is gone. Rare Earth phosphor had been used for a long time by high atomic number and quality efficiency. Therefore, the optical properties of Gd2O3:Eu by sintering atmosphere were investigated. Phosphor were made sintering temperature 1000℃ for 1h and atmosphere is N2, O2 and Air, respectively. The samples were analysis using X-ray diffraction(XRD), Field-emission scanning electron microscopy(FE-SEM) and Photoluminescence(PL) spectroscopy. As a result, Optical properties have the strongest emission at 611nm. The strongest luminessence intensity was achieved at O2 flow.

P3-26 소아 CT에서 환자 특이적 감쇄 추정을 통한 자동 피폭조절기능의 적정성 평가

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This paper evaluates the effectiveness of automatic exposure control (AEC) in CT examination. Dose evaluation is performed in terms of size-specific dose estimates, and each patient is classified to verify the gain with AEC according to the water-equivalent diameter. In the scans with AEC, three patient specific attenuation measures, lateral dimension diameter, water-equivalent diameter, and maximum linear attenuation in lateral direction, were calculated to predict the behavior of AEC in pediatric patients.

P3-27 QMRA를 이용한 내경동맥 협착을 가진 환자의 뇌혈류량 평가

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Quantitative magnetic resonance angiography using noninvasive optimal vessel analysis that use time-of-flight and phase-contrast MRI has emerged as a selectable noninvasive technique for blood flow assessment. We conducted a retrospective study for the patients with internal carotid artery stenosis examined from 2012 in The Catholic university of Korea Bucheon St. Mary's hospital. We compared the blood flow of the patients with data for normal range. The patients who checked after stent insertion among the patients through the radiation intervention is eight patients, there were no significant changes in total cranial flow and total vertebral artery before and after stent insertion.

Medical Nano and Microtechnology

P3-28 증폭라만산란 신호를 이용한 인플루엔자 바이러스 검출법

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In-situ influenza viruses become one of the most important topics in diagnostics and it is required for prevention and control of contagious disease. Here, we demonstrate our virus detection method which is to measure the Raman signals from the surface proteins and lipids of each virus. Also, we can identify SERS based viruses generated from unique shape and proteins on them and by comparing VSVG and pseudo-type influenza virus, we verify virus identification. Furthermore, based on our experimental results, we will analyze reverse genetics method based fabrication of live influenza viruses, pseudo-type and inactivated influenza viruses

without replication ability.

P3-29 선택적 단일 역분화 줄기세포 생성을 위한 나노 인젝터 기반의 역분화 인자 고효율 전달

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Previously, it was hard to observe selective nuclear reprogramming with quantitive measurement by a single cell level owing to difficulty to identify cell-to-cell variation after randomly treatment of reprogramming factor by multi cell level. Here, we developed the nanotechnology which can deliver nuclear reprogramming factors selectively in single cell. In this study, we fabricated nanoprobe that can be injected safely into a single cell unit and through this nanoprobe, we also could verify the real-time delivery of nuclear reprogramming factors into single animal somatic cell by attaching fluorescent protein, with pico-pump fluid delivery system.

P3-30 플라즈몬 공명 에너지 전이 현상을 이용한 실시간 초고감도 pH 나노센서

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The acidity in a living cell has been an unexplored area of cell researches. Here, we developed nanoscale pH sensor via Plasmon Resonance Energy Transfer (PRET) from gold nanoparticle (GNP) to the functionalized Neutral red on the surface of GNP. As pH is changing, there is drastic change in absorption profiles of the acceptor-neutral red. Then, the Rayleigh scattering profiles of the donor-GNP are changing. According to analysis these variations, we can detect acidity around GNP-neutral red complex directly. This technology will allow us to develop new fields of cell research.

P3-31 기능화 된 다이아몬드 표면의 세포배양

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Biocompatibility and physical-chemical stability is required to fabricate high sensitive biosensors and electrochemical sensors. The diamond is satisfied these conditions. We culture the neuroblastoma cell (SH-SY5Y) on the surface of nanocrystalline diamond (NCD) and microcrystalline diamond (MCD) thin film. And we functionalize the diamond surface with fluorine(-F) and oxygen(-O) groups by plasma methods. And we evaluate the viability of neuroblastoma cell on the diamond surface. As a result, oxygen groups are more suitable for cell culture than that of fluorine on the diamond surface.

P3-32 서브파장 크기의 유전체 격자를 갖는 대면적 표면 플라즈몬 공명 바이오센서칩의 제작 및 응용

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In this study, we fabricate a larger-area surface plasmon resonance (SPR) structure with subwavelength dielectric gratings on a thin gold film and apply it for sensitive detection of biomolecular reactions and imaging biological samples. A high sensitivity is attributed to an increased surface area and an enhanced field amplitude at the binding sites of biomolecules. Also, real-time imaging is feasible through a diffraction of propagating surface plasmons.

P3-33 다이아몬드 기판 위에서의 자성입자를 이용한 정량적인 DNA hybridization 검출

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Magnetic particles, using magnetic fringe field of magnetic particles by external field, has many advantages as a biosensor such as high sensitivity and stable labeling system. We use carboxylated (-COOH) diamond and to detect DNA. The probe DNA is immobilized on diamond surface through amide bond. And the target DNA is immobilized on the magnetic bead through the 5'-terminal by amide bond. Hybridization of target DNA is detected by GMR (giantmagnetoresistance) sensor. According to the change of resistivity on the GMR sensor, we can detect the hybridization with probe DNA and target DNA quantitatively.

P3-34 자성나노입자의 특성을 이용한 DNA 센서

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Research of DNA has attracted a great deal of attention for diagnosis of diseases and for biosensor. To make DNA sensor, we used magnetic nanoparticles(MNPs) and micro-crystalline diamond. MNPs having large surface area are useful biomaterial used in diagnosis. The immobilization of DNA is applied by amide bond between carboxyl-modified MNPs and NH2-terminal probe DNA. For detection of hybridization of DNA, Cy3-terminal target DNA and APTES-modified micro-crystalline diamond are used. Fluorescence of target DNA is observed on the APTES treated diamond surface.

P3-35 금 나노 전극 위에 선형 DNA-브리지 형성에 관한 연구

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This paper reports an efficient method for selective alignment of DNA molecules and thus DNA-templated gold nanowires (AuNWs) between 2-aminoethanthiol (AET)-coated gold (Au) electrodes onto Si chips. We utilized tilting method to prepare stretched DNA structures on AET-coated Au electrodes and found important parameters in the alignment process that tilt angle, DNA concentration, and surface potential are controlled the density and structure of DNA aligned on the surface on AET-coated Au electrodes. This method also describes a simple way to form singled, bundled and networked DNA arrays on Si substrates.

Neural Engineering

P3-36 폴리라이신의 표면농도차이를 이용한 신경세포 미세패터닝 기술

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In vitro neuron patterning technology for the hippocampal neuron study has been developed with the objective of overcoming complexity and low-reproducibility of ramdomly distributed raculture network. Especially, to control the neurite outgrowth is important part to decide polarity of neuron. However, it's hard to maintain the patterned neuronal cultures on micropatterns on a few micrometer fine lines due to the lack of cell adhesive area. Neural networks cultured on such fine patterns not only lost their primary structure, but also showed low viability with the course of time. In this work, we report an alternative neuronal patterning technique that is effective in obtaining low-density long-term neuronal networks on a few micrometer lines.

P3-37 시각의 선택적 주의 집중을 이용한 루게릭병 환자의 이진 의도 분류

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In the present study, we classified the binary (yes/no) intentions of a patient with severe ALS, who cannot freely control his eyes and eyelids, using a brain-computer interface (BCI) system based on steady-stated visual evoked potential (SSVEP). The implemented system had two LEDs flickering at different frequencies, and the patient was selectively gazing to either left or right LED under eyes-closed condition to answer to ten given questions. EEG signals were acquired while the patient was selectively focusing on one of the LEDs, and his binary intentions were classified in real time. The classification accuracy of the online experiment was 80 %, demonstrating the practical feasibility of our implemented BCI system.

P3-38 Biphasic current pulse 자극의 위상 간격에 따른 배양된 신경네트웍 유발 반응 분석

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Neural network or single neuron stimulation and recording present valuable measurement to analysis. The adjustment of the stimulation parameters is required to modulate network activity pattern. Effects of stimulus amplitude and inter phase interval on the ability to recruit neural activity were demonstrated by previous research. However neural network which has complicated structure may present diverse response patterns. In this article we studied the effect of inter phase interval of stimulus pulse on the neural network activity pattern. As a result, neural activity pattern retained though threshold

of each neural signal was lowered.

P3-39 근적외선분광기를 이용하여 측정한 경두개직류자극에 따른 뇌 혈류량 변화 고찰

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In the present study, we observed cerebral blood flow (CBF) changes during transcranial DC stimulation (tDCS) using functional near-infrared spectroscopy (NIRS). Seven rats received anodal stimulation with 200 μA direct current for 10 min. The changes in oxygenated hemoglobin [oxy-Hb] concentration were observed before, during, and after tDCS, using linear regression and correlation analyses. As a result, oxy-Hb was almost linearly increased during tDCS, and linearly decreased after tDCS. We also found a significant negative correlation between the incremental and decremental rates of oxy-Hb.

P3-40 전기자극에 의한 해마뉴런의 네트워크 변화

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한양대학교 의공학교실

The neuronal network is comprised of synaptic associations. The neuronal system is non-linear dynamic system. Through rapid communication between neurons in the network, neuronal networks can create complex electrophysiological spatio-temporal patterns. The communication signal call spontaneous activities. MEA (Multi-Electrode Array) is able to detect the signal. In our study, we observed that neuron signal was changed according to electrical stimulation.

P3-41 경두개직류자극의 개인간 효과 편차의 원인 분석: 개인별 MRI data를 이용한 시뮬레이션 연구

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Transcranial direct current stimulation (tDCS) is a kind of neuromodulation protocol, which transmits low DC through scalp electrodes to facilitate or inhibit particular areas of the brain. However, the outcomes of the tDCS treatment are not consistent among subjects. The hypothesis of our study was that the individual variability in the tDCS effect might be caused by anatomical differences among subjects. The results showed that participants who showed enhanced WM task performance after tDCS had a significantly larger current density on DLPFC, suggesting that the inconsistent behavioral outcomes of tDCS might be due to the anatomical differences among subjects.

P3-42 두피 내 이식형 뇌심부 자극 시스템에 대한 연구

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DBS (Deep brain stimulation) is used to stimulating specific areas of the brain to relieve the symptoms of Pakinson's disease and Neurological abnormalities. But typically DBS system has built-In battery system. It is fatal drawback for implanted system. So, to solve this problem, we use the TET (Transcutaneous Energy Transfer) system. The strength of our DBS system is that enables the development of smaller and semi-permanent system. And to evaluate the system, we conducted in-vivo test with a rat model.

P3-43 Fornix 전기 자극에 따른 Nucleus Accumbens의 도파민 분비 측정

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Deep Brain Stimulation (DBS) is recently turned up as a potential therapy for improving memory functions in Alzheimer's Disease. However, neurochemical change inside brain caused by electrical stimulation is still unknown. Here, we implant twisted stimulation electrode in the fornix of the rat, a key element of the memory related circuitry, and applied electrical stimulation with various stimulation amplitude and frequency. We measured neurochemical changes in nucleus accumbens(NAcc) depends on stimulation parameters.

P3-44 영장류에서의 뇌경막외 피질뇌파(epidural ECoG)의 BCI 유용성 연구

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Recently, several studies have reported use of epidural electrocorticography (eECoG) for brain computer interface (BCI). However the feasibility and performance of eECoG on BCI were not fully evaluated yet. In this study, we aimed to verify the usability of implanted eECoG on BCI in primate. Two micro electrode patches were inserted over duramater on rhesus monkey. The monkey performed four directional eye movement tasks responding to target's color change. As results, eECoG showed the different activation pattern between before and after the perception of the color change and target direction. This demonstrates the possibility of BCI using eECoG.

P3-45 미세전극어레이를 위한 다채널 전기자극 패턴 발생기 개발

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Neural network stimulation is an important technique to analyze current network state or to perform a goal directed learning task by integrating with closed loop system. Moreover, delivering electrical stimulation to each channel of multi-electrode array(MEA) at a specific time and location with desired pattern is crucial in network study. Here, we developed the self-designed multichannel stimulation generator that can deliver electrical stimulation to every 60 channels in simultaneous and sequential manner. We are expecting to study the network response elicited by spatiotemporal stimulation with this system.

P3-46 시각적 Oddball 작업 시 하지불안증후군 환자에서의 신경활동 변화: LORETA 연구

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In this study, we explored the alteration in brain activities in patients with restless legs syndrome (RLS) during a visual oddball task, which was observed in source level using low-resolution electromagnetic tomography (LORETA). Significantly altered source activities were observed in RLS patients at anterior cingulate cortex and medial frontal gyrus at early period, and at parahippocampal gyrus and medial frontal gyrus at late period. Our results support that cognitive dysfunction in RLS patients could be associated with the functional deficit in frontal lobe.

Orthopedic and Rehabilitation Engineering

P3-47 새롭게 개발된 3차원 자연 두부 위치 재현 방법의 정확도 검증

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Exact recording and simulation of natural head position (NHP) is one of the important factors for accurate orthognathic surgery planning and operation. In this study, we have newly developed 3D NHP recording and simulation method using POSIT algorithm and evaluated the accuracy of developed method. A phantom was designed to evaluate the accuracy of the NHP recording and simulation method. The phantom was composed of three parts; a skull model, acrylics stand, and rotation stage in 3 degree of freedom. 7 ceramic sphere markers were attached to the skull model for application of POSIT algorithm. The rotation stage was adjusted to be parallel with the global horizontal using a spirit level. Then, acrylic stand and a skull model were positioned on the rotation stage. This position was considered as virtual NHP of the phantom. Photograph of virtual NHP was acquired and CT scanning of the phantom was executed. The result of POSIT algorithm was applied to the 3D surface model of the phantom and discrepancy between the ideal virtual NHP and simulated NHP of the phantom was determined as an error of developed method. According to the t-test (p-value=0.05), the simulated NHP showed good alignment with the virtual NHP and, also, showed intra- and inter-observer consistency.

P3-48 EMG 트리거 손목 재활 훈련 시스템 개발에 관한 연구

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This study is about EMG triggered rehabilitation training system (ETRTS) for wrist. ETRTS can perform voluntary rehabilitation training of wrist pronation and supination. We selected pronator teres muscle for wrist pronation and supinator muscle for wrist supination. If the EMG signal is over the threshold, EMG trigger is generated and the motor rotates the wrist of the subjects. By using this method, it is expected that patients can training voluntarily over the limitation of the ROM (Range of Motion).

P3-49 KINECT 기반의 요통 완화를 위한 Mckenzie 운동 시스템 개발

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McKenzie exercise is primarily used for relieving the lower back pain in clinics widely. It is consisted of four kinds of extension and three kinds of flexion movements. This study reports the development of KINECT based Mckenzie exercise self-training system which can be used in home without medical staffs. KINECT is used for X-BOX game controller. With KINECT, our program detects the subject and analyzes the posture to determine whether he/she is doing proper Mckenzie exercise. With real-time feedback about his posture, the subject may perform Mckenzie exercise safely and the compliance can be increased with functional game using KINECT.

P3-50 가상 해면골 모델에서 골소주의 영향

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Several researchers investigated the mechanical characteristics of human trabecular bone using finite element analysis. This result indicated that there was a strength difference between various structure of trabeculae. In addition, for more exact evaluation of osteoporosis, it was recommended to analyze not only the mechanical characteristics but also the morphology characteristics.

P3-51 무연뜸 개발을 위한 백금촉매 온열장치의 온도특성 연구

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In order to develop smokeless moxibustion, we made heating equipment using platinum catalyst. We observed the combustion characteristic of this equipment. Its combustion time is much longer than similar sized commercial small-size moxibustion. This heating equipment is expected to develop smokeless moxibustion.

P3-52 동물 이명검사를 위한 비 구속형 GPIAS 측정: 배경잡음의 시작이 놀람 반응에 주는 영향

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Tinnitus is difficult to accurately diagnose by the conventional testing method. GPIAS (gap pre-pulse inhibition of acoustic startle) method that Turner et al. designed can verify the existence of animal tinnitus objectively through the startle response measurement by acoustic stimuli. In this paper, we suggest GPIAS measurement system using an unconstraint type enclosure and research on the effect of starting point of background noise on startle response.

System Biology, Physiological Modeling

P3-53 섬유증 심장조직에서 Conduction Velocity Restitution 과 부정맥성 불안정과의 상관관계 분석: 시뮬레이션 연구

리스키 이마니아스투티, 임기무
금오공과대학교 메디컬IT융합공학과

Arrhythmia which is mostly caused by abnormalities in excitation of cardiac muscle has strong correlation with the presence of cardiac fibrosis and conduction velocity restitution (CVR). It is well known that cardiac fibrosis slows the conduction velocity by reducing the electrical coupling between cardiac myocytes, but not clearly known about the relationship between fibrosis and CVR according to our knowledge. This study investigates the

correlation between the cardiac fibrosis, CVR and cardiac instability. We demonstrate by one- and two-dimensional simulation of normal and fibrotic cardiac condition using a model of human ventricular cell. Fibrotic condition is simulated and analyzed under various stages, such as fibrosis 10%, 20%, and 30% of cardiac tissue.

P3-54 인공골격 및 관절 개발을 위한 골격의 3차원 형상 재구성과 유한요소해석에 대한 연구

송승엽, 최성대, 이원창

MicroNX, 금오공과대학교 지능기계공학과,
금오공과대학교 IT융복합공학과

In this study, the CT images using the Mimics program the bones of three-dimensional CAD data generated, and we will analyze the results of finite element analysis. In this way, the development of high-precision artificial bones and joints can be treated with surgery and will be able to perform efficiently.

P3-55 심장의 전기생리학적 연구를 위한 in silico 플랫폼의 개발

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Many research groups in the world have developed the electrophysiological model of cardiac cells with their own empirical data. The cardiac electrophysiological model have been used for the in silico experiments which is alternative way to ex vivo or in vivo experiments for developing new drugs or therapies for the heart failure or arrhythmia. The purpose of this study is to integrate 20 different types of cardiac cell models, which have been developed and validated in several research groups in the world, and develop one cardiac in silico experiment platform.

P3-56 심부전 정도에 따른 좌심실 보조장치의 박동효율 예측: 시뮬레이션 연구

김은혜, 임기무

금오공과대학교 메디컬IT융합공학과

Introduction: It is important to begin left ventricular assist device (LVAD) treatment at appropriate time for heart failure patients who expect cardiac recovery after the therapy. In order to predict the optimal timing of LVAD implantation, we predicted pumping efficacy of LVAD according to the severity of heart failure theoretically. Method: We used LVAD-implanted cardiovascular system model which consist of 16 Windkessel compartments for the simulation study. Although this study was conducted in silico, our results may be used as a reference data for clinical experiments when considering LVAD treatment as "bridge to recovery"

Tissue Engineering and Biomaterials

P3-57 세포 공배양을 통한 기증 세포부족의 해결 : 1형 당뇨의 세포치료를 위한 이자세포와 간세포의 공배양 구체 이식실험

이재서, 전예슬, 강아란, 이상훈

고려대학교 생체의공학과

We made co-culture spheroids of primary (rat) islets and hepatocytes with a ratio of 3:1 and encapsulated the spheroids in collagen-alginate micro-fiber after 7 days of culture. Then we conducted (mouse) intra-peritoneal transplantation of the fiber to observe therapeutic effects of the spheroids. Blood glucose levels of different groups of mice (co-culture spheroid fiber, islet fiber, free islet, non-transplantation) are checked for a month. Also we performed IPGTT to measure glucose-control efficiency and compared with each group. This spheroid model can gives a solution of the cell shortage which is one of the major drawbacks of cell therapy.

P3-58 토끼 연골 결함 모델에서의 PLGA 재질의 노즈빔을 이용한 연골 지지 능 검증

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Autologous cartilage is generally accepted for nasal-tip plastic surgery. However, autologous cartilage has drawbacks, such as difficulty in collection and deformation of the surgical site. For this reason, polymeric structures have been widely studied to replace

autologous cartilage and thus, overcome these drawbacks. A nose beam used in this experiment is composed of the polymer, the safety of which has alrelady been proved to a large extent. In this study, to evaluate the feasibility of the polymeric nose beam for various applications, the in vivo experiments were performed by implantation of this system to the parts of the body other than the nose. This study revealed a promising result and thus, we conclude that the polymeric nose beam used in this work can be applicable to various parts of body for augmentation.

P3-59 Wip1 유전자 전달을 이용한 엔지니어드 연골세포의 연골조직재생

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For autologous chondrocytes therapy, long-term culture is absolutely necessary. But long-term culture would result in serious impairment of inherent characteristics of chondrocytes. We observed that whether the introduction of Wip1 in chondrocytes, affects the dedifferentiation status by the regulation of ROS levels. In this result, the suppression of stress responses by Wip1 apparently extended the increase of proliferation, compared with passage 5 mock vector. Finally, Wip1 gene delivery resulted in significantly prolonged chondrogenicity of chondrocytes, followed by higher expression of chondrogenic marker of both in vitro and in vivo.

P3-60 생체접착제의 유효성 평가를 위한 연조직 적용 연구

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Biological adhesives made from naturally occurring materials are commonly used during open surgeries to expedite recovery. Because these adhesives are mainly imported and sold at high prices, the demand for an affordable, domestically-made bioadhesives continues to increase. In this study, the efficacy and safety of new bioadhesives were compared against Dermabond and Histoacyl via pathological analyses and tensile strengths. The new bioadhesive HyMac_A showed less inflammation, while HyMac_L showed greater tensile strength compared to Dermabond and Histoacyl.

P3-61 조직 공학 응용을 위한 기체 함입된 Microfiber

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There has been many efforts to study cell encapsulation methods for tissue engineering applications. The most important issue in cell encapsulation is to enhance the cell survival when it is transplanted. Here, gas-embedded microfiber was developed to increase the cell viability. The gas bubbles inserted into the fiber can be helpful for preventing encapsulated cells from hypoxia environment. To see the shape of the gas-embedded fiber, the optical imaging and SEM imaging were used. This gas-embedded microfiber could be an useful cell encapsulation tool for tissue engineering.

P3-62 빛에 의한 일주기 리듬의 교란이 소동물의 말초조직에 미치는 영향

서동현, 박지형, 정영진, 엄시내, 김한성
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This study aimed to evaluate the effects of circadian rhythms disruption on phenotype of peripheral tissues of growing mouse. fourteen C57bl/6 mice were randomly allocated into two groups; Normalv(NOR) and Night shift (NS). The tibia and torsos (3rd ~ 6th lumber vertabrae) of each groups in mice were scanned at 0 and 4 weeks by using in-vivo micro CT. BV/TV, Tb.N, Tb.Pf on trabecular bone and Cs.Th on cortical bone were significantly lower than those in NOR ($p<0.05$). The area of abdominal adipose tissues in NS were significantly higher than those of NOR ($p<0.05$). Thus, the disruption of circadian rhythms might be induced bone loss, and increase accumulation of abdominal adipose tissues.

P3-63 평활근 세포로의 분화 방법에 따른 중간엽 줄기세포 핵 모양 변화

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연구소/UHRC/심혈관 대사질환 연구센터

Biochemical and/or mechanical stimuli are widely adopted methods to be effective in differentiating into smooth muscle cells (SMCs) but detailed mechanisms of each method are still unclear. As a first step the morphological changes in nuclei of mesenchymal stem cells (MSCs) during SMCs differentiation using two differentiation methods were examined. Roughness and circularity of the nuclei were measured based on microscopic images. The MSC nuclei under combinational stimuli underwent changes such as increase in roughness and elongation during differentiation. This study suggested the necessity of further study with regard to differences during differentiation when subjected to different methods.

U-Health, e-Health, m-Health Technology

P3-64 착용식 fNIRS을 위한 저발열 광검출기 개발

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In the paper, the improvement of the photodetector for the portable fNIRS was described. The in-house fNIRS system was developed for comfortable monitoring of cerebral blood flow and brain-computer interface (BCI) application. The focus of the improvement was to restrain the heat from the amplifier in the photodetecting circuit. Controlling the temperature of the instrument was the important step because the safety is essential for daily monitoring in U-healthcare or BCI system. After the development, monitoring temperature was conducted for comparison between the former photodetector and the improved photodetector.

P3-65 양이 비대칭 방향성 마이크로폰을 이용한 잡음 감쇄 알고리즘 개발

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In noisy environment, the speech recognition ability of sensorineural hearing-impaired persons drastically decreases due to the deteriorated hearing levels and spectral resolution of the auditory system, and to compensate these weaken listening abilities, they use a hearing-support device such as a hearing aid or a cochlear implant. In order to improve intelligibility in noisy environment, high-end hearing aids use spatial noise reduction algorithms such as beamforming or directional microphone. The algorithm is to reduce input signals of specific directions such as 90° ~ 270°, to enhance input signals of 0°. Therefore, if hearing aid users want to hear a signal of the specific directions or if emergency signals occur at the specific directions, the users don't hear that signal.
This study is to develop a novel spatial noise reduction algorithm that is to enhance a front side signals and back side signals. And the algorithm is evaluated by several objective measurements.

P3-66 개인건강관리를 위한 모바일 플랫폼 기반의 시스템 개발에 관한 기초연구

신영은, 최우혁, 신태민
연세대학교 보건과학대학 의공학부

This is a basic research for developing health care system for private use. Other existing health care systems can't monitor user's physical condition in real time. We developed the smart-phone application based on Android OS that could display user's health condition with graphs in real time and save user's data in the mobile device. This system could make users monitor their physical condition in real time without the complicated device and they could care their health systematically.

P3-67 하지 압력 기반의 운동량 평가를 위한 시스템 및 알고리즘 개발에 관한 기초연구

김상훈, 황라영, 최우혁, 신태민
연세대학교 보건과학대학 의공학과

Accelerometer-based energy expenditure estimation used for evaluating exercise load is inappropriate to exercise lower extremity. In this study, we measured pressure of lower extremity to complement this limitation. Based on the pressure, we developed system and algorithm which can evaluate accurate exercise load. This system has good portability so it is possible to combine with exercise load evaluation system based on acceleration or heart rate.

P3-68 주파수 압축과 이분청취 알고리즘을 이용한 명료도 및 인지도 향상

황종호[1], 육순현[1], 윤성훈[2], 남경원[1], 김인영[1]
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[2]한양대학교 의공학연구소

Severe high frequency hearing loss person have a difficulty of listening about the high frequency region sound information. Also, the person has wide auditory band width. It cause spectral masking effect and reduce frequency selectivity. As a result, the person has a difficulty of speech recognition.
In this paper, using non-linear frequency compression let the person listen the high frequency region sound information. Also, using dichotic non-linear comb filter let the person compensate the wide auditory band width. As a result, those algorithms can increase speech recognition for severe high frequency hearing loss person.

P3-69 유비쿼터스를 위한 모바일 기반의 의료정보시스템 구축에 관한 기초연구

송문, 최우혁, 신태민
연세대학교 보건과학대학 의공학과

In many fields, It is required combination with Ubiquitous according to broaden environment which can build a Ubiquitous system caused by IT development. Also, the standardization is actively progressed using HL7 in domestic medical institutions. In basic research, we apply transformation and transmission system of medical information using HL7 standard to Android and Window CE-based embedded system, smart phone and bio-information measuring device and can get result that have compatibility.

P3-70 산소포화도 측정 센서용 아날로그 프런트 엔드 설계 기술

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Analog front-end is the most important part within the whole bio-medical processing system. This includes current-to-voltage converter and programmable gain amplifier regulated by the digital control signals. It allow us to amplify the target signals from the bio-sensor with less affection from the environment noise, proper amplitude depending on the system requirements and transfer it to the followed analog-to-digital converter. In this article, underlying technologies are reviewed: current-to-voltage converter and programmable gain amplifier.

P3-71 A-law 압축 방식을 이용한 2.4GHz GFSK통신 무선 양이 보청기의 음성신호 전송 연구

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Wireless binaural hearing aids provide better understanding of speech, and localization than monaural one. However, the 16bit digitalized audio signal might not be transmitted correctly from transmitter to receiver on the 2.4GHz GFSK wireless communication. In this study, a basic experiment was designed to make available to transmit audio data correctly using A-law algorithm. The Audio data is compressed from 16bit to 8bit with presented A-law algorithm via designed look-up table. The result shows the compressed signal is able to be transferred accurately with the 2.4GHz GFSK wireless communication. By using this technology, the 2.4GHz GFSK wireless binaural hearing aids will be developed in the future.

P3-72 ECG와 가속도 센서 기반 수면 무호흡증 컴퓨터 보조 진단 알고리즘 개발

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Obstructive sleep apnea syndrome (OSAS) is a sleep disorder which is caused by repetitive occlusion at the upper airway. This condition may be related with many clinical complications such as cardiovascular disease, high blood pressure, stroke, diabetes, and clinical depression. In this paper, portable electro-cardiograph (ECG) equipment and three accelerometers (x, y, z-axis) are used for OSAS detection. A novel R-peak detection and feature extraction algorithms are also developed. This work is the initial step towards achieving real-time OSAS event recorder for patients.

P3-73 정전용량센서를 이용한 수액의 점적 상태 모니터링 기초연구

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Intravenous(IV) drip infusion is the most widely used for medical treatment. However it requires a lot of attention to check IV solution exhaustion for several reasons such as the regurgitation. To avoid this situation, in this paper, IV solution exhaustion detector is designed using capacitive sensor comprising two copper electrodes attached to intravenous drip chamber. Measured capacitance value according to frequency of fluid drop through the drip chamber and vertical position of capacitive sensor attached on the chamber case are observed. The result shows that position of capacitive sensor affects the capacitance value but the frequency of fluid drop has no influence.

P3-74 림트레이너를 이용한 자전거 운동 시 표면근전도의 근피로도 변화 분석

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The purpose of this study is to find the optimal pedal rate and gear ratio using surface EMG signal represented the condition of muscle. It used indoor rim trainer that is previous study for pattern recognition of outdoor cycling exercise when we analyzed changing sEMG. 4 subjects(male) completed four trials with same power output(149.58W) and four different gear ratios. As a result, when the subjects exercised equal velocity and power output, muscle fatigue varaiation is different due to gear ratio. We find that the sEMG signal can be used for the efficient cycling exercise.

P3-75 초저전력 블루투스 임베디드 시스템이 장착된 자가발전이 가능한 교육용 블록 완구

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In this study, we developed a ultra low power bluetooth embedded system mounted self-generatable educational block toy. Generator module is manufactured as convertible shaped educational block toy with driving by pulling way considering user convenience. And we configured the wireless data transfer system that using power occured from generator driving. Also, we exploered way that can use the transfered data interlocking with smart devices. Developed technique through this study is expected to be more usefully applied in field of which sustainable power supplying is needed in the wireless environment not only educational toys but also like ubiquitous healthcare systems.

P3-76 Android O/S를 이용한 보행 모니터링 시스템 개발

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Gait is measured in a variety of ways for a long time and has been used as a measure of health. Most existing monitoring systems require large, high-cost. However, advances in technology made possible the development of a small and low-cost system. Accordingly, under the ubiquitous environment, want to measure the gait patterns of everyday life needs arose. This system, the requirement was implemented. Goal of this system is a small, low-power, visual monitoring, wireless, data accumulation, low-cost, intuitive direction. Through the system, users can manage health easily, and experts can identify their customer's health easily.