CONTENTS

학회장 인사말

2010년도 추계학술대회를 맞이하여

지구 환경이 변화하고 있음을 몸과 마음으로 느끼게 한 올 여름이 벌써 지나고 가을이 점점 깊어갑니다. 기후가 급변하는 것과 같이 의용생체공학을 둘러싸고 있는 환경도 빠르게 변화하는 것을 느끼게 한 한 해였습니다. 그중에서도 기술의 발전이 평범한 사람들의 일상생활을 얼마나 크게 근본적으로 변화시킬 수 있는지를 보여준 물건은 통상적인 전화기를 이미 벗어 난 '스마트 폰'이라고 할 수 있겠습니다.

이번 추계학술대회에서는 '스마트 테크놀로지'가 의료 분야에 미칠 영향을 논하고 예측하는 기회를 마련했습니다. 기조강연에 이어 다양한 분야에 걸쳐 전문가들의 발표와 생산적인 토의가 이루어질 것으로 기대합니다. 여러분들의 적극적인 참여를 부탁드립니다.

2010년 10월 1일
대한의용생체공학회 회장 정도언 올림

조직위원장 인사말

2010년도 추계학술대회를 맞이하여

대한의용생체공학회 2010년 추계 학술대회에 참여해주신 모든 회원 여러분과 관심을 보여주신 여러분들을 진심으로 환영합니다.

국가적으로 우리나라가 의료기기산업 선진국으로 발전하기 위해 산학연관 모두가 최선의 노력을 경주하고 있는 이때에, 의공학관련 국내 유일의 정통학술단체인 본 학회 학술대회가 특별히 1946년 10월 개교 이후 날로 발전을 거듭하여 이제는 "겨레의 대학에서 세계의 대학으로" 비상하고 있는 서울대학교 관악캠퍼스에서 열리게 된 것은 매우 뜻 깊은 일이라 하겠습니다.

모든 참여하시는 분들이 많이 보고, 듣고, 깨달아서 우리나라 의공학 분야 학문 발전은 물론이고 의료기기산업 발전에도 크게 기여하는 좋은 기회가 되기를 소망합니다.

여러분께서 관악산의 정기와 학술위원회에서 마련한 다양하고 알찬 프로그램을 마음껏 즐기실 수 있도록 저희 조직위원회는 최선의 노력을 다하겠습니다. 감사합니다.

2010년 10월 1일
대한의용생체공학회 조직위원장 김희찬 올림

대한의용생체공학회 제18대 임원

직 책	성 명	소 속	직 책	성 명	소 속
회 장	정도언	서울대	편집이사	이상훈	고려대
수석부회장	조진호	경북대		이재성	서울대
부회장	선 경	고려대	정보이사	안원식	서울대
	손원길	메디슨		노정훈	부산대
감 사	차은종	충북대	국제협력이사	김법민	고려대
	허 웅	명지대		김태성	경희대
총무이사	최진욱	서울대		김희찬	서울대
	지영준	울산대	산학협력이사	유규하	식약청
기획이사	최귀원	KIST		김용주	벡톤디컨슨코리아(주)
	김인영	한양대		김명남	경북대
재무이사	이원진	서울대	회원관리이사	이봉수	건국대
	정선근	서울대		신홍범	코모키수면클리닉
	김동욱	전북대		김 린	고려대
교육이사	김주명	광양보건대	특임이사	홍성화	삼성병원
	정병조	연세대		김윤년	계명의대
학술이사	신정욱	인제대			
	남윤기	KAIST			

정보위원회

직 책	성 명	소 속	직 책	성 명	소 속
정보이사	노정훈	부산대	위원	공현중	서울대
정보이사	안원식	서울대	위원	신범주	부산대
위원	서광석	서울대	위원	정동근	동아대
위원	최성욱	강원대			

학술위원회

직 책	성 명	소 속	직 책	성 명	소 속
학술이사	신정욱	인제대	위원	이수홍	차의과학대
학술이사	남윤기	KAIST	위원	임도형	한국생산연구원
위원	최영빈	서울대	위원	서종모	서울대
위원	변경민	경희대	위원	정 용	KAIST
위원	양 성	GIST	위원	박재영	고려대
위원	전누리	서울대	위원	심은보	강원대
위원	황도식	연세대	위원	최성욱	강원대
위원	임창환	연세대			

교육위원회

직 책	성 명	소 속	직 책	성 명	소 속
교육이사	김동욱	전북대	위원	심은보	강원대
교육이사	김주명	광양보건대학	위원	오대호	한림성심대학
위원	정병조	연세대	위원	윤종인	대구가톨릭대
위원	권기진	영남이공대학	위원	이기영	관동대
위원	김법민	고려대	위원	이주원	안동과학대학
위원	김선정	한양대	위원	이동훈	동명대
위원	김성민	건국대	위원	이석재	서남대
위원	김영곤	인제대	위원	이수열	경희대
위원	김정래	을지대	위원	임용규	상지대
위원	김휘영	동주대학	위원	임재근	극동정보대
위원	나승권	폴리텍대학(원주)	위원	천민우	동신대
위원	박기영	전주비전대학	위원	최병철	춘해대학
위원	박해암	남부대	위원	최승한	대구한의대
위원	박현진	가천의과학대	위원	태기식	건양대
위원	서광석	서울대			

편집위원회

직 책	성 명	소 속	직 책	성 명	소 속
편집이사	이상훈	고려대	위원	이계한	명지대
편집이사	이재성	서울대	위원	한동근	한국과학기술연구원
위원	이수열	경희대	위원	송병섭	대구대
위원	이종민	한양대	위원	김한성	연세대
위원	권성훈	서울대	위원	임창환	연세대
위원	임도형	한국생산기술연구원	위원	신정욱	인제대
위원	유선국	연세대	위원	김동욱	전북대
위원	정동근	동아대	위원	이성재	인제대
위원	엄광문	건국대	위원	이우철	을지대
위원	남윤기	KAIST			
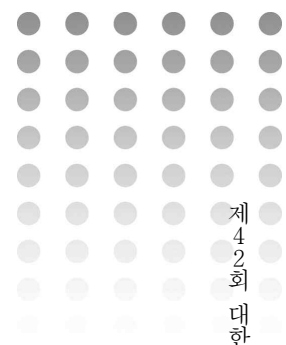
프로그램위원회

· Biomedical Optics

　변경민_경희대학교　　　　　　　　최영빈_서울대학교

· Biomedical Robotics

　임도형_한국생산기술연구원　　　　박재영_서울대학교

· Cardiovascular Engineering

　최성욱_강원대학교　　　　　　　　정용_KAIST

· Medical and Bioinformatics

　최진욱_서울대학교　　　　　　　　남윤기_KAIST

· Medical Imaging

　황도식_연세대학교　　　　　　　　임창환_연세대학교

· Medical Nano and Microtechnology

　양성_GIST　　　　　　　　　　　전누리_서울대학교

· Neural Engineering

　남윤기_KAIST　　　　　　　　　　임창환_연세대학교

· Orthopedic and Rehabilitation Engineering

　신정욱_인제대학교　　　　　　　　임도형_한국생산기술연구원

· Respiratory Engineering

　정용_KAIST　　　　　　　　　　　박재영_서울대학교

· Systems Biology, Physiological modeling

　심은보_강원대학교　　　　　　　　최성욱_강원대학교

· Tissue Engineering and Biomaterials

　이수홍_CHA의과대학교　　　　　　최영빈_서울대학교

· U-Health, eHealth Technology

　서종모_서울대학교　　　　　　　　양성_GIST

· Biomedical Engineering Education and Career
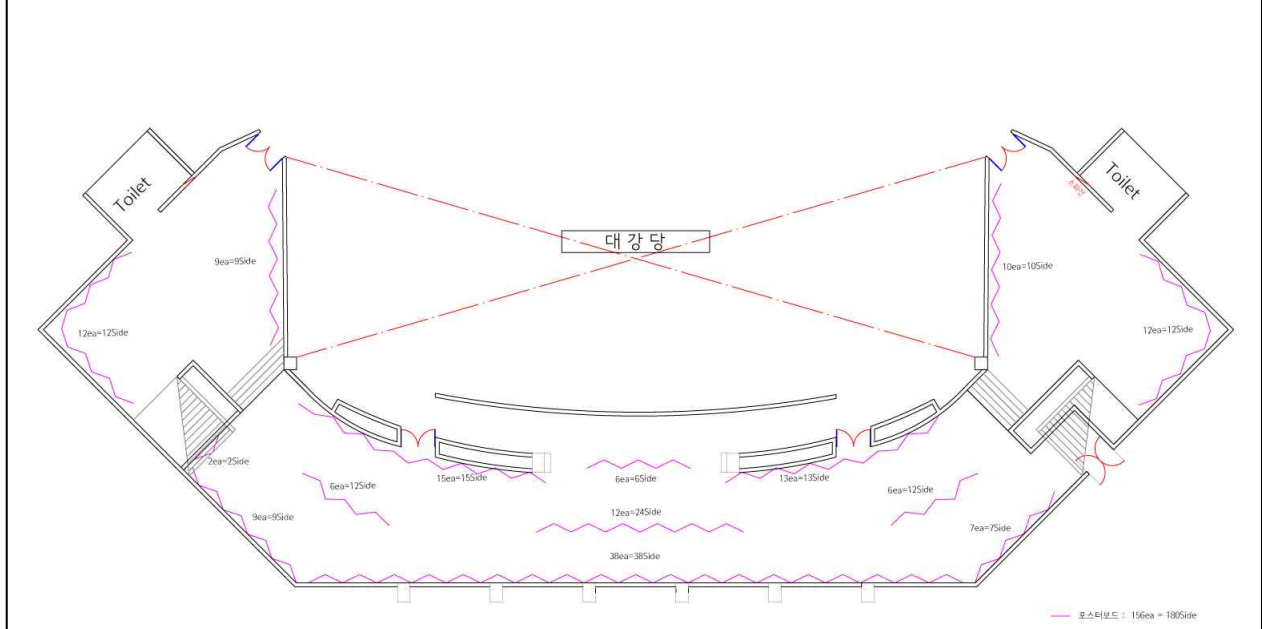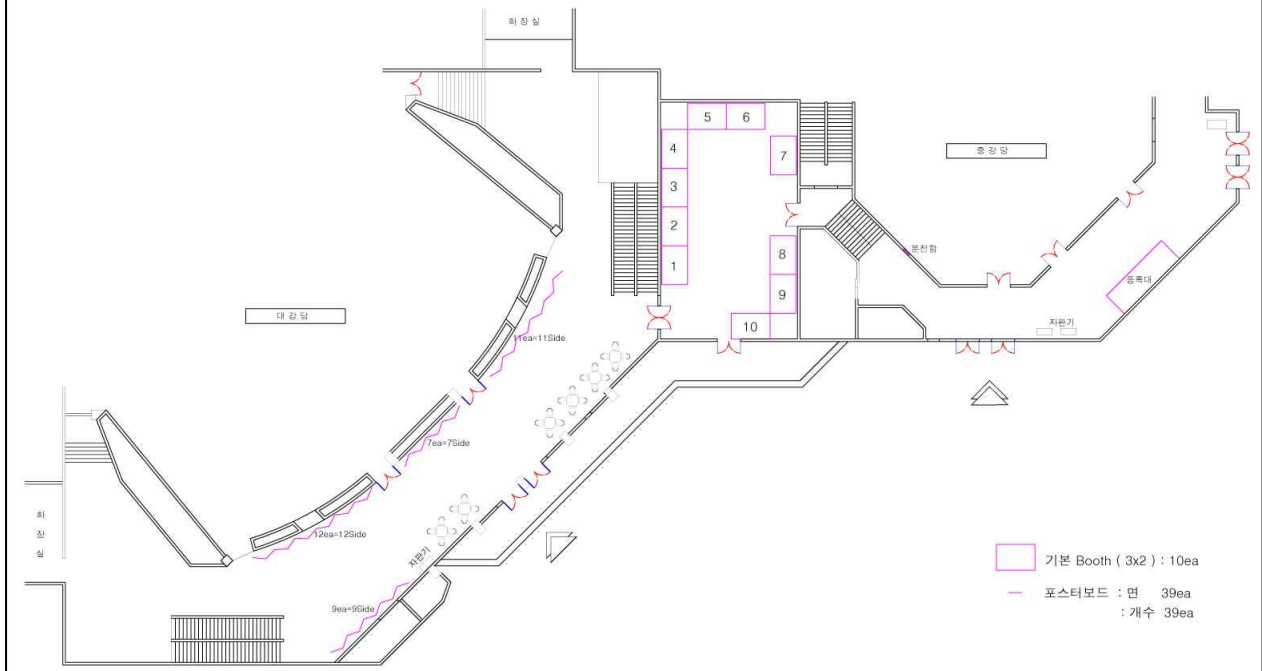
　지영준_울산대학교　　　　　　　　신정욱_인제대학교

조직위원회

직 책	성 명	직 책	성 명
위원장	김희찬	위원	최진욱
위원	김성완	위원	최영빈

추계학술대회 프로그램 일정

- 주 최: 대한의용생체공학회
- 주 관: 대한의용생체공학회, 서울대학교
- 일 정: 2010년 11월 26일(금)
- 장 소: 서울대학교 문화관

심포지움 프로그램	
08:30 ~ 09:30	등록
09:30 ~ 11:00	<특별강좌> 스마트폰용 Medical 앱 개발 (중강당) (좌장: 임창환 / 연세대학교)
09:30	Smart Medical App: Interactive, Intelligent, and Just-in-Time Service 박승훈 교수 (경희대학교 동서의료공학과)
10:00	개발사례: 서울아산병원의 모바일헬스 어플리케이션 이재호 교수 (울산의대 서울아산병원 응급의학과)
10:30	개발사례: 3D 의료영상솔루션 및 I-Phone APP-"3D 가성성형"소개 손수익 대표 ((주)엠엑스알커뮤니케이션즈)
11:00 ~ 11:40	산업체 특별강연 (중강당) (좌장: 지영준 / 울산대학교) 삼성전자의 헬스케어 사업전망 및 요청사항 김한신 수석연구원 / 그룹장 (삼성전자 HME)
11:40 ~ 12:40	점심
12:40 ~ 13:50	포스터 발표 (대강당)
13:00 ~ 13:40	연구재단 특별강연 (중강당) (좌장: 김법민 / 고려대학교) 바이오-의료융합 분야의 연구과제 발굴 및 기회 창출 전략 이성종 박사 (한국연구재단 융합과학단)
13:50 ~ 14:00	개회식 (중강당) (사회: 신정욱 / 인제대학교)
14:00 ~ 14:50	기조 강연 (중강당) (좌장: 남윤기 / KAIST) Connected Healthcare 시대의 도래 이명성 박사 (SK텔레콤 최고기술책임자 (CTO))
15:00 ~ 16:00	초청세션 1.1 스마트 의료영상 (중강당) (좌장: 황도식 / 연세대학교)
15:00	Searching for New Contrast Information by Using Multiphysics 우응제 교수 (경희대학교 동서의료공학과)
15:30	Molecular Imaging: Smart Tool for Translational Biomedical Research and Personalized Medicine 김동억 교수 (동국대학교 일산병원 신경과)
15:00 ~ 16:00	초청세션 1.2 스마트 생체재료 (대강당) (좌장: 이수홍 / 차의과대학교)
15:00	Biomimetic Artificial Muscle: Based on Fusion Technology 김선정 교수 (한양대학교 전기생체공학부)
15:30	Smartly Configured Biomaterials for Precision Drug Therapy 최영빈 교수 (서울대학교 의과대학 의공학과)
16:00 ~ 16:15	휴식
16:15 ~ 17:15	초청세션 2.1 스마트 헬스케어 (중강당) (좌장: 양 성 / GIST)
16:15	Trends and Future of Advanced Biomedical Sensor System Technology 조진호 교수 (경북대학교 전자공학부)
16:45	Smart Care Project for Metabolic Syndrome and Obesity 조비룡 교수 (서울대학교 의과대학 가정의학과)
16:15 ~ 17:15	초청세션 2.2 스마트 나노바이오 (대강당) (좌장: 변경민 / 경희대학교)
16:15	Microfluidic Biochip Platform for Personalized Diagnostics 박제균 교수 (KAIST 바이오및뇌공학과)
16:45	Nanoplasmonic Spectroscopic Imaging and Molecular Probes for Living Cells 최연호 교수 (고려대학교 생체의공학과)
17:15 ~ 17:45	폐회식 (중강당) (사회: 남윤기 / KAIST)
17:45 ~ 18:15	만찬 장소 이동 (낙성대 호암생활관)
18:30 ~ 20:30	총회 및 시상식 (사회: 최진욱 / 서울대학교) / 만찬

● 학회장소 : 서울대학교

점심식사 장소 약도

저녁만찬 장소 약도

대한의용생체공학회 2010 추계학술대회

기본 Booth (3x2) : 10ea

포스터보드 : 면   39ea
: 개수 39ea

대한의용생체공학회 2010 추계학술대회

포스터보드 : 156ea = 180Side

※ 참가비 납부방법

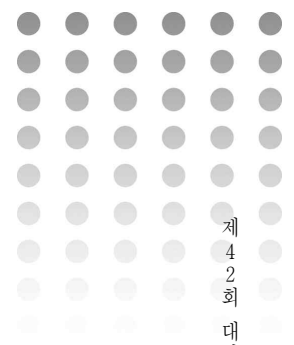| 2010 추계	사 전	당 일
일 반	10 만원	12 만원
학 생	5 만원	6 만원
비회원 일반	11 만원	14 만원
비회원 학생	7 만원	8 만원
학부생(참관)	2 만원	2 만원

• 학술대회 논문발표자는 반드시 학회 회원으로써 연회비 납부와 사전등록비를 각각 따로의 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)

특별강좌

KOSOMBE

Smart Medical App: Interactive, Intelligent, and Just-in-Time Service

이름 : 박승훈 교수
직위 : 정교수
소속 : 경희대학교 동서의료공학과
기타 : 한국방송통신융합서비스협회 회장, ㈜더힘스 유헬스연구소장 등

Abstract

After the success of Apple's App Store, smartphone apps have been regarded as an effective and efficient means of implementing an interactive, intelligent, personalized, and just-in-time health care service. This lecture introduces how to choose appropriate problems which can fully take advantage of smartphone's personalized and interactive features, and how to design, develop, test, debug, and distribute professional smartphone applications. Some successful examples are illustrated to easily jump into a new era of smartphone app stores.

Bio sketch

Seung-Hun Park is presently a Professor of the Department of Biomedical Engineering at the Kyung Hee University. He is also the Chairman and Founder of the Korea Communications Convergence Association. In 1998, he founded a venture company named The HIMS Inc. where he invented many instruments for Sports Medicine and commercialized a new model of Ubiquitous Wellness Service. He is currently working as the CTO of the company responsible for developing IT-based devices and systems for Health Promotion Services. From 1991 to 1999 he was with the Kon Kuk University as Professor of the Biomedical Engineering Department. He received the B.S. and M.S. degree from Seoul National University and later the Ph.D. in Electrical Engineering from the University of Florida. Prof. Park's research interests lie in the application of biomedical engineering methodologies, information and communication technologies to persuade people to alter their thoughts and behavior towards a healthy life.

서울아산병원의 모바일헬스 어플리케이션

이름 : 이재호 교수

직위 : 조교수

소속 : 울산의대 서울아산병원 응급의학과

기타 : 서울아산병원 의료정보실장보
서울아산병원 u-health센터 부소장

요 약

서울아산병원은 작년 말 아이폰의 도입으로부터 시작된 모바일 시대에 대응하여, 유용한 모바일헬스 어플리케이션을 개발하고 제공하기 위하여 u-health센터 내에서 개발 모임을 조직하였다. 처음에는 간단한 텍스트 위주의 앱을 응급센터의 컨텐츠를 활용해 개발하여 역량을 키웠고(Toxicology, CPCR Drug), 이후에는 약품에 대한 식별, 검색, 등록 등의 기능이 담긴 약품정보 앱(My Medication)을 개발하였다. 병원이 애플의 Enterprise Developer로 등록된 후에는 병원 '연락처' 앱을 직원들에게 배포하였다. 현재는 대외협력실의 연구비 지원을 받아 기존의 제한적인 약품정보 앱을 업그레이드 하고 있고 다양한 모발일 헬스 앱들을 개발하고 있다.

소 개

이재호 교수는 응급의학전문의로 현재 서울아산병원 의료정보실장보와 u-Health센터 부소장을 맡고 있다. 임상현장에서의 풍부한 경험을 바탕으로 임상현장에 친화적인 병원정보시스템 구축과 운영에 관여하고 있다. 2006년부터 2007년까지 EHR핵심공통기술개발사업단의 임상의사결정지원시스템 팀의 일원으로 일했다. 현재 병원에서는 전자의무기록위원회, 개인건강정보보호 및 보안위원회, e-Med운영위원회 등의 업무에 참여하고 있으며, 대외적으로는 한국CPO(Chief Privacy Officer)포럼 운영위원, 대한의료정보학회 기획법제위원, 환자안전연구회 총무 등으로 활동하고 있다.
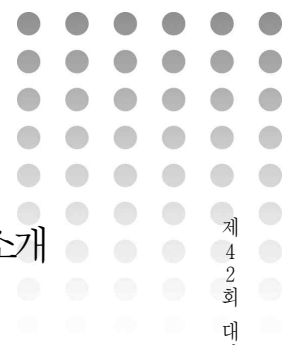
3D 의료영상 솔루션 및 I-Phone APP -"3D가상성형" 소개

이름 : 손수익 대표
직위 : 대표이사
소속 : ㈜엠엑스알커뮤니케이션즈

요 약

- 3D 의료영상 솔루션 전문기업 ㈜엠엑스알커뮤니케이션즈에서 개발, 생산, 판매중인 성형외과, 치과 그리고 한의학용 솔루션 소개
- 성형외과용 "3D 성형상담 솔루션 : RENAI-VS"
- 치과용 "3D 교정상담 솔루션 : RENAI-D"
- 한의학용 "사상 및 형상진단 솔루션 : RENAI-MEF"
- 그 외 3차원 얼굴 특징점의 유사성을 계측, 분석하여 적용한 "3차원 얼굴인식 출입통제 시스템" 소개
- 표면 반사모델을 적용한 "차세대 메이크업 시뮬레이션" 소개
- SMART PHONE에 적용된 성형외과용 "3D 가상성형" APPICATION 소개
- www.mxr.co.kr

소 개

현, ㈜엠엑스알커뮤니케이션즈 대표이사
* 세계 최고의 3D 의료영상 솔루션 회사라는 비젼을 가지고 의료 영상 시장에 접목중임.
- 2008년 8월 KFDA(식약청) 으로부터 르네시스템 의료기기 인증완료
- 3D 스캔 시스템 및 소프트웨어 특허 출원 및 등록 다수

특별강좌

특별강연

● Vision for Samsung Electronics'Healthcare Business and Entreaties
  for Biomedical Engineers
  김한신 수석
  삼성전자 HME

● 바이오−의료융합 분야의 연구과제 발굴 및 기회 창출 전략
  이성종 박사
  한국연구재단 융합과학단

KOSOMBE

Vision for Samsung Electronics' Healthcare Business and Entreaties for Biomedical Engineers

이름 : 김한신 수석
직위 : 수석연구원 / 그룹장
소속 : 삼성전자 HME

Abstract

Samsung Electronics announced in May 2010 that it will invest 1.2 trillion won over the next 10 years in development and manufacture of electronic healthcare equipment, with an initial focus on diagnostics tools. The investment is part of the company's long-term Vision 2020 initiative that also includes new business investments in eco technology such as solar cells. In June 2010, Samsung Electronics had launched portable, professional-use blood analysis device, its first product offering as part of a new strategic investment in the medical device business. It will enable closer and more efficientpatient-care, resulting in better patient-care and lower over care cost. As technology evolves, portable diagnosis devices will be increasingly applied to various home care applications including chronic disease management. In the near future, the company aims to expand its domain and maintain leadership in the infotainment business and secure a business foundation in the field of life-care.

Bio sketch

Hanshin Kim is group leader of HME (Health Medical Equipment) Business team of Samsung Electronics. He received his M.S. in Biochemistry from Yonsei University, Korea in 1993. From 2000 to 2009 he was a researcher atthe Samsung Advanced Institute of Technology. In 2005, he received MBA from Sogang University, Korea. He was involved in number of research and publications as listed below.

"Centrifugal microfluidics for biomedical applications" Lab on a Chip. (2010)

"Ca2+-mediated activation of c-Jun N-terminal kinase and nuclear factor" Journal of Neurochemistry. (1997)

"Kappa B by NMDA in cortical cell culture" Journal of Neurochemistry. (1997)

"Nitric Oxide midulates the c-Jun N-terminal kinase/Stress-activated protein" Biochemistry. (1997)

"Kinase activity through activating c-Jun N-terminal kinase" Biochemistry. (1997)

"A non-enzymatic p21 protein inhibitor of stress-activated protein kinase" Nature. (1996)

His current research interests are diagnostic system and POCT (Point of Care Test) devices.

특별강연

바이오-의료융합 분야의 연구과제 발굴 및 기회 창출 전략

이름 : 이성종 박사
직위 : PO(Program Officer)
소속 : 한국연구재단 융합과학단

요 약

2010년도 연구재단에서는 RB제도를 도입하기 위하여 학문단 별로 지원분야를 재정립하였다. 융합과학단은 기존의 의공학, 환경공학, 산업공학 등과 같은 학과 중심의 지원분야를 바이오의료융합, 정보전자융합, 에너지환경자원, 복합과학 등과 같이 연구성격 중심의 분야로 재편하면서 15개 RB 분야로 재구성하여 과제를 지원하였다. 따라서 기존의 의공학 분야 과제는 주로 바이오의료융합 전문분과군의 보건의료Ⅰ, 보건의료Ⅱ 세부분과에 편성되었다.

한편 2010년도 기초연구사업에는 총 18,841과제가 접수되어 4,704과제를 선정하였다. 융합과학단에는 전체의 12%에 해당하는 2,241과제가 접수되어 490과제를 선정하였으며 평균 선정율은 21.9%였다. 융합과학단에 신청된 2,241과제 중 바이오의료융합-보건의료Ⅰ과 바이오의료융합-보건의료Ⅱ에는 모두 480과제가 접수되어 97과제를 선정하였다. 이 분야에서는 남성보다 여성이 선정율이 높았으며 지역보다는 수도권의 선정율이 높았다. 연령대가 낮을수록 선정율이 높은 경향을 보여 선정자 전체 평균 연령은 바이오의료융합-보건의료Ⅰ이 42.4세, 바이오의료융합-보건의료Ⅱ가 44.5세이고 미선정과제 신청자 평균연령은 이보다 높았다. 재단 과학기술연구인력정보에 등록된 자료를 기준으로 선정과제 연구책임자의 5년간 발표한 SCI 논문의 총 편수는 바이오의료융합-보건의료Ⅰ과 바이오의료융합-보건의료Ⅱ 분야에서 각각 22.2편과 21.8편이었으며 주저자 논문비율은 37.3%와 46.0%였다. 지난 3년간 주저자 논문비율은 이보다 높아지는 경향이 있으며 특허출원이나 등록과 관련한 정량적 실적과 과제선정과의 관련성은 뚜렷하지 않은 것으로 보인다.

이에 따라 추후 보다 많은 바이오-의료융합 분야의 연구 과제를 발굴하기 위해서는 재단 기초연구사업에 관심을 가지고 보다 적극적으로 사업에 참여해야 할 것으로 보인다. 세부 RB 분야별 특성을 파악하여 적정한 분야에 신청하는 것도 중요하며 기존 선정과제 수준의 실적 관리도 필요할 것으로 보인다. 나아가 평가에 참여하게 될 경우 분야의 비전을 담아 올바른 과제를 선정할 수 있도록 노력을 기울여야 할 것이다.

소 개

의학박사/생리학

현 한국연구재단 기초연구본부 융합과학단 PO, 한국과학재단 전문위원실 간사, 연구기획 Task Force 팀원, 수리과학 전문위원실 간사, 생명공학 전문위원실 간사, 생명과학 전문위원실 간사, 한국연구재단 융합과학팀 팀장 등 역임

기조강연

● Connected Healthcare 시대의 도래
이명성 박사
SK텔레콤 최고기술책임자 (CTO)

KOSOMBE

Connected Healthcare 시대의 도래

이름 : 이명성 박사
직위 : CTO
소속 : SK텔레콤 최고기술책임자 (CTO)

요 약

21세기에 들어서며, Healthcare 산업은 20세기와는 다른 형태로 발전할 것이다.
산업을 둘러싼 소비자, 기술, 규제, 경쟁 측면의 변화로 인해 미래 Healthcare 산업은 고객에 대한 Predictive, Preventive, Personalized, Participatory & Partnership(이하 P4) 강화되는 방향으로 진화할 것임. 이러한 고객중심의 Total Health Management를 위한 P4로의 진화는 의료와 ICT와의 융합을 통해 가능해 지고 있으며 미국 Major 병원 및 ICT Player에서도 큰 Trend로 나타나고 있음. 고객중심의 Total Health Management로 진화하는 과정에서 intelligent Network을 포함한 Smart ICT 기반의 Connected Healthcare의 중요성이 크게 부각될 것임. Connected Healthcare 시대의 도래는 시공간의 제약을 벗어난 고객관점의 Total Life Healthcare, 의료의 Quality의 획기적 향상 등 다양한 서비스를 제공할 수 있게 될 것임.

소 개

이명성 부사장은 현재 SKTelecom CTO로서, 회사의 모든 기술 개발 및 기술 전략 수립을 총괄하고 있다. 1978년 서울대학교 전자공학과를 졸업하고 University of Michigan에서 Computer Engineering으로 석사 및 박사학위를 취득하였다. 이 후, AT&T Bell Laboratories 연구위원, 한국통신 연구개발원 책임연구원, 세종대학교 정보통신학과 교수 등을 역임하였다. 1999년부터 SKTelecom에서 중앙연구원장, 전략기술 부문장 등을 역임하면서, 세계최초로 동기식 3G 이동전화 시스템인 CDMA 1x EV-DO 상용화를 달성하는 등 우리나라 정보통신 기술혁신과 위상상향에 크게 기여한 공로를 인정받아 2009년 과학기술훈장 혁신장을 수여 받았음. 현재 Healthcare를 비롯한 자동차, 교육 등 다양한 Industry와 ICT를 융합하는 기술개발을 책임지고 있음.

초청강연

- **Searching for New Contrast Information by Using Multiphysics**
  우응제 교수 / 경희대학교 전자정보대학 동서의료공학과

- **Molecular Imaging: A Smart Tool for Translational Biomedical Research and Personalized Medicine**
  김동억 교수 / 동국대학교 일산병원 신경과

- **Biomimetic Artificial Muscle: Based on Fusion Technology**
  김선정 교수 / 한양대학교 전기생체공학부

- **Smartly Configurated Biomaterials for Precision Drug Therapy**
  최영빈 교수 / 서울대학교 의과대학 의공학과

- **Trends and Future of Advanced Biomedical Sensor System Technology**
  조진호 교수 / 경북대학교 전자공학부

- **Smart Care Project for Metabolic Syndrome and Obesity**
  조비룡 교수 / 서울대학교 의과대학 가정의학과

- **Microfluidic Biochip Platform for Personalized Diagnostics**
  박제균 교수 / KAIST 바이오및뇌공학과

- **Nanoplasmonic Spectroscopic Imaging and Molecular Probes for Living Cells**
  최연호 교수 / 고려대학교 생체의공학과

KOSOMBE

Searching for New Contrast Information by Using Multiphysics

이름 : 우응제 교수

직위 : 교수

소속 : 경희대학교 전자정보대학 동서의료공학과

기타 : 이온전도영상화사업단장

Abstract

To overcome limitations of existing bioimaging modalities, researchers are looking for new contrast information including electric, magnetic, optical, and mechanical properties of biological tissues and organs. Electrical impedance tomography reconstructs cross-sectional images of conductivity and permittivity distributions inside the human body atvariable frequencies up to a few MHz. Magnetic resonance electrical impedance tomography adds new contrast information of conductivity to a clinical MRI scanner. Quantitative mapping of susceptibility distributions also adds new diagnostic information to an MRI scanner. Magnetic resonance elastography and ultrasound elastography are finding clinical applications. These new modalities are often based on multiphysics. After briefly reviewing such bioimaging methods, we will focus on magnetic resonance electrical impedance tomography as an example of multiphysics-based novel bioimaging modality providing new contrast information that is not available from other bioimaging modalities.

Bio sketch

Eung Je Woo received BS and MS degrees in electronic engineering from Seoul National University in 1983 and 1985, respectively. He joined the BME group at the University of Wisconsin-Madison in 1986 and received his PhD degree in 1990. From1990 to 1999, he was with the BME department at Konkuk University as an assistant and associate professor focusing on the development of electronic medical devices. In 1999, he moved to Kyung Hee University as a professor, where he has been teaching bioinstrumentation and doing research in electrical impedance imaging, modeling of bioelectromagnetism, and instrumentation. Since 2002, he has been the director of the Impedance Imaging Research Center (IIRC) focusing on the development of new imaging methods such as MREIT. He is a life-time member of the KOSOMBE and a senior member of the IEEE. In 2010, he was elected as an AdCom member of the IEEE EMBS representing the Asia-Pacific region. He has served the KOSOMBE in its numerous committees. He organized more than ten international conferences and he was the chair of the scientific program committee for the WC2006. For the IEEE EMBC09, he served a co-chair of the biomedical imaging and image processing theme. Since 2010, he is leading the ion conduction imaging project to develop novel multi-modality bioimaging methods to directly visualize neural activity.

Molecular Imaging: A Smart Tool for Translational Biomedical Research and Personalized Medicine

이름 : 김동억 교수

직위 : 부교수, 신경과장

소속 : 동국대학교 일산병원 신경과

기타 : Director of Molecular imaging & Neurovascular Research (MINER) Lab, 미래기반기술사업 PI

Abstract

Molecular imaging, a novel technology to visualize biologic processes at the cellular and molecular level, is reshaping both biomedical research and clinical practice. By providing molecular information to supplement and augment conventional anatomy-based imaging, molecular imaging is expected to allow (1) the earlier detection of diseases, (2) precise evaluation of disease stages, and (3) both diagnostic and therapeutic monitoring of the disease progress in a quantitative manner. In this talk, I present my view on the prospect of molecular imaging in the field of translational biomedical research and its potential future role for personalized medicine

Bio sketch

1997.3 – 2001.2	Seoul National University Hospital
	Residency in Neurology
2001.3 – 2002.5	Seoul National University Hospital
	Clinical & Research Stroke Fellowship in Neurology
2002.6 – 2005.5	Postdoctoral Fellow
	Center for Molecular Imaging Research (Dr. Weissleder)
	MGH, Harvard Medical School
2005.6 – present	Chief, Department of Neurology
	Director, MINER Lab
	Dongguk University Ilsan Hospital
	Dongguk University College of Medicine
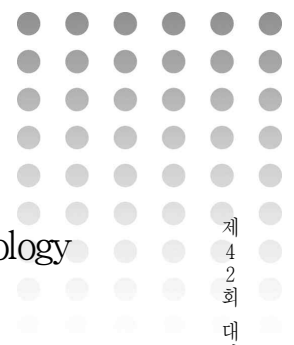
Biomimetic Artificial Muscle: Based on Fusion Technology

이름 : 김선정 교수
직위 : 정교수
소속 : 한양대학교 전기생체공학부
기타 : 생체인공근육 창의연구단장

Abstract

Nature has served as a model for mimicking in humans desire to their life. By adapting mechanisms and capabilities from nature, scientific and technologic approaches have helped and understood related phenomena and associated principles in order to improve the capability. Natural muscle is one of the most important actuators in biological systems. Artificial muscle research has focused on actuators for use in bio-mimicrobots, flapping wing-type subminiature aircraft, and biomedical devices. Technologies for fabricating artificial muscle systems have to be developed, and these require techniques for the fabrication of materials, for interfacing and control, and the development of power sources. That is, artificial muscle systems require nanotechnology (NT) fabrication techniques to fabricate structures on the nanoscale, and biotechnology (BT) to imitate natural muscle to improve the systems performance. Interfacing and control require comprehension of the mechanism and an ability to model contraction and relaxation behavior of artificial muscle, and suitable information technology (IT)need to be developed to sense bio-information such as electrical and chemical signals. The development of artificial muscle system requires a fusion of the development technologies discussed above, utilizing NT, BT, and IT technology.

Bio sketch

Seon Jeong Kim is Professor of Department of Biomedical Engineering at Hanyang University and Director of National Creative Research Initiative Center for Bio-Artificial Muscle of the Ministry of Education, Science and Technology. He received Ph.D. in Industrial Chemistry from Hanyang University.

He has worked bio-articial muscle as a bio-mimetic system; the fabrication of materials for bio-artificial muscles that can be driven by a low power supply, the drive of bio-artificial muscle with a bio-fuel cell that can use energy sources(glucose), and the investigation into bio-artificial muscle system that can control the contraction and relaxation of bio-artificial muscle using bio-information.

Smartly Configurated Biomaterials for Precision Drug Therapy

이름 : 최영빈 교수

직위 : 조교수

소속 : 서울대학교 의과대학 의공학과

Abstract

Drug delivery systems (DDS) have been drawing much attention in both industry and academia to improve the efficacy and convenience in drug therapy as well as the patients' compliance. Although many of traditional DDS have shown their advantages in drug therapy to a large extent, several critical issues, such as highly precise and directional drug delivery, have been still unresolved due to their uncontrolled physical aspects. Therefore, we developed novel methods to smartly process biomaterials and investigated their applications in precision drug therapy. Thus-produced biomaterial-based devices include monodisperse microspheres, mucoadhesive microdiscs, nanofibrous membranes with micro-porosity and several bulk-type devices with controlled geometry, which exhibited accurately tailored drug delivery as well as enhanced targeting efficiency.

Bio sketch

Young Bin Choy is an Assistant Professor of the Department of Biomedical Engineering in College of Medicine at Seoul National University. His research is focused on developing biomaterial-based devices for their various applications in medicine, such as drug delivery, tissue engineering, medical implants and multifunctional medical devices. From 2006 to 2009 he worked a postdoctoral fellow in the Department of Chemical and Biomolecular Engineering at the Georgia Institute of Technology, where he studied on bioadhesive microparticles for ocular drug delivery with collaboration with the Eye Center at Emory University. He received the Ph.D. degree at University of Illinois at Urbana, Champaign in 2006 and the M. S. degree at the University of Wisconsin – Madison in 2000, both at the Department of Electrical and Computer Engineering with specific major in biomedical engineering. He received his B.S. degree from the School of Electrical Engineering (Seoul, 1999) of Seoul National University.

Trends and Future of Advanced Biomedical Sensor System Technology

이름 : 조진호 교수
소속 : 경북대학교 전자공학부

Abstract

Over the recent years, digital signal processing, integrated circuits, and noise control technologies have been brilliantly advanced. These technological advances are enabling miniaturized low power design of system for biomedical signal sensing and processing. To bring forward the upcoming health and welfare era in conjunction with U-health technologies, developments of various high performance sensor systems are expected to more than anything else. The major components of future biomedical sensor systems are fusion technologies of optical sensor, bio-nano, MEMS (micro electro mechanical systems) sensors, implantable sensors, and miniaturized signal processing chip. By using these new sensors related components and myriad of its applications, the era of advanced smart biomedical systems with high performance are heralding. Advanced biomedical sensor technologies can offer an important way of easy diagnosis and it will eventually contribute greatly for the promotion of all humankind health. In the lecture, advanced technologies of biomedical sensing systems are introduced as new hope for human disease treatment and life extension.

Bio sketch

Jin-Ho Cho received a B.S. degree in Electrical Engineering, in 1977, M.S and Ph.D. in Electronics from Kyungpook National University, Daegu, Korea, in 1979 and 1988, respectively. He was a visiting professor in department of Biomedical Engineering, School of Medicine at University of Iowa, USA, in 1991. He is currently a Dean on the College of IT Engineering at Kyungpook National University and a Director of the Global Human Resources Development Center for IT Convergence, a Vice-chairman of the Korea Society of Medical Biological Engineering, a Director of the Advanced Research Center of Recovery of Human Sensibility. His research interests include the biomedical signal processing, sensor applications, and biomedical instrumentations. He is a Member of the IEEE. He has been hosted the international symposium "Middle-Ear Mechanics in Research and Otology, 2012" (MEMRO 2012) in Daegu City, Korea.

Smart Care Project for Metabolic Syndrome and Obesity

이름 : 조비룡 교수

직위 : 부교수

소속 : 서울대학교 의과대학 가정의학과

기타 : 대한가정의학회 상임이사, 서울대학교병원 건강증진센터 장,
　　　보건복지부 건강검진, 건강관리서비스 자문위원, 스마트케어
　　　대사증후군 시범사업 임상연구 책임자

요 약

대사증후군이 있으면서 비만한 수진자를 대상으로 스마트케어를 이용한 의료서비스의 효과를 평가하는 임상시험이 446명의 환자를 대상으로 시작되었다. 대조군은 기존의 의료서비스와 측정장비만을 받게 되고, 시험군은 기존의 서비스에 원격모니터링이 가능한 측정장비와 이의 평가 등 스마트케어 서비스를 추가로 받게 된다.

대사증후군과 비만은 기존의 심각하고 응급한 질환을 주목표로 하여 왔던 원격의료와는 달리 매우 흔하고, 가역성이 크며, 일반인의 적극적인 행동변화가 필요한 영역으로 사용의 용이함과 이익이 크면 폭발적인 이용량의 증대를 불러일으킬 수 있어 새로운 관심사이다. 이러한 영역에서 어떠한 스마트케어 서비스와 기기가 도움이 되며, 현재의 문제점과 함께 이를 보완할 수 있는 미래지향적 모델을 살펴본다.

Collaborator: 임주원교수, 신동욱 교수. Support: LG, 에임메드

소 개

조비룡 교수는 서울대학교 의과대학 가정의학교실의 주임교수로 있으며, 서울대학교병원의 건강증진센터 소장을 역임하고 있다. 미시간대학의 노인병센터에서 교환교수로 활동하였으며, 현재도 임상적으로는 건강증진 영역에서도 특히 '건강노화'에 많은 진료활동과 연구성과를 보여, 건강위험평가, 컴퓨터를 이용한 일차의료 치매선별검사, 건강노화 패스포트, 맞춤형 건강검진모델 등을 보건복지부 등 정부 용역사업으로 개발하였다. 서울대병원에서 처음으로 서울대학교와 원격진료를 시작하였으며, 현재도 실시 중이다. 현재는 '의료정보' 또는 '스마트케어'를 이용한 건강증진과 일차의료 활성화 사업에 많은 역할을 하고 있으며, 이번 스마트케어 임상시험도 담당하게 되었다.

Microfluidic Biochip Platform for Personalized Diagnostics

이름 : 박제균 교수
직위 : 정교수
소속 : KAIST 바이오및뇌공학과
기타 : Lab on a Chip 편집위원, 나노바이오공학 NRL 연구실장

Abstract

In this talk, some recent results of microfluidic immunocytochemistry (ICC)/ immunohistochemistry (IHC) will be presented to give a new insight of clinical applications of microfluidics. A quantitative, reliable, fast, and inexpensive multiplexed ICC/IHC system is critical for personalized cancer therapy. We recently developed a novel microfluidic multiplexed ICC/IHC platform for the examination of up to 20 biomarkers in patient tissue samples. By creating a simple and robust interface between the device and human breast tissue samples, we not only applied conventional thin-section tissues into on-chip without any additional modification process, but also attained perfect fluid control for various solutions, without any leakage, bubble formation, or cross-contamination. To demonstrate the suitability of the device for scarce samples, it was also applied successfully to tissues from needle biopsies. Our results indicate that this novel concept in ICC/IHC technology will enable histopathological diagnosis using numerous specific biomarkers at a time even for small-sized specimens, thus facilitating the individualization of cancer therapy.

Bio sketch

Je-Kyun is a Professor of Bio and Brain Engineering at the Korea Advanced Institute of Science and Technology (KAIST). He obtained his PhD degree in biotechnology from the KAIST in 1992. Prior to joining the KAIST, he worked as a Postdoctoral Fellow in the Department of Biomedical Engineering at the Johns Hopkins University School of Medicine in the USA (1996-1997) and a Chief Research Engineer at the LG Electronics Institute of Technology in Korea (1992-2002). He joined the Department of BioSystems at the KAIST as an Associate Professor in 2002 and served as the Department Head of Bio and Brain Engineering (2006-2009). His expertise spans interdisciplinary fields of biotechnology, bioelectronics and bioMEMS. He has been an editorial board member of several international journals, including Biosensors and Bioelectronics, and BioChip Journal. In 2010, he became an editorial board member for Lab on a Chip, and the Chair of the BioMEMS and Lab on a Chip Committee at The Korean BioChip Society. His research focuses on the microfluidic lab a chip platform for biological sample processing and detection, including optoelectrofluidics, hydrophoretic separation, magnetophoretic assay, and cell-based assay.

초청강연
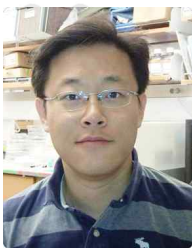
Nanoplasmonic Spectroscopic Imaging and Molecular Probes for Living Cells

이름 : 최연호 교수

직위 : 조교수

소속 : 고려대학교 생체의공학과

Abstract

Label-free, sensitive and selective detection methods with high spatial resolution are critically required for future applications in chemical sensor, biological sensor, and nanospectroscopic imaging. Here I describe the development of Plasmon Resonance Energy Transfer (PRET)-based molecular imaging in living cells as the first demonstration of intracellular imaging with PRET-based nanospectroscopy. *In-vivo* PRET imaging relied on the overlap between plasmon resonance frequency of gold nanoplasmonic probe (GNP) and absorption peak frequencies of conjugated molecules, which leads to create 'quantized quenching dips' in Rayleigh scattering spectrum of GNP. The position of these dips exactly matched with the absorption peaks of target molecules. As another innovative application of PRET, I present a highly selective and sensitive detection of metal ions by creating conjugated metal-ligand complexes on a single GNP. In addition to conferring high spatial resolution due to the small size of the metal ion probes (50 nm in diameter), this method is 100 to 1,000 folds more sensitive than organic reporter-based methods. Moreover, this technique achieves high selectivity due to the selective formation of Cu^{2+} complexes and selective resonant quenching of GNP by the conjugated complexes. Since many metal ion ligand complexes generate new absorption peak due to the *d-d* transition in the metal ligand complex when a specific metal ion is inserted into the complex, we can match with the scattering frequency of nanoplasmonic metal ligand systems and the new absorption peak.

Collaborator: Prof. Luke P. Lee, Univeristy of California at Berkeley, Berkeley, CA

Bio sketch

Yeonho Choiis Assistant Professor of Department of Biomedical Engineering at Korea University. From 2000 to 2003, he was a full time instructor of Department of Mechanical Engineering at Korea AirForce Academy (KAFA). He received the B.S. degree and the M.S. from Seoul National University (SNU) in Mechanical Engineering, and later Ph.D. in Mechanical Engineering from University of California at Berkeley. Prof. Choi's research interests lie in the application of label-free nanoplasmonic based molecular probing, intra-cellular imaging, design and nanofabrication of multi-functional plasmonic probes.

POSTERS

- Biomedical Optics
- Biomedical Robotics
- Cardiovascular Engineering
- Medical and Bioinformatics
- Medical Imaging
- Medical Nano and Microtechnology
- Neural Engineering
- Orthopedic and Rehabilitation Engineering
- Respiratory Engineering
- Systems Biology, Physiological modeling
- Tissue Engineering and Biomaterials
- U-Health, eHealth Technology
- Biomedical Engineering Education and Career

KOSOMBE

Biomedical Optics

P-001 근적외선을 이용한, 랫드 후각 망울에서의
냄새자극에 따른 혈류역학적변화의 관찰

이현주[1], 남윤준[2], 고진수[1], 서인석[1], 임창균[1], 최승진[2],
신형철[1]

[1]한림대학교 의학과 생리학교실
[2]포항공과대학, 컴퓨터공학과, 기계학습연구실

Olfaction is one of the most important senses in mammals
for communication, collecting environmental information
and mallals can distinguish thousands of odorous
compounds. Different odorants induce odor−specific
spatiotemporal patterns and regional responses in the
olfactory bulb. In this study, we examined odor−induced
hemodynamic changes of the rat olfactory bulbs with
near−infrared spectroscopy (NIRs) and found that NIRS
has a potential in this application.

P-002 생체 이미징을 위한 고속 이광자 현미경과 도플러
빛간섭 단층 촬영의 결합시스템 개발

정보수[1], 이병학[2], 양보기[3], 남효석[2], 윤상준[2], 장명호[3],
도준상[1,2,3], 김기현[2,3]

[1]포항공과대학교 시스템공학부
[2]포항공과대학교 기계공학과
[3]포항공과대학교 융합생명공학부

We present a combined high−speed two−photon
microscopy (TPM) and Doppler optical coherence
tomography (DOCT) which can provide complement
information of *in vivo* tissues: molecular and cellular
information with TPM and tissue structure and vasculature
with DOCT. This combined system can do simultaneous
imaging in principle as using separate light sources.
Currently the combined system is under development,
and preliminary data of individual imaging modalities are
presented: ex−vivo tissue imaging with TPM, intralipid
flow imaging in micro tube with DOCT.

P-003 광섬유 전극의 생체 내 삽입을 위한 기계적 특성
연구

문효원, 김신애, 이성은, 김성준
서울대학교 전기컴퓨터공학부

We have demonstrated the mechanical properties of the
optical fiber probes for the *in vivo* study. Three types
of fiber probes were fabricated: flat−end, conic−core
and pencil−shaped fiber probes. These probes were
fabricated by wet etching MEMS fabrication using HF
and buffered HF solutions. We observed insertion force
between our fabricated fibers and agarose gel, since
its properties are similar to those of brain. In addition,
surface deformations of the gel which represent cell
damages were also monitored when the probes injected.
Our approach is expected to suggest an optimal design
of optical fiber probe for the safety of the probe as well
as cells in various *in vivo* studies.

P-004 금속 나노격자 구조를 갖는 표면플라즈몬공명
바이오센서에서 플라즈몬 필드 분포와 감도
특성의 상관관계 연구

정우경, 김낙현, 변경민
경희대학교 전자정보대학 동서의료공학과

A surface plasmon resonance (SPR) biosensor with
surface relief metallic nanostructures was investigated
to evaluate the correlation between plasmon field
distribution and sensor sensitivity. The SPR configuration
was modeled as a periodic metallic nanograting with
rectangular profile deposited on a gold film. The numerical
results using rigorous coupled−wave analysis and the
finite difference time domain method demonstrated that
localized plasmonic fields affect the sensitivity
significantly and in especial, target localization on
nanograting sidewalls contributes an enhanced
sensitivity dominantly because of a strong overlap with
localized plasmonic fields.

P-005 ZnO 나노로드 구조를 갖는 고감도
표면플라즈몬공명 바이오센서 연구

김낙현, 정우경, 변경민
경희대학교 전자정보대학 동서의료공학과

We demonstrated an enhanced surface plasmon
resonance detection with ZnO nanorod arrays (NRAs)
built on a thin gold film. ZnO NRAs were fabricated by
wet chemical growth method and used for the detection
of DNA hybridization. Experimental results exhibited that
ZnO NRAs provided a notable sensitivity improvement,
which is mainly attributed to an increase in surface
reaction area. Also, the measured sensitivity enhancement
matched well with numerical analyses using an effective
medium theory.

P-006 1차원 광섬유 팬텀 선량계를 이용한 전자선의 심부선량 백분율 측정

문진수, 장경원, 유욱재, 서정기, 허지연, 박장연, 이봉수

건국대학교 의료생명대학 의학공학부, 의공학 실용기술 연구소

A fiber−optic phantom dosimeter is composed with water−equivalent phantom, optical fiber and photo−detectors. This phantom dosimeter has two advantages. First advantage is minimization of air gap. The air gap, in electron beam from LINAC, is leading to a lower central dose deposition. Square scintillators and optical fiber could reduce air−gaps between water−equivalent phantoms and fiber−optic dosimeters. Second, the phantom dosimeter can measure several depth doses at once due to its one−dimension property. In this study, we fabricated a one−dimensional fiber−optic phantom dosimeter which has 9−channel using PMMA blocks, square organic scintillators and square optical fibers. In addition, we measured the percentage depth dose of 12 MeV electron beam using a fiber−optic phantom dosimeter.

P-007 플라스틱 광섬유에서 발생되는 체렌코프 방사선을 이용한 치료용 광자선의 상대깊이선량 측정

장경원, 유욱재, 서정기, 허지연, 문진수, 박장연, 이봉수

건국대학교 의료생명대학 의학공학부, 의공학 실용기술 연구소

In this study, the intensity of Cerenkov radiation was measured according to depths of solid water phantom using a spectrometer and compared with the output of ionization chamber. To fix the irradiated length of plastic optical fiber, we employed a subtraction method by using a reference optical fiber.

P-008 진단용 X선 기기의 정류형태에 따른 리플비교

김태곤[1], 김영표[1], 천민우[2], 이호식[2], 박용필[2]

[1]동신대학교 대학원 전기전자공학과
[2]동신대학교 병원의료공학과

The medical treatment X−ray machineries used in diagnosis of the human body is possible to diagnosis inside of the human body with the method of noninvasive so that it has shared a very important role in diagnosis from the medical institution. According to rapidly development of up−to−date technology, the X−ray machineries have also been come a many transfiguration. In this paper, we produced a X−ray generator with resonant inverter to reduce switching loss and high frequency noise. In addition, to identify the differences among types of rectification, we compared ripple of X−ray with full−wave rectification and dual−voltage rectification type.

P-009 이동 촬영을 위한 X선 장치의 성능평가

김태곤[1], 김영표[1], 천민우[2], 박용필[2]

[1]동신대학교 대학원 전기전자공학과
[2]동신대학교 병원의료공학과

The X−ray device used for diagnosis is classified into fixed type that is used by installing at the location with the stable power supply and mobile type that can be taken by moving the X−ray device to the location where a patient is. Mobile X−ray system which is typically used in the mobile type of X−ray can be used very usefully beyond the space restriction. However, due to its difficulty to generate high−voltage, it is mainly applied to take hand and foot shootings which only need low output power. In this study, by designing and producing the large volume of mobile X−ray device which doesn't have the limitations on diagnostic areas of the body, the operating characteristics of device according to the loading change was identified.

P-010 저출력 광의 광치유 효과

천민우[1], 박용필[1]

[1]동신대학교 병원의료공학과

The treatment method for these lights in curing diseases or symptoms is expressed by Light therapy. Human body is structured with tissues, organs, and systems, and every part of the human body does not discontinue to maintain internal environment & homeostasis for its survival. Considerable studies were performed under respective test circumstances, we reduced the number of potential parameters, and developed LED light irradiation unit that can generate the wavelength light as that of the low level laser and applied it to wound healing.
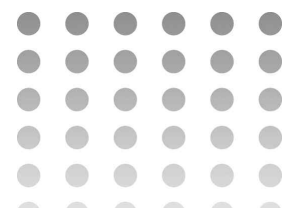
P-011 3색 LED를 이용한 의료용 라이트

천민우[1], 박용필[1]

[1]동신대학교 병원의료공학과

At the time of medical treatment and surgical operation, halogen lamp and plasma lamp were mainly used as luminous source for lighting. These two luminous sources have drawbacks that the life of lamps are not long, various problems are brought about due to excessive heat generation and its volume is very big because of cooling device. Accordingly, in this research a light was developed so that a partial shadowless shooting for the patient's affected area at the medical treatment room and surgical operation room using high luminance LED for which attention is being paid as new lighting parts for medical purpose.

P-012 전파정류방식의 고전압발생장치를 이용한 X선 기기의 선질 분석

김영표[1], 김태곤[1], 천민우[2], 박용필[2]

[1]동신대학교 대학원 전기전자공학과
[2]동신대학교 병원의료공학과

X-ray device used in diagnosis of the human body is possible to diagnosis inside of the human body with the method of noninvasive so that it has shared a very important role in diagnosis from the medical service. It is said that a full-wave rectifying X-ray equipment such as the fabricated system can shorten initiating period and be precision control because of stable output, compared with the X-ray equipment of a Half wave rectifying type used in the usual clinical medicine. Therefore in order to evaluate the capability of the fabricated equipment, I performed radiation quality experiments.

P-013 의료용 X선 기기의 조사 재현성 평가

김영표[1], 김태곤[1], 천민우[2], 이호식[2], 박용필[2]

[1]동신대학교 대학원 전기전자공학과
[2]동신대학교 병원의료공학과

High voltage occurrence system which is most important in occurrence of X-ray has mainly been used the existing type of high voltage transformer, however it has a low efficiency of X-ray occurrence since it is a big and heavy, and a high ripple ratio of the direct current high voltage come to the X-ray tube. In order to solve this problem,

the research has been advanced about the high voltage power supply system, and the inverter type of the high voltage occurrence system which occurs a high voltage by increasing the power frequency from about ten times to about hundred times with the inverter has currently used mainly. Therefore in order to evaluate the capability of the fabricated equipment, I performed reproducibility experiments.

P-014 광혈류량측정법을 이용한 무채혈 혈당측정에서의 혈당 농도 보정

김다미, 오현호, 오진건, 심봉주, 구윤희, 김무섭, 양용주, 음혜진, 조성문, D. R. Miller

LG전자기술원

Non-invasive glucose sensing has an important meaning for treating diabetes. Though many approaches were tried, no approach has attained acceptable performance yet. In human body, there are interferences originated from physiological changes. These changes disturb the robust measurement of glucose concentration. In this paper, we examine the possibility of glucose concentration correction by Photoplethysmograph (PPG) to reduce the effect of interferences. The glucose concentration is estimated by partial least squares (PLS) regression. Simulated ex-vivo and in-vivo data is used with considering the effect of Hemoglobin concentration.

Biomedical Robotics

P-015 LVDT 거리센서를 이용한 인체 진동 제어 시스템

박근철[1], 유주연[1], 전아영[1], 노정훈[1], 전계록[1]
[1]부산대학교 의학전문대학원 의공학협동과정

There are many studies of the vibration effects on musculoskeletal system with different results. Some of them reported that whole body vibration was effective on the musculoskeletal system as the bone density was increased. But, other study presented there was no specific evidence about the result. In the study, the vibration system was implemented to verify the relation between vibration and musculoskeletal. The implemented system was designed to apply accurate frequency and acceleration of vibration.

P-016 원격제어 카테터 로봇의 미세 힘제어 연구

최재순[1,2], 송승준[1,2], 박준우[1,2], 이정주[1,2], 안치범[1,2], 선경[2,3]
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[2]고려대학교 한국인공장기센터
[3]고려대학교 의과대학 흉부외과

Radiofrequency ablation performed manually may cause complications such as heart damage, prolonged exposure to radiation, and development of complications depending on the experience of the surgeon. Thus, it is necessary to develop a robotic system for the ablation catheter guide and drive in remote control manner, which is capable of accurate catheter tip location and driving control in the target area of the heart that requires RF ablation. In this paper we propose a novel catheter robot system for radiofrequency ablation surgery which enables teleoperation and micro force feedback control.

P-017 복강경 수술 시뮬레이터를 위한 햅틱인터페이스 장치 개발

송승준[1,2], 최재순[1,2], 백두진[1,2], 선경[2,3]
[1]고려대학교 BK21 의용생체공학
[2]고려대학교 한국인공장기센터
[3]고려대학교 의과대학 흉부외과

Virtual reality based surgical simulator systems offer a very elegant solution to the development of endoscopic surgical trainers. The haptic interface adopted in the VR based laparoscopic surgery training system can augment the effect and quality of the training by providing more realistic representation of the surgery situation. A haptic interface for laparoscopic surgery training has been developed by the authors. The developed system showed satisfactory performance as a laparoscopic surgery specialized haptic interface as experimental results show, and now more system refinements are underway.

### P-018 최소침습로봇수술을 위한 다자유도 수술기구의 설계

홍만복, 조영호
국립암센터 의공학연구과

In this paper, the new concept of dexterous surgical instrument for minimally invasive robot surgery is introduced. The wrist mechanism of the surgical instrument is designed using the structure of 3−DOF (degrees of freedom) parallel mechanism with three serial legs. Further, it has a 7−DOF center leg in order to actuate the grasp motion as well as the axial rotation of forceps. Thus, the proposed surgical instrument has a total of 5 degrees of freedom. Since no wires and gear trains are used for the realization, the proposed mechanism may be effective for high reliability and precision characteristics.

P-019 CT 기반 생검에 대한 바늘 힘 측정

김민태, 김수현, 신헌수, 김광기, 조영호
국립암센터 융합기술연구부 의공학연구과

Current practice of CT guided biopsy requires manual insertion of biopsy needle by a practitioner risking an exposure to radiation. To minimize radiation exposure of operators during CT−guided biopsy, we developed CT guided biopsy robot. In this study, forces applied tobiopsy needle were measured during simulated biopsy using various types of skin tissue. The robot equipped with 3 links, 3 joints and load cell was used in the experiment with 3 types of needles. Forces in the biopsy needle during insertion and extraction were dependent on the types of needle and/or tissue. The result showed that the CT guided biopsy robot is a possible solution to reduce radiation exposure during practice. Data measured in this study can be used for the selection of biopsy needles.
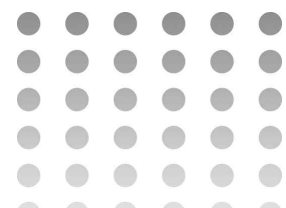
P-020 손동작 영상획득을 이용한 수술 로봇 마스터 인터페이스

장익규, 홍만복, 남경원, 조영호

국립암센터 융합기술연구부 의공학연구과

Surgery robot should have intuitiveness during control the instrument because it replaces the role of accurate operation process with operator's hand. In this paper, we verified the feasibility of 3d master interface through measuring accuracy getting from the hand motion using the infrared cameras without hardware handle. Firstly, we get the measured 3d position using 6 infrared cameras and 3 reflection markers then calculate the grasp, yaw, pitch, roll, translation. We confirmed the similarity with value of protractor and both standard error and standard deviation are extremely low. Further we can expect high intuitiveness, dexterousness of master interface.

P-021 자기공명을 이용한 동물용 케이지의 무선 파워 전송 시스템

엄경식, 이승우, 정준수, 김성준

서울대학교 공과대학 전기컴퓨터공학부

Conventional wireless power transfer system uses inductively coupled link which has short transmission distance. Using this inductive coupled link, external powering device should be close (<2cm) to the experiment animal. Because of this proximity, external device can be easily broken by experiment animal. In this paper, we use electromagnetic resonant coupling which can deliver power more efficiently for longer range then inductively coupled link. Using this electromagnetic resonant coupling we can place the external device on the bottom of the cage which is far from the animal.

P-022 3축 맥진 시스템 개발

신기영[1], 최상호[2], 전성채[1], 김경하[3], 허영[1]

[1]한국전기연구원 의료IT융합연구본부
[2]성균관대학교 바이오메카트로닉스
[3]휴비딕

Pulse-power diagnostic is important method of diagnosis in Oriental medicine. However, it is acted by oriental doctor's knowledge and experience. Therefore, it has low accuracy about 50%. Pulse-power diagnostic system was developed to get more accuracy and quantitative result. 1 axis system is sold in market but, it takes long time to measure pulse. To decrease pulse measurement time, 3-axis system is developed. This system consists of sensor, mechanical part, and PC. It reduces pulse measurement time and produces more accuracy information.

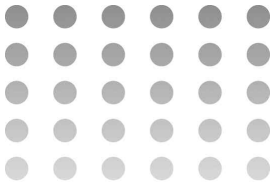## P-023 LED 조명 및 회전 가능 직장경을 내장한 경항문 내시경 미세수술용 수술 도구 개발

이상봉[1], 이준화[1], 신현수[1], 손대경[2], 김광기[1]

[1]국립암센터 융합기술연구부 의공학연구과
[2]국립암센터 대장암센터

Commercial instruments have been developed for transanal endoscopic microsurgery (TEM) and clinically applied. They are usually equipped with an irrotatable rectoscope tube which has an opening at one end. It seems more suitable for surgery on the deep part of the rectum. In this study, a new TEM device was developed. It is equipped with rotatable rectoscope tubes which have an opening in the side wall and an LED lighting system. It would be more convenient for surgery on the part of the rectum which is located not far from the anal canal. The circumferential position of the opening could be easily changed with rotatable rectoscopes. Further, an LED lighting system would make the view more clear.

P-024 Rat 원격제어가 가능한 뇌 자극 시스템 개발

김국화[1], 최영석[1], 김익현[1], 이만기[2], 정상돈[1]

[1]ETRI 신경계인터페이스연구팀
[2]경북대학교 뇌과학연구소

Recently, a research on animal-robotics (hybrid robot) has gained remarkable interest. In this study, we developed a brain stimulation system which aims to control rat remotely. The MFB (Medial Forebrain Bundle) of rat was stimulated by an implantable electrode. The system consists of three separated components: a transmitter (using ZigBee telecommunication) base station that is controlled by a PC operator, a 3 channels (right, left, stright) remote-controlled stimulator backed by rat, and a computer cam based rat motion-analysis system. We tested the control ability of rats to go through a maze. The experimental results demonstrated that electrical stimulator would play a role in directional control of rat.

Cardiovascular Engineering

P-025 음파자극을 병행한 복합 안마의 심박변위도에 미치는 영향

권용찬, 신용승, 장영식, 최동혁, 태기식
건양대학교 의공학과

To investigate the effects on stress relaxation of the hybrid massage combined audio stimulation, we analyzed the heart rate variability (HRV). 17 healthy subjects were allocated to receive a 15min section of four types ((1)resting mode, (2)audio stimulation(AS) mode, (3)light massage combined AS, (4)strong massage combined AS). We suggest that the all groups might have beneficial effects on stress relaxation. We conclude that strong massage combined audio stimulation mode improve stress-related parameters in healthy populations, especially.

P-026 관상동맥 협착의 형상인자와 심근분획 혈류 예비력(FFR)과의 상관관계에 대한 수치해석적 연구

김영태[1], 이승철[1], 심은보[1], 박승정[2]
[1]강원대학교
[2]울산대학교 의대 심장외과

Although fractional flow reserve (FFR) is one of the most important clinical indexes as well as major hemodynamic parameters for effectively predicting severity of coronary stenosis and for more effective surgical planning, there have not been a variety of studies on relation between geometric parameters of stenosis and their hemodynamic effects and FFR. In this work, computational hemodynamic simulations of the effects of stenosis geometry on Pa, Pd, and FFR were performed and discussed. Blood vessel was modeled for different three stenotic patterns of sine wave, abrupt, and linear constructions based on clinical information and pressure across stenosis lesion was simulated with respect to three major geometric parameters such as diameter of blood vessel, length of lesion, and rate of stenosis. Results showed length of lesion is most critical geometrical parameter causing severe stenosis and low FFR.

P-027 맥파 생성시스템 개발: 심장

최수지[1], 강희정[2], 신상훈[1]
[1]상지대학교 한방의료공학과
[2]대요메디㈜

Pulse diagnosis is important means of oriental treatment. It is essential to explain the mechanism of the pulse diagnosis with modern science. In this study, the pulse simulator was developed. The system was composed with three part; control part, pulse generating system, pipe system.

### P-028 심실보조장치의 양쪽 삽관을 이용한 심박조율기와 알고리즘

김유석[1], 최성욱[2]
[1]강원대학교 기계의용공학과
[2]강원대학교 기계의용공학과, 강원대학교 의료 · 바이오신소재융복합연구사업단

In this paper, we developed the pacemaker that increase the survival rate and treatment effect of cardiac disease patients using VAD. The electrode of pacemaker is positioned apex of heart where placed VAD's cannula for influx of blood. It is effective method that can transmit a electrical stimulation directly to purkinje fiber of myocardium. In particular, by using the pacemaking of patient's heart and the VAD simultaneously can synchronize or asynchronize the pulse wave of heart. we will demonstrate the performance and safety of pacemaker with VAD by animal experiments.

P-029 심전도 측정시의 불확도 모델

전은주, 최효준, 이미순, 공현중, 안원식
서울대학교병원 마취통증의학과

When the reporting the result of a measurement of a physical quantity, it is obligatory that some quantitative indication of the quality of the result be given so that those who use it can assess its reliability. The concept of uncertainty as a quantifiable attribute is relatively new in the history of measurement, although error and error analysis have long been a part of the practice of measurement science or metrology. However, recent studies are limted on personal studies since there has not been accurate evaluation of ECG measurement, and lack of standard to measure of reliability. An evaluation of uncertainty of measuring ECG must be conducted. In this paper, we suggested uncertainty model for ECG.
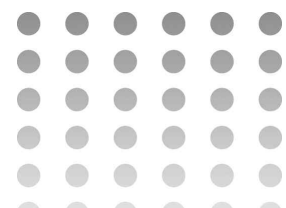
P-030 심박변위도를 이용한 체성분별 전동안마의 스트레스 이완 효과 비교

김용대[1], 최동혁[1], 이현주[2], 태기식[1]

[1]건양대학교 의공학과, [2]건양대학교 물리치료학과

To investigate the effects of an electric massage according to human body composition, we analyzed the heart rate variability (HRV) using the ECG. 40 healthy subjects were randomly allocated to receive a 15-min section of four types ((1) light knocking mode, (2) strong knocking mode, (3) light rub-down mode, (4) strong rub-down mode in 4 groups driven in skeletal muscle mass and body fat mass, respectively. We suggest that the electric massage might have beneficial effects on parasympathetic activity and stress relaxation, Also, these analysis might have usefulness of discriminate between optimal massage modes according to the to human body composition.

P-031 심실보조장치를 착용한 환자를 위한 임피던스 측정장치

김문수[1], 한민호[1], 최성욱[1,2]

[1]강원대학교 기계의용공학과
[2]의료·바이오신소재융복합연구사업단

In this study, the opening time of aortic valve will be measured by using vascular impedance from the artery to the skin above ventricular muscle. To construct impedance measuring system, we will develop the 30 kHz alternative current generator, low noise sinusoidal oscillator, precision voltage-current converter, 100 kHz Preamplifier, analog filter-amplifier, controller, control program, external monitoring program and analyzing program. we will developed the high frequency impedance measuring system, study the optimal method to place electrode, obtain the animal and clinical experimental data and analyze those by comparing other measured data.

P-032 스마트폰을 이용한 휴대형 디지털 식도청진기

신지윤, 이은미, 차은종, 이태수

충북대학교 의용생체공학과

Esophageal stethoscope is a device to measure heart sound and respiratory sound by inserting a catheter into the esophagus close to the heart. It is used by anesthesiologists during operation to get the information on the patient's heart condition. In this study, we designed Portable Digital Esophageal Stethoscope System using smart phone that can measure heart sound and display its waveform. Heart sound was heard clearly and its waveform was produced stably as the result of a test in the environment of operating room.
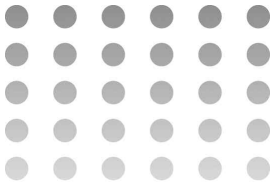
P-033 심박회복 분석을 통한 금연의 단시간 효과

조재성[1], 김도현[1], 김태경[1], 이종실[1], 김선일[1], 김인영[2], 지영준[3]

[1]한양대학교 의용생체공학과
[2]한양대학교 의과대학 의공학교실
[3]울산대학교 의용생체공학과

We suggested whether there is significant difference of the pattern and gradient of heart rate recovery before and after smoking cessation between two groups, quitting smokers and non-smokers. Heart rate and respiration were measured and saved on computer. The acquired data could provide information about short-term effect of smoking cessation. As the result of the testing for a month or two, we found that there was no significant difference of pattern and its gradient of the heart rate recovery of the non-smokers. But there was significant difference between before and after smoking cessation of the quitting smokers.

P-034 락타이드의 개환중합에 의해 나노커플링된 생체적합성 스테인레스스틸 표면의 접착안정성 개선

조성배[1,2], 이봉수[1], 최지연[1], 박귀덕[1], 정동준[2], 한동근[1]

[1]한국과학기술연구원 바이오소재센터
[2]성균관대학교 고분자공학과

Bare metal stent (BMS) is very useful in patients of coronary artery disease (CAD) but often elicits inflammation, thrombosis, and even restenosis. To prevent this problem, a drug-eluting stent (DES) has been developed and found effective in reducing restenosis. But DES on which polymer coated is a delamination of the sub-micrometer scale between polymeric layer and the metal surface, after a polymeric layer was coated onto metal surface by electrospraying. This separation inhibits interfacial adhesion between them, leading to unstable state in their adhesion. We introduced a nanocoupling concept by the grafting method such as surface-initiated ring opening polymerization (SI-ROP). L-lactide (LA) was

grafted by SI−ROP from the hydroxyl group generated by oxygen−plasma discharge on silicon wafer and stainless steel. Surface characterization was investigated by ellipsometry, atomic force microscopy (AFM), and scanning electron microscopy (SEM), etc. Peel off & scratch tests were carried out for investigating of a coating stability of polymer.

P−035 맥동성분의 특성을 이용한 새로운 혈압추정 방법

박성민, 노정훈, 전계록

부산대학교 일반대학원 의공학협동과정

In this paper, we propose a new method of blood pressure estimation using characteristic of pulse in oscillometric waveforms. This method doesn't use the oscillometric method.

We can confirm several types of pulses in oscillomteric waveform. The pulse type is change in accordance with measurement time. In this study, significant parameter for establishing a method of more accurate blood pressure measurement is power and phase each pulses. We analyzed the pulses using re−sampling method that is a cubic spline interpolation and FFT for power and phase. Further study, we will use more parameters like as PSD, LogLog plot and so on.

P−036 벡터심전도의 기하평균 차이를 이용한 심실조기수축검출

김종태[1], 정동근[2], 박경태[2], 노정훈[1], 전계록[1]

[1]부산대학교의학전문대학원 의공학교실
[2]동아대학교 의과대학 의공학교실

Analyses of vectorcardiographic pattern recognition parameters for premature ventricular contraction (PVC) are presented. The VCG loop was constructed using the ECG samples in a fixed−size window around R peak as a fiducial point. In 2D plane, the distance between reference VCG and ongoing VCG was computed and integrated. The sum of differences during time of interest of ECG was compared with the threshold to determine PVC appearance in the ongoing ECG. The optimal cutoff value of receiver operating characteristic curve (ROC) was analyzed with PVC heart beats in the MIT−BIH arrhythmia database. The accuracy of PVC detection was 82.78% in MIT−BIH ECG data.

P−037 흰쥐의 출혈성 쇼크에서 젖산농도와 관류의 상관관계

최재림[1,2], 양동인[1,2], 장경환[1,2], 남기창[2,3], 김덕원[1,2,4]

[1]연세대학교 생체공학협동과정
[2]연세대학교 의과대학 의학공학교실
[3]세브란스병원 의료기기임상시험센터
[4]연세대학교 의과대학 의과학과

Hemorrhagic shock is a common cause of death in the emergency departments. However, there are no reliable and convenient methods available for early diagnosis and evaluation of treatment effects during hemorrhagic shock. Although lactate concentration has been considered a good indicator in evaluating hemorrhagic shock, it needs blood drawing, takes some time to get result, and that is not continuous. Using rat experiment, we tried to find correlation between lactate concentration and perfusion using laser Doppler.

P−038 이중 약물방출 스텐트용 약물 지속 및 조절 방출거동 연구

김동민[1,2], 이봉수[1], 강종희[1], 박귀덕[1], 손태일[2], 한동근[1]

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The thrombus formation and the proliferation of the smooth muscle cells induced by injury after angioplasty of metal stents have generated in−stent restenosis inside them. To solve these problems, the development of self−degradable scaffolds carrying drugs blocking/inhibiting the proliferation of the cells. Biodegradable polymers containing alpha lipoic acid (ALA), well known as blocking neointimal hyperplasia, and ReoPro (Abciximab), a potent inhibitor that blocks the final pathway of platelet aggregation, were served as a drug carrier. The hierarchical structure composed of biodegradable polymers was formed by coated onto the stent surface by electrospray and ultrasonic nanocoating for constructing the sustained and successive release behavior of drugs.

P−039 광용적맥파를 이용한 혈관경화도 평가 프로그램의 설계 및 구현

장대근[1], 우말 파르크[2], 박장호[2], 박승훈[2], 한민수[1]

[1]한국과학기술원 전기및전자공학과
[2]경희대학교 동서의료공학과
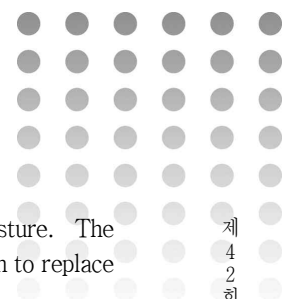
A considerable number of studies have proved that arterial stiffness is an independent prognostic factor of cardiovascular diseases (CVDs). Although various measurement techniques such as pulse wave velocity (PWV) have been proposed and applied in many clinical situations, they are cost expensive and have poor usability. In order to cope with these problems, we propose the photoplethysmograph-based arterial stiffness estimation program. Since the photoplethysmograph contains several characteristic points that are highly correlated with arterial properties, we can estimate arterial stiffness using the pulse parameters extracted from the photoplethysmograph. By using our developed program, cardiovascular diseases can be managed in home healthcare environments with low cost.

P-040 음악청취를 이용한 혈압변화의 안정성 평가

신영숙

조선대학교 정보통신공학과

Emotional reactions to music have revealed as a real since music produces specific patterns of change in heart rate. Blood pressure varies continuously in a 24-hour period. This study investigates the potential of music listening as a reliable channel for stability of blood pressure variance based on oscillometric blood pressure measurements. The study group consisted of total 15 individuals (males and females) and was measured in the morning during two months. The experimental results showed the stability of blood pressure variance in 4.43 (average of standard deviation) for non-music listening, 2.54 (average of standard deviation) for music listening.

P-041 심박동수 변이를 이용한 12 채널 용량성 전극 배열의 성능평가

이홍지[1], 이승민[1], 이강무[1], 박광석[2]

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[2]서울대학교 의과대학

Many researchers have currently developed devices that are to measure biosignals non-invasively, especially-electrocardiogram (ECG). Following this trend, we made a 12-channel-capacitive-coupled-electrodes array to measure ECG. In this paper, performance evaluation of the array was done using heart rate variability (HRV). A male subject participated in the experiment and measured ECG on a bed with four sleep posture; a supine, prone, right lateral, and left lateral posture. The performance of the array is quite good enough to replace traditional ECG measurement systems.

P-042 심장 판막 협착증 심음 신호에서의 심음 에너지 변화를 이용한 제 1심음과 제 2심음 검출법

이기현[1], 김필운[1], 이윤정[1], 김명남[2], 조진호[3]

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[2]경북대학교 의학전문대학원 의공학교실
[3]경북대학교 대학원 전기 전자 컴퓨터 공학부

A heart sound which provides important information for heart diagnosis is consists of 4 components. Most of algorithms for detecting primary sound components have poor performance at a heart sound which has large murmurs. In this paper, it is proposed that the first and second heart sound detection algorithm using energy magnitude and variance of heart sound. According to simulation results at cardiac stenosis heart sound signal, the proposed algorithm has better performance than former study.

P-043 CPR 흉부 압박 깊이 측정 정확도 향상 장치

송영탁[1], 우지환[2], 오재훈[3], 지영준[2]

[1]울산대학교 의용생체공학협동과정
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[3]언양병원 응급의학과

During the cardiopulmonary resuscitation (CPR), the correct chest compression depth and period are very important to increase the resuscitation possibility. For the feedback of chest compression depth, the depth monitoring device based on the accelerometer is developed and widely used. But this method tends to overestimate the compression depth on the bed. To overcome this limitation, the chest compression depth estimation method using two accelerometers is suggested. The experimental results show that the single accelerometer estimates as 61.4mm for the actual compression depth of 43.6mm on the mattress. The depth estimation with the dual accelerometer was 44.6mm which is close to the actual depth. With the automatic zeroing in every single compression, the integration error for the depth can be reduced. The dual accelerometer method is effective to increase the accuracy of the chest compression depth estimation.

Medical and Bioinformatics

P-044 방광염에 의한 척수 신경 활동성의 변화 분석

임창균[1], 유경진[2], 이현주[1], 고진수[1], 서인석[1], 신현출[2], 신형철[1]

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Spinal cord neural activity was recorded from 30 min prior to 60 min post acetic acid (AA) infusion into the bladder of anesthetized rats. 0.1% AA gradually increased the responses to saline infusion. 5% AA exhibited strong decrease of saline−induced response during infusion and thereafter gradually weaker suppressions. 0.1% AA showed inhibition of % net response from infusion to 60min. 5% AA exerted much stronger suppression of % net response. These results suggested that acute inflammation−induced by AA infusion to the bladder facilitated spontaneous responses of the spinal cord single neurons, but dose−dependently inhibited evoked responses activated by bladder extensions.

P-045 시설 유지를 위한 항온·항습 감시장치 개발

김만기[1], 박필준[1], 신택수[1], 김종순[1], 신동익[1], 주세경[1,2], 허수진[1,2]

[1]서울아산병원 의공학과
[2]울산대학교 의과대학 의공학교실

In a hospital, there are several rooms requiring constant temperature and humidity control, such as server computer rooms, drug storage, document storage, and other rooms for special research purposes. Monitoring and recording temperature and humidity of these rooms are important in alarming conditional change and checking temperature or humidity maintenance system. In this paper, we developed a monitoring system of temperature and humidity. The developed system monitors humidity and temperature constantly and record the data in every 10 minutes. In addition, the system sends an alarming text message to an administrator when they sense abnormality.

P-046 내시경의 고장률 감소를 위한 프로세스 개선활동

김진만[1], 최기철[1], 김종순[1], 신동익[1], 주세경[1,2], 허수진[1,2]

[1]서울아산병원 의공학과
[2]울산대학교 의과대학 의공학교실

The area requiring endoscopic diagnosis and surgery is getting wider and thus the operating frequency and time of endoscopic equipment are increasing rapidly. Therefore, to help the system maintain a good condition, an efficient way of management for the scope is highly required. In Health Promotion Center at Asan Medical Center, there are 46 endoscopes in total and the cost spent for repairing has been raised for several years according to the repair history. Prevention of such failure is crucial to lessen time and cost of repairing. In this paper, we report our activities for reducing failure rate of the endoscopes. To build an effective scope management process, our investigation was performed in three parts, scope management, user operation, and education. For those three parts, several methods for improvement were proposed and applied. As a result, we could reduce the number of repair and the cost about 62% and 44%, respectively.

P-047 청각자극의 방향에 따른 P300의 분석

류수아, 전상호, 김진수, 박규칠, 장윤석
부경대학교

We detect P300 components in the ERP (event−related potential) generated from human brain when auditory stimuli are presented. The P300 components of the ERP has been studied for understanding of human brain activities. In this study, we elicit the P300 component due to direction of the auditory stimulus. In oddball paradim for eliciting P300, we need standard stimuli and target stimuli. The auditory target stimuli are presented to right or left side of participants. We analyze brain waves to recognize the target stimuli. In our study, we use ICA (Independent Component Analysis) to analyze the brain waves and show the results analyzed due to the direction of the auditory stimuli.

P-048 Sedation 환아의 MR 검사시 산소포화도(SpO_2) 측정 개선을 통한 검사시간 감소 활동

조성범[1], 진경원[1], 김종순[1], 신동익[1], 주세경[1,2], 허수진[1,2]

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For pediatric patients, MR scanning takes 30 to 60 minutes due to the movement during the scan. To reduce time and increase the quality of image, scanning of infants
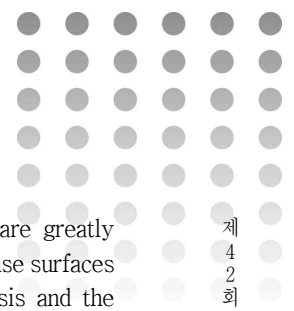
and children is generally done after sedation. For constant monitoring of oxygen saturation (SpO_2) of such patients, nonmagnetic pulseoximeters are used. When the signal of the pulseoximeter is intermittent or not detected, additional delay for safety check and inspection of the patient is necessary. In this paper, we report several methods for reducing MR scanning time of such sedated pediatric patients by improving measurement methods of oxygen saturation. We could reduce the scanning time about xx% as the result of such improvements.

P-049 초음파 수술기의 효율적인 관리와 비용 절감 활동

오주현[1], 사은식[1], 김종순[1], 신동익[1], 주세경[1,2], 허수진[1,2]

[1]서울아산병원 의공학과
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Electrosurgical unit is a common surgical tool used in incision of patient tissue or hemostasis in operating room. Recently, ultrasonic surgical aspiration system is emerging and takes place of previous one using radio frequency, especially in transplant and cranial surgery since there is less tissue damage during incision. However, the ultrasonic surgical aspiration system is more expensive than electrosurgical units, which implies higher maintenance cost. In this paper, we present cost-effective ways of management of ultrasonic surgical aspirators in terms of reducing breakdown time, inspection activities and cost reduction.

P-050 의료기기 전원공급장치 소자의 돌입전류 제어기술

김옥균, 강보안, 황규석
남부대학교 보건경영대학원 의공학과

With an increasing demand of small-sized medical devices for autodiagnosis, super capacitors exhibiting superior charge/recharge ability could be applied for power supply instead of commercial rechargeable batteries. In many cases for the practical applications, however, circuit damage due to abrupt inrush current will be occurred. In this work, avoidance plan on the circuit damage will be studied in order to apply super capacitor for the power supply of medical devices.
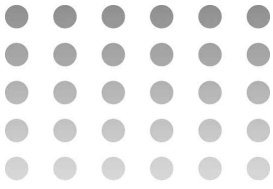
P-051 모터 펌프를 이용하는 의료기기의 진동 저감을 위한 선행 연구

조영근, 김한성
연세대학교 일반대학원 의공학과

Medical devices with using a motor pump are greatly affected by the vibration. In this study, response surfaces were created by using the 3D virtual analysis and the design of experiment method with stiffness and damping coefficient of spring. It could confirm that changes in stiffness and damping coefficient saffected contours of the response surface in a particular area. Displacement of the center of the motor pump was reduced at $K \approx 2000$ N/M, $C \approx 12.5$ N-sec/M. In contrast, the frequency was increased at $K \approx 2000$ N/M, $C \approx 15$ N-sec/M.

P-052 Beam-Projector와 Video Camera를 이용한 경혈 위치 정보 시스템

이승환, 고현철, 윤영로
연세대학교 대학원 의공학과

In this paper, we proposed to project accuracy acupuncture location to human body at short time. For this object, we made a projection system and a computer program of controlling projection system. This program can adjust projected acupuncture points figure, established by WHO, to tester's body outline. Consequently, a people, nothing to know about acupuncture points, can find more accuracy acupuncture location.

P-053 자동 이득 조절에서 해제 시간 최적 설정에 대한 추가 연구

황세미[1], 전유용[1], 박헌진[2], 송영록[1,3], 이상민[1,3]

[1]인하대학교 전자공학과
[2]인하대학교 통계학과
[3]인하대학교 정보전자 공동연구소

Automatic gain controller (AGC) is used in hearing aids to compensate for the hearing level as to narrowed dynamic range. This study especially focus on release time in automatic gain controller (AGC), originally used in fitting of hearing aids and estimate the speech recognition score based on individual. This study extend former study with more various speech list composed of 6 conditions, in various release time such as 12, 128, 512, 2094ms, and now focus on the best speech score in 24conditions. Thirteen normal hearing and thirteen hearing impaired listeners are participated. In conclusion, totally about 70% had the same best recognition score in specific release time. If the hearing aids are set by the optimum release time, it is more profitable for communication discrimination.

P-054 자동화된 후각인지 테스트 시스템 개발

김제남[1], 유문호[2], 김남균[3], 김성현[4]

[1]전북대학교 헬스케어공학과
[2]전북대학교 바이오메디컬공학부
[3](주)칼라세븐, [4]헬스케어 기술개발사업단

This study presents a olfactory cognition test system, which is suitable for mass screening test. The RFID identification success rate, which is important for the automation, was tested for the system performance. The functional feasibility of the proposed system was confirmed with eighteen healthy subjects in their twenties. The RFID identification success rate was above 99.9% for 0−9mm, and all the 10000 trials succeeded at the optimum distance 6mm. All the subjects showed normal results for n−Butanol threshold test and olfactory identification with the proposed system. Even though further clinical test is necessary, the proposed system is anticipated to be useful for rapid, accurate, low−cost olfactory cognition in mass screening.

P-055 심전도 비트 분류 성능 향상을 위한 특징점 선택 방법

박관수[1], 김도형[1], 김인영[2], 박훈기[3]

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The QRS complex of the ECG is the most important waveform to interpret the heart conditions. There are many ways to extract QRS complex, and they are produced many features. Besides, when there are many features, the conventional classification classifier may have skewed results. In this study, We extract 63 morphology features from QRS complex, and We apply the Relief−F to select feature for optimize classifier. We evaluate the classification performance of feature selection using support vector machine (SVM). The best classifier with the 22 selected features gave 0.9954 of the area under the curve by receiver operation characteristics analysis.

P-056 에러그리드를 사용한 대체부위 혈당검사의 유용성 검증

박경순[1], 박미숙[2], 최성수[2], 이인광[2], 김경아[2], 차은종[2]

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Blood glucose information is important for self regulation, but the frequency of self test remains to be only 17% (9 tests/month) in Korea, mainly due to pain during blood sampling. The present study tried to validate the clinical efficacy of the forearm as an alternative sampling site with minimized pain. Capillary blood was sampled both on the index finger (G_F) and the forearm (G_A), followed by glucose measurements in 531 subjects, who visited the C University Hospital, then venous blood (G_V) was sampled for glucose test. Error grid analyses of G_F−G_V, G_A−G_V, and G_A−G_F revealed that the number of data points in regions A and B took 100%, 99.8%, and 97.9%, respectively. These results demonstrate the forearm blood glucose test is not only accurate but also clinically valid.

P-057 베이지안 빌리프 네트워크를 이용한 유방암의 조기 진단에 관한 기초 연구

임민혁[1], 김성완[1], 박성근[1], 박보영[1], 박수경[1], 이치원[2], 김명선[2], 배종희[2], 김유단[2]

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A Bayesian Belief Network is a powerful framework in dealing with complexity and uncertainty. There are many risk factors involved in disease occurrence that have complex relationships between variables. In this study, a Bayesian Belief Network for early diagnosis of breast cancer is developed. This model provides several benefits. The model could predict a probability of breast cancer occurrence for an individual with specific risk factors and the model could also show the characteristics of population that could be used in epidemiological study. Furthermore, the model will support physicians' final decision making process & treatment. The outcomes of this research could be applicable to various areas of medicine.

Medical Imaging

P-058 고조파 영상기법에서의 적응 직교복조를 위한 주파수 추정 방법

여선미[1], 이다영[1], 윤창한[1], 장진호[2], 송태경[1]

[1]서강대학교 전자공학과
[2]서강미래기술연구원

In medical ultrasound imaging, the center frequency of ultrasound receive signal is changed as the imaging depth increases. Typically, the center frequency of the harmonic component in ultrasound receive signals experiences higher decrease. In the proposed adaptive quadrature demodulation method, the harmonic center frequency is adaptively determined and applied to increase the signal−to−noise ratio (SNR). The performance of the three different methods, i.e., short−time fast Fourier transform (ST−FFT), autocorrelation, autoregression, were evaluated with the B/A model simulation by measuring the frequency−dependent attenuation coefficients.

P-059 영상의 경사도를 이용한 초음파 속도 추정

양하나[1], 서해진[1], 유양모[1], 장진호[2], 송태경[1,2]

[1]서강대학교 전자공학과
[2]서강 미래 기술 연구원

Ultrasound imaging systems typically use a constant value (i.e., 1540 m/s) as the sound speed in the beamforming process. However, the distortion would be occurred in a beamforming process with constant sound speed because the sound speed in an imaging region is always varying as patients or affected area. In this paper, we propose a new sound speed estimation method using image gradient to minimize the distortion. In the proposed method, the RF channel data of a frame is acquired and 20 Images are formed with 1400 to 1600 m/s sound speed. After that the average gradients of the images are calculated and the sound speed of the image which has the maximum gradient energy is considered as the optimum sound speed. The proposed method is evaluated by phantom experiment and the results indicate that the method could improve ultrasound images.

P-060 초음파 B−mode 영상의 automatic image optimization 기술 개발

김초예[1], 진성민[1], 송재희[2], 유양모[1,2], 송태경[1]

[1]서강대학교 공과대학 전자공학과
[2]서강대학교 대학원 바이오융합기술 협동과정

In this paper, a new automatic image optimization for ultrasound B−mode imaging is presented. In the proposed method, three optimization parameters, i.e., time−gain compensation (TGC), dynamic range (DR) and gain, are adaptively determined by analyzing the input ultrasound B−modeimage. The performance of the proposed automatic image optimization method was evaluated with *in vivo* data acquired from a commercial ultrasound machine.

P-061 초음파 영상에서의 Spatial smoothing Coherence Factor 적응 수신 빔 집속 기법

권지원, 윤성수, 윤종욱, 조한진, 강지운, 유양모, 송태경

서강대학교 전자공학과

In this paper, a new spatial−smoothing coherence factor (SSCF) method for effective ultrasound beamforming is proposed. Previously, a coherence factor (CF) method was proposed to improving receive focusing in ultrasound imaging. However, this method introduces a significant amount of artifacts due to channel interferences. In the proposed SSCF method, these artifacts were removed by applying spatial smoothing of CF values from multiple sub−arrays. With *in vivo* data acquired from the thyroid of a volunteer, the proposed SSCF method improved the contrast−to−noise ratio (CNR) over the conventional delay−and−sum beamforming method while reducing the artifacts compared to the CF method.

P-062 제조 조건에 따른 나노 입자의 MR 변수 측정

장무영[1], 한용희[1], 문치웅[1,2]

[1]인제대학교 의용공학과
[2]인제대학교 UHRC

Early diagnosis is important item for a treatment of all of diseases and is developed consistently. Theragnosis that is new concept is mixed word using "Therapy" and "Diagnosis" and is way to perform both at once. Theragnosis field is expanded centering on with nanomedical sciences. In this study, MR variables measurement of nanoparticles for realizing the Theragnosisas combining hyperthermia and MRI monitoring was performed. Nanoparticles are 6 types. MR image was acquired about each type. T1 and T2 time were calculated by Levenberg−Marquardt method for image intensity of nanoparticles.

P-063 Conductivity Imaging of Canine Body Using 3T Magnetic Resonance Electrical Impedance Tomography (MREIT) System

Z.J. Meng, Y.Q. Han, W.C. Jeong, A.S. Minhas, Y.T. Kim, H.J. Kim, C.Y. Lim, H.M. Park, and E.J. Woo

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[2]BK21 Basic & Diagnostic Veterinary Specialist Program for Animal Diseases and Department of Veterinary Internal Medicine, Konkuk University, Seoul, Korea

Magnetic resonance electrical impedance tomography (MREIT) has been recently proposed for cross−sectional conductivity image reconstructions with a spatial resolution of a few millimeters. In this study, we validate its feasibility by performing conductivity imaging experiments of post−mortem canine bodies. We injected imaging current in a form of short pulses into the imaging area, of which timing was synchronized with a chosen pulse sequence. Obtaining images of induced magnetic flux density distributions inside the dog, we reconstructed conductivity images using the single−step harmonic B_z algorithm based on the relation between the conductivity and the magnetic flux density. Reconstructed conductivity images of the heart, kidney, prostate, and other organs exhibit unique contrast information which is hardly observed in other imaging modalities.

P-064 Human Body Segmentation using ID Boundary for Posture Analysis

Fozia Rajabdad, Seung Hun Park

Department of Biomedical Engineering Kyung Hee University South Korea

The paper investigates the application of digital image processing techniques to detect the human postural disorder. Goal of this work is human figure detection from a static image and localizes human body landmarks. Data used for this work is a collection images from male and female with different age, body height and body shape. The approach we used is image segmentation which guides our detectors of human body parts. Output of which are assembled into marked human figure for posture analysis.

P-065 통계적 영상정보와 영역 기반의 Level Set 방법을 이용한 유방밀도 자동 측정 방법

김영우[1], 이명은[2], 김종효[1,3]
[1]서울대학교 의과대학 방사선응용생명과학 협동과정
[2]전남대학교 컴퓨터공학부
[3]서울대학교 의과대학 영상의학교실

This paper presents a new method for automated breast density estimation based on statistics and boundary information of a breast region in a mammogram. The initially estimated contour was, then, adjusted by using modified level set method. Breast density has found to be a strong indicator for breast cancer risk, but measures of breast density still rely merely on a qualitative judgment of the radiologist. Therefore, objective and quantitative measurement is necessary to derive the relation between breast density and cancer risk. In this paper, we first detected the breast region by the unique histogram shape of the mammogram, perform contrast stretching to maximize the difference between fat and dense region, and apply median filtering so as to eliminate the noise. Then, two features were extracted: statistical and boundary information. Statistical information is the standard deviation of fat and dense region in breast area. Boundary information is the edge magnitude of a set of pixels with the same intensity. These features were calculated for all existing pixel level. By combining these two features, the initial threshold was determined which best divided the fat and dense region. The initial segmented contour which sometimes underestimate the glandular region was adjusted the modified level set method with additional region term.

P-066 Film phantom을 이용한 MREIT 도전율 대조도 영상

김영태, 정우철, 민하스 아뚤 씽, 김형중, 우응제
경희대학교 전자정보대학 생체의공학과

Magnetic resonance electrical impedance tomography (MREIT) aims to produce cross−sectional images of a conductivity distribution inside the human body with a spatial resolution of a few millimeters. Injected currents into an imaging object at different directions induce internal distributions of magnetic flux densities, which are measured by using an MRI scanner. We can reconstruct a conductivity image based on this relation with the induced magnetic flux density. In this work, we explain the apparent conductivity contract mechanism in MREIT using a cylindrical saline phantom and a cylindrical anomaly without and with four holes equally placed around its side.
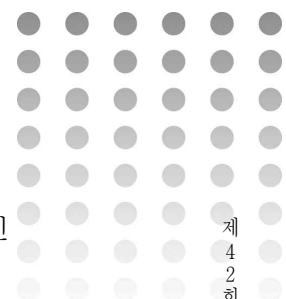
P-067 천식 환자에서 약물 반응을 통한 기능적 제논 환기 CT의 영상 분석

박상준[1], 김종효[1,2], 구진모[2], 이창현[2]
[1]서울대학교 의과대학 방사선응용생명과학
[2]서울대학교병원 영상의학과

Asthma is a chronic inflammatory disease and hypersensitivity and responsiveness to various stimuli. The clinical diagnosis of asthma is commonly made by documenting physiologic airway obstruction that improves following administration of bronchodilator and reacts to an inhaled substance, methacholine. Recent clinical experiences of xenon-enhanced CT with dual source CT suggested a possibility to evaluating regional morphological abnormality and functional conditions in chronic obstructive pulmonary diseases and asthma without additional radiation. Therefore, the purpose of this study was to investigate the dynamic changes of xenon parameters and airway values in response to drugs on xenon-enhanced chest CTs in patients with asthma.

P-068 X-ray Image Denoising: Comparison between ADF and TV-minimization Filtering

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X-ray image denoising could reduce x-ray dose in human imaging. There are many denoising filters that can denoise the x-ray images while preserving edges. In this paper, we compare anisotropic diffusion filtering (ADF) and total variation (TV)-minimization filtering in terms of signal-to-noise improvement and edge preservation.

P-069 사이노그램 상에서의 CT(Computed Tomography) 움직임 보정

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CT (Computed Tomography) image has the disadvantage of severe distortions artifacts by the motion. When the breathing and movement of organs inside of the body happened, the image quality will degrade. In this paper, non-rigid and various movement artifact images are applied motion correction method in sinogram. The result, the motion artifact image is compensated by this method.

P-070 FPGA 구현을 위한 G-APD 베이스라인 보정기법 개발

권순일[1], Daniel Stricker-Shaver[2], Armin Kolb[2], Bernd J. Pichler[2], 이재성[1]
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Geiger-mode avalanche photodiode (G-APD) is promising device for the development of simultaneous PET/MRI. G-APD has an intrinsic fluctuation of its baseline. This effect makes energy information loss and flood image degradation. In this study, new baseline correction method was introduced. This method was based on two linear fitting and filter. This method was suitable for real-time FPGA implementation. The real G-APD signals were successfully corrected using this method. Energy resolution and flood image were improved with this method.

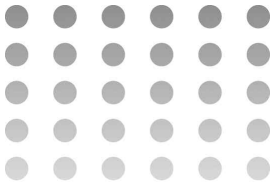## P-071 시공간 중간값 필터링을 이용한 초음파영상에서의 움직임 측정 정확도 향상

김지한, 황도식
연세대학교 전기전자공학부

Medical ultrasound imaging is an ultrasound-based diagnostic imaging technique used to visualize the inside structure of human body. Different from other modalities, it provides real-time images, so many researches have been conducted for using this "real-time" property such as compounding image, elastography, etc. For such applications, it is needed to estimate motion information accurately. In this work, we used spatio-temporal median filter for improving motion information estimated from ultrasound image sequence, and assessed its performance and accuracy by constructing compound image.

P-072 간 치료를 목적으로 하는 수술용 네비게이션 시스템 개발

신기영, 이희은
성균관대학교 바이오메카트로닉스학과

3 dimension coordination and tracking can be calculated with conducting Surgical Navigation. According to surgical navigation, the wound caused from cingulotomy (liver operation) will be minimized and perfectly operation

can be done without directly sight by accurate 3D coordinate. Currently, cause of excessive drinking and smoking, liver cancer is the main reason on depth in part of cancers. However, there is no using the surgical navigation system to treat liver diseases. According to development of surgical navigation, accurate operation can be realized with 3D graphic technology, with get off old methods only using CT or MRI. In addition, surgical navigation can be applied on surgical robot.

P-073 DSSD와 CZT로 구성된 컴프턴 카메라의 점퍼짐함수를 이용한 해상도 복원

김수미[1,2], 이재성[1,2], 서희[3], 박진형[3], 김찬형[3], 이춘식[4], 이명철[1], 이동수[1], 이수진[5]

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[4]중앙대학교 물리학과
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We developed new three−directional Compton camera (3DIR−CC) consisting of DSSD (double−sided silicon strip detectors) and 4 CZTs (cadmium zinc telluride) which provide good energy resolution and small segment size. In this study, we are aim to recover the limited spatial resolution which are suffered from the measurement uncertainties of interaction position pairs and scattering angles using distance−dependent point spread function (DD−PSF). The DD−PSF was derived from Monte−Carlo simulation data for 7 point sources located at different distance from 3DIR−CC and was incorporated into system model for statistical image reconstruction algorithm to recover resolution during image reconstruction.

P-074 경도인지 장애와 알츠하이머 환자에 대한 디폴트 모드 네트워크의 양적, 질적인 분석

차정호[1], 윤의철[1], 서상원[2], 나덕렬[2], 김선일[1], 이종민[1]

[1]한양대학교 의용생체공학과
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Functional magnetic resonance imaging (fMRI), which measures BOLD signal, has been suggested as a useful tool in the study of MCI and AD. In particular, low−frequency fluctuations during the resting−state have been widely used to analyze dysfunctional connectivity in AD and MCI since reported functional networks included in simultaneously fluctuating during resting−state. [1] The purpose of our study was to examine functional connectivity, especially DMN, qualitative and quantitative changes in AD, MCI patients.

P-075 디지털 래디오그라피를 위한 평판형 플렉시블 디텍터의 유용성 검증

조옥라, 윤승만, 한종철, 임창휘, 김호경
부산대학교 기계공학부

We have investigated the feasibility of flexible detector by comparing theoretical detective quantum efficiency (DQE) with that of the conventional amorphous silicon− based detector. We chose copper phthalocyanine− fullerene (CuPc−C_{60}) organic material for the flexible flat−panel detector. The DQE performance of proposed organic material was estimated by linear−systems transfer theory. As CuPc−C_{60} has lower quantum efficiency and higher additive noise, DQE of the flexible detector is lower than that of conventional one. From the result, the flexible detector shows comparable DQE performance with the conventional detector by optimizing quantum efficiency, fill factor and additive noise.

P-076 GAPD 기반 시제품 소동물용 PET 스캐너의 특성 평가

고근배[1,2], 윤현석[1,2], 권순일[1,3], 이찬미[1,2], 이또우 미끼꼬[1,4], 이동수[1,3,4], 홍성종[5], 이재성[1−4]

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Geiger−mode APD (GAPD) is an outstanding photo− sensor for PET/MR application because it has relatively high gain and insensitivity of magnetic field. We developed prototype small animal PET scanner consisted of 8−detector blocks using MPPC, GAPD from Hamamatsu Corp. The PET scanner has 90mm diameter and 36mm axial FOV. Each of detector blocks consists of 20x18 LGSO crystal array with a dimension of 1.5x1.5x7 mm^3, 2x2 MPPC with 4x4 sensitive cells (S11064−050P), and soft PVC. We obtained average 13.9% energy resolution and 1.45mm intrinsic spatial resolution. ^{18}F capillary tube image was successfully acquired.
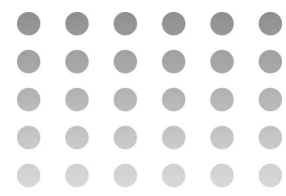
P-077 MR 호환 G-APD 기반 양전자단층촬영시스템 개발 및 PET/MR 동시영상

윤현석[1,2], 고근배[1,2], 권순일[1,3], 이찬미[1,2], 이또우 미끼꼬[1,4], 이동수[1,3,4], 홍성종[5], 이재성[1-4]

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[3]방사선응용생명과학 협동과정
[4]방사선의학 연구소
[5]을지대학교 방사선학과

In molecular imaging, there are needs for hybrid imaging system that combines different modalities, such as PET/MR. However; there are many challenges to use conventional PET scanner in a MRI. One of them is the use of photomultiplier tubes which are very sensitive to the magnetic field. Therefore we have developed geiger-mode avalanche photo-diode (G-APD) based PET scanner, which is compatible with MRI. PET scanner is composed of 8 detector modules with ring diameter of 9.0cm. Simultaneous PET/MR images were successfully acquired with this scanner in a 3T MRI.

P-078 효과적인 초음파 조영제의 제작 방법에 대한 연구

박진감, 박동희, 고유미, 유흥일, Saad M. Khan, 문상협, 서종범

연세대학교 보건과학대학 의공학과

Albumin shell ultrasound contrast agent (UCA) and lipid shell UCA were fabricated in a cost effective manner using perfluoropentane. Responses to an ultrasound field were measured using a commercially ultrasound imaging system and single element transducers. UCAs were quantitatively compared using a commercially available UCA, Definity®. According to an analysis of the ultrasound imaging, approximately 40dB increments of brightness can be observed when 0.001% of the fabricated UCAs were added into water. This increment is similar to the results from the Definity®. Additionally, all three of the UCAs that were tested share similar frequency characteristics.

P-079 ^{68}Ga-Bapen PET 영상을 통한 랫에서의 동역학 모델 파라미터 추정

김지후[1,2], 김수진[6], 이재성[1,2,4], 양보연[1,2], 정재민[1,2,7], 이동수[1,2,3,5]

[1]서울대학교 의과대학 핵의학과
[2]방사선응용생명과학협동과정
[3]인문대학 인지과학협동과정
[4]분당 서울대병원 핵의학과

Myocardial blood flow radio tracer ^{68}Ga-Bapen by Ga generator synthesisis is aninexpensive and easy synthesis PET tracer. We obtained 120min dynamic PET scan in the rat. We could observed the image contrast of myocardial to other organs. 60 min PET scan was suitable in contrast with liver, lung and blood pool. Also by using the dynamic data, we estimated kinetic model parameter by model fitting method. $K1/k2$ was estimated as 0.65 and volume of blood fraction was 0.57 in the myocardium.

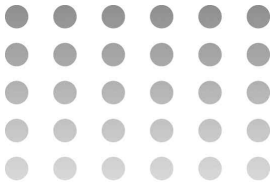## P-080 수근부의 3차원 영상을 통한 Capitate의 움직임 분석

박찬수[1], 김광기[1], 김유신[1], 백구현[2], 이상림[3], 유도현[1]

[1]국립암센터 융합기술연구부 의공학연구과
[2]서울대학교 의과대학 정형외과 교실
[3]인제대 부속 상계 백병원

The carpal bone consists of complex anatomy and remains incompletely defined. Several biomechanical studies have measured the wrist motion of a cadaver using sensors implanted in the wrist joint. The primary purpose of this study was to understand the capitate motion using three dimensional models reconstructed from computed tomography (CT) images. CT images of a wrist joint were captured at maximum radial extension, maximum ulnar flexion, and three intermediate positions during dart throwing motion. Four non-traumatic cases were acquired and analyzed. We verified the primary role of a capitate in the wrist kinematics during Dart throwing motion.

P-081 대면적 평판형 디텍터의 잡음 요소 분석

한종철, 윤승만, 임창휘, 조옥라, 김호경

부산대학교 기계공학부

We investigated the noise component in two different compositional type x-ray detectors such as indirect conversion detector and direct conversion detector and compared each noise component by noise power spectrum (NPS). The total noise were divided with three noise component such as stochastic noise, non-stochastic but varying noise, and fixed pattern noise as the reference and expressed by a noise power spectrum. There were no significant effect in total noise by fixed pattern noise and non-stochastic but varying noise in investigated detectors. This study could be

helpful for better design of x−ray detectors, providing how the different type detectors are affected by each noise component.

P-082 조직 분할 영상과 그룹 기반 템플릿을 이용한 해마 영역 자동 분할 연구

이동균[1], 장건호[2], 이학영[2], 윤의철[1], 이종민[1], 김선일[1]

[1]한양대학교 의용생체공학과
[2]경희대학교 동서신의학병원

In this study, We describe hippocampus segmentation using group specific template that maked old subject data. The method use MNI anatomical pipeline to make group specific template and performed to segmentation and registration. We compared a difference of template that ICBM template and group specific template. The Relative Error compared with ICBM template was less than 14%. The Similarity index compared with ICBM template was over than 7%.

P-083 영구자석 자기공명영상장치 용 3채널 몸통 코일 개발

박대성[1], 김형식[1], 김소현[2], 이춘형[2], 이정한[1]

[1]건국대학교 의학공학부, 의공학실용기술연구소
[2](주)에이아이랩

A new three−channel rf coil for body imaging with vertical field permanent magnet MRI is proposed. The new body coil is comprised of two modified orthogonal elliptic coils and a Maxwell pair coil. Magnetic coupling among the three coil channels are cancelled by it geometrical shapes and current flow direction. Electrical coupling was minimized by modifying its tuning circuits. A realized 3−channel body coil provides channel isolations better than −21dB and uniform sensitivity over the imaging area.

P-084 디지털 방사선 영상 센서의 효율 향상을 위한 광도전체 구조에 관한 연구

박혜진[1], 박근우[1], 전승표[1], 이상훈[1], 정숙희[2], 남상희[3]

[1]인제대학교 일반대학원 의료영상과학학과
[2](주)인피니트헬스케어
[3]인제대학교 의료영상연구소

The aim of this study is to embody more specific image

and to reduce a radiation dose for a patient by improving detecting efficiency of a digital radiation detector which shows a low dark current, also the efficient detector combines with digital imaging processing technique and Picture Archiving and Communications System (PACS) to achieve higher quality medical image. In this study, a lamination structure for PN junction was fabricated to broaden Band Gap and adjust Fermi level for reduction of dark current, and BiI3 and PbO were deposited on HgI_2 and PbI_2 which have high x−ray sensitivity. Also polycrystalline film was fabrication by Particle in Binder (PIB) method which has high efficiency in large area fabrication progress but not existing vacuum deposition method, and the electrical properties, dark current and x−ray sensitivity were evaluated in a dark room. As a result, the possibility of reduction of dark current was ensured using a lamination structure of photo−conductor used as direct method in Digital radiography, also the possibility of using a digital radiation detector was ensured. Hence, it is considered to study for efficient control of specific variable and practical processing technique.

P-085 Digital Radiography 적용을 위한 유전체의 구조에 따른 광도전체의 특성연구

김성헌[1], 이영규[1], 정재훈[1], 조규석[1], 오경민[1], 성한규[2], 남상희[1,3]

[1]인제대학교 의용공학과
[2](주)리노펙
[3]인제대학교 의료영상연구소

Digital x−ray detectors are divided into direct method and indirect method. In this study, two candidate materials (HgI2 & PbI2) were used to study the reaction in fabricated x−ray film depending on variation of the dielectric layer structure. Parylene C type material with high permittivity was deposited as dielectric layer using PDS (Parylene deposition system) 2060. Samples were measured by scanning electron microscopy (SEM) to observe structural property. Also, to investigate electrical characteristics, a dark current in the dark room, sensitivity to x−ray exposure in the energy range of general radiography diagnosis were measured to the range of operating voltage. The different of electrical signals were occurred depending on dielectric layer structure in x−ray films. As a result of the experiment, the PbI2 film added bottom dielectric layer showed optimized electric properties. On the other hand, in the case of HgI2, the film with Top dielectric layer showed superior electric characteristics than other films.
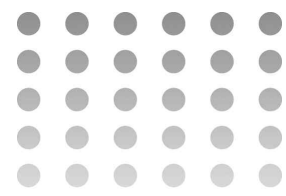
P-086 대뇌 피질 모델링 기술을 이용한 알츠하이머 환자의 대뇌 회질 영역의 평균확산도에 관한 연구

권오훈[1], 윤의철[1], 권훈기[1], 서상원[2], 김선일[1], 나덕렬[2], 이종민[1]

[1]한양대학교 의용생체공학과
[2]성균관대학교 의과대학 삼성의료원 신경과

Diffusion tensor imaging is considered as the important technique for microstructural analysis of brain. In the recent AD and mild cognitive impairments (MCI) studies with DTI, the scalar DTI index such as mean diffusivity (MD) has been used to demonstrate widespread alteration. In present paper, we investigated changes in MD values in cortical GM regions in AD patients compared with a healthy elderly group. For detecting abnormalities in cortical GM, we utilized surface−based strategy that sampling DTI volume such as MD volume in cortical GM to cortical surface model reconstructed from T1−weighted volume.

P-087 내재적 임계치 방법을 이용한 생체 내 임플란트−골 결합 체적 분석

이우진[1], 김대승[1], 이원진[2], 조영탁[2], 김효근[3], 이수열[3]

[1]서울대학교 협동과정 방사선응용생명과학과
[2]서울대학교 치과대학 구강악안면방사선학교실
[3]경희대학교 동서의료공학과

In implant dentistry, the measurement of implant stability and osseointegration is important to assess the success of treatment. The stability of an implant is determined by the mechanical properties of the implant−bone interface and the quality of the fixation between the implant surface and bone. We investigated the *in vivo* micro−CT images in implant and peri−implant bone to measure bone−to−implant contact ratio. The separation between implant surface and around bone was performed using intrinsic thresholding method. The linear regression analysis of BIC ratio was performed using SPSS. We found that the BIC ratio was significantly increased during observation period (p<0.05).

P-088 전기적 장세척을 위한 3차원적 partial volume effect 복원 방법 개발

김승환 김동성

숭실대학교 정보통신공학과

Virtual colonoscopy is favored over conventional colonoscopy because it is non−invasive and can cleanse colon electronically instead of uncomfortable conventional colon cleansing. Electronic Conlon Cleansing (ECC) has a challenging issue of Partial Volume Effect (PVE). This paper proposes an ECC method that can not only remove PVE but also recover inherent natural PVE. The proposed method reduces PVE using 3D expansion Adaptive Density Correction (ADC) and then removes fluid. Next, it generates natural PVE for PVE recovered air adjacent to ST and finally makes smooth ST adjacent to PVE recovered air.

P-089 컴프턴 카메라에서 3차원 영상 재구성을 위한 푸리에 재배열 기법

이미노[1,2], 김경민[2], 이수진[1]

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We develop a method of Fourier rebinning for 3−D Compton camera reconstruction, which has proven useful for estimating equivalent parallel projections from oblique projections in conventional emission tomography. In this work we show that the Fourier rebinning method can also be useful for Compton camera reconstruction by replacing the time−consuming calculations of conical projection and backprojecction with the fast calculations of parallel projection and backprojection. Once the Compton scattered data are successfully rebinned, a variety of conventional reconstruction methods can be directly applied to Compton camera reconstruction. Our simulations using the conventional filtered−backprojection algorithm demonstrate that the Fourier rebinning method can be useful for rapidly reconstructing Compton scattered data.

P-090 GPU 기반 역투영 복원을 이용한 3D 의료영상기기 개발

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3D reconstruction from 2D projections obtained along a rotational source trajectory is most commonly performed by the filtered back-projection algorithm which is necessary to have much computation. Recent developments in high performance computing solutions are related to graphic processing units (GPUs) using multi-core and parallel processing. We have implemented an algorithm for 3D reconstruction of cone-beam computerized tomography (CBCT) data using the compute unified device architecture (CUDA) provided by NVIDIA. Our implementation results in improved

reconstruction times on the phantom data set to observe differences that can occur between CPU and GPU-based reconstructions. By using our approach, the computation time for the skull phantom is reduced from 600 minutes on the CPU to 3 minutes on the GPU.

P-091 광학 트래킹 시스템을 이용한 fMRI에서의 피험자 움직임 검출

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연세대학교 의과대학 분자뇌신경영상연구실

In this paper, we describe a depth extraction and stereo vision for detection of head movement on MRI scanner. The system consists of 2 cameras, framegrabber, 940nm infrared illuminator, and moderate desktop computer. All image processing and calculation is done in attached desktop, including calibration and triangulation. During the MRI scanning procedure, subject head movement is unavoidable, and the system detects the movement of infrared reflective marker in real time and notices how much they moved during scanning.

P-092 대뇌피질 두께의 비대칭성과 좌우 기능적 연결성의 상관관계 분석

박준성[1], 윤의철[1], 차정호[1], 서상원[2], 김선일[1], 나덕렬[2], 이종민[1]

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In a structural perspective, the human brain has asymmetric properties. The relationships between cortical asymmetry and interhemispheric connectivity had become popular concerns for a longtime respect to understand the rules in the development and evolution of the brain in both human and nonhuman primates. Using neuroimages, we tested theory that the constraints on fast interhemispheric communication can somehow contribute to the development of ipsilateral, intrahemispheric networks, which might promote the development of brain lateralization.

P-093 Compressed Sensing을 이용한 MRI의 위상 영상 재구성

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경희대학교 동서의료공학과

Compressed sensing is a technique to reconstruct signals and images from significantly fewer measurements than Niquist sampling limit. It is now recognized that compressed sensing works well in reconstructing magnitude images if the sampling mask and the sparsifying transform are well chosen. Phase images also play important roles in MRI particularly in chemical shift imaging and magnetic resonance electrical impedance tomography (MREIT). Through computer simulation and real MRI experiments, we reconstructed phase images using the compressed sensing technique and we compared them with the ones reconstructed by conventional Fourier reconstruction.

## P-094 3개의 15×8 배열전극을 이용한 마이크로 임피던스 영상시스템의 성능검증

안중우, 손중표, Qin Liu, 위헌, 오동인, 우응제

경희대학교 동서의료공학과

We developed a new microscopic electrical impedance tomography (micro-EIT) system to visualize conductivity distributions within a miniature hexahedral container, where we place small biological samples with a background solution or gel. Primary current is injected between two plate electrodes at the right and left sides to produce a uniform current flow inside the container. Induced voltages are measured from three sets of 15×8 array electrodes on two other sides and the bottom of the container. Secondary current injections between a pair of bar electrodes inside the container are adopted for more voltage data. In this study, we describe the performance and reconstructed images of the developed micro-EIT system. The SNR in voltage measurements is over 65dB on all measurement channels and the CMRR is over 84dB. Our future work should include the development of a customized three-dimensional image reconstruction algorithm for the micro-EIT system.

P-095 Respiratory artifact reduction in small animal micro-CT imaging using TV-penalized reconstruction

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In small animal imaging with a micro-CT, respiratory motion artifacts degrade the image quality. Reduction of respiratory motion artifacts is technically challenging due to faster respiratory cycle of the small animal and the much longer scan time of the micro-CT. We try to
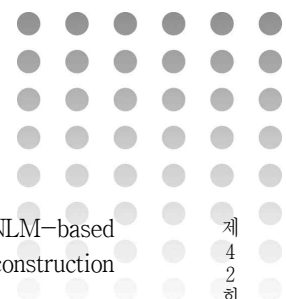
get respiratory gating signal from the two-dimensional projection data by tracking the vertical position of diaphragm. After extracting the respiratory signal, we sort the projection data retrospectively so that we have the projection data from only inhale or exhale period. In reconstructing micro-CT images, we adopt TV-penalized iterative image reconstruction method to minimize the aliasing artifacts.

P-096 다른 3T MRI 기기에서 얻어진 영상간 대뇌피질 두께 측정의 재현성 검증

전세운, 윤의철, 김종헌, 나덕렬, 이종민

한양대학교 의용생체공학과, 성균관대학교 삼성서울병원 신경과

Alzheimer's disease (AD) is the most common form of dementia affecting many millions around the world. To find a biomarker of AD, the "Multi-center Neuroimaging Bank" system must be established. Because multi-center studies can provide more detection power and confidence of research. But potential confound introduced by different scanners, similar acquisition protocols must be used to minimize variation in the data collected due to technical non-uniformity across-site and thus maximize sensitivity to true biologic variation. We undertook a pilot study to investigate the reproducibility between centers to test reliability by quantitative measurement method to identify the feasibility of system.

P-097 Edge-Preserving Bayesian PET Reconstruction Using Nonlocal Means Priors

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We develop an edge-preserving Bayesian reconstruction method with nonlocal means (NLM) priors. The NLM algorithm, which exploits the self-similarities of natural images, has proven useful for image restoration and reconstruction. According to our own investigation, however, the edge preservability of the conventional NLM method in low-resolution PET reconstruction is not as noticeable as that in high-resolution x-ray CT or MRI reconstruction. In this work, to improve the performance of the NLM-based Bayesian method for PET reconstruction, we generalize the penalty function from the simple quadratic form to a more expressive convex non-quadratic (CNQ) model. Our preliminary results show

that the use of CNQ penalties improves the NLM-based Bayesian method for low-resolution PET reconstruction by preserving the edges more accurately.

P-098 다중양극 광전자증배관 이득 불균일 보정법의 실험적 검증

이찬미[1,2], 권순일[1,3], 윤현석[1,2], 이또우 미끼꼬[1,4], 고근배[1,2], 이동수[1,3,4], 홍성종[5], 이재성[1-4]

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Multi-anode position sensitive photomultiplier tube (PSPMT) is widely used for small field-of-view imaging devices. However, the anode gain non-uniformity of this device is a limiting factor that degrades the intrinsic performance of detector module. In the previous study, we demonstrated the feasibility of an efficient and inexpensive compensation method for multi-anode PSPMT by using simulation toolkit (OrCad 10.5). The aim of this study was to evaluate the performance of a block detector which consisted of H8500 or H9500 PMT and $L_{0.9}$GSO scintillation crystal with and without gain compensation unit. In results, the uniformity of photo-peak position was improved.
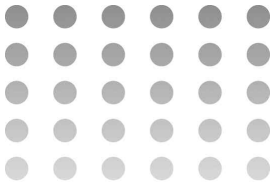
P-099 MDS기법을 이용한 알츠하이머병 정량화 방법

박현진

가천의과학대학교 의공학과

Multidimensional scaling (MDS) is a statistical tool to differentiate clusters based on collection of pair-wise distances. Here we adopted bending energy of pair-wise image registration as the pair-wise distance and applied MDS. Applying MDS to collection of normal control and Alzheimer's disease (AD) scans yielded separable clusters between two groups. Furthermore, a distance derived from the MDS results was shown to correlate with a widely available clinical measure of dementia, mini mental state exam (MMSE). The MDS based shape quantification was shown to be more robust than traditional shape quantification methods.

POSTERS / Medical Imaging

P-100 디지털 마모그라피 디텍터를 위한 최적의 광전도체 선정

윤승만, 임창휘, 한종철, 조옥라, 김호경

부산대학교 기계공학부

We theoretically investigate the signal and noise characteristics of various photoconductors such as amorphous selenium, cadmium zinc telluride, mercuric iodide, lead iodide, lead oxide, and thallium bromide. A simple serial cascaded model has been employed to obtain the detective quantum efficiency (DQE) of a detector material. The spatial distribution of absorbed energy distribution (AED) is calculated using Monte Carlo methods. The cascaded model estimates that mercuric iodide and thallium bromide show the best DQE performance. The developed model and analysis will be very useful to find an optimal photoconductor for the use in digital mammography detectors.

P-101 투시진단 의료기기의 효과적인 동영상 저장 방법

엄태웅, 김기태

건국대학교병원 의공학팀

Fluoroscopy is a special type of x-ray that provides continuous x-ray images of a patient's organ structures in real time. The live fluoroscopy video is used for diagnosis review, teaching and research. Traditionally, the live fluoroscopic video can be saved by using DVD recorder. Because of non continuous fluoroscopy acquisition during examination, the saved video has black images and we can't directly play or view a specific image. In this paper, we propose the effective method for saving live fluoroscopic video. The proposed method can detect informed images by using detection algorithm and save the live video with real time compression for data storage reduction.

P-102 Keyhole Method를 이용한 2차원 위상대조도 자기공명 혈관조영술에서의 VENC에 따른 Artifact Power 측정

신우호[1], 홍철표[1], 이동훈[1], 강진구[1], 강수진[1], 이만우[2], 한봉수[1]

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Phase contrast magnetic resonance angiography (PCMRA) is a useful MRA technique to scan low speed blood flow. "Keyhole" is a imaging method that high spatial frequency components are used as reference data and low spatial frequency components, called keyhole data, are merged. In this study, we applied keyhole method to PCMRA to evaluate the artifact power (AP) according to changing the keyhole factors and velocity encoding (VENC). We acquired images that using a 0.32T MR scanner and adjusted VENC from 10 to 100. Then we calculated AP using MATLAB respectively. Our results propose applicability of keyhole method to 2D PCMRA.

P-103 유방 초음파 영상에서 명암도 조절을 통한 종괴 경계 검출법

유동훈, 이수열

한국전자통신연구원 유헬스연구팀

Breast cancer diagnosis on ultrasound images significantly contributes in the area of early detection. Detecting proper boundary of lesions is very important on deciding the type of lesion (cancer or benign). We composed the automatic segmentation algorithm using proposed RDCA (radius dependent contrast adjustment) method. RDCA is introduced to overcome the limitation of Gaussian constraint function. It decreases contrast around the center of lesion but increases contrast proportional to the distance from the center of lesion. As a result, segmentation algorithm shows robustness in various shapes of lesion. The proposed algorithms may help to find boundary of lesions efficiently.

P-104 문신기 바늘 자극에 의한 피부 손상 측정을 위한 OCT의 활용

김영균[1], 여창민[1], 이태우[1], 정병조[1], 권영미[2], 차지훈[2], 허찬회[2], 박기정[2], 김동섭[2], 김한성[1]

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[2]식품의약품안전평가원 융합기기팀

In this paper, we present the feasibility of the optical coherence tomography. OCT images were reconstructed from tattooed skin image, which plays an important role in noninvasive measurement. In preexistence study tattooed human skin was examined, but parametric study has to be examined by needle depth, speed. Tattoo affects the skin by mechanical and chemical reaction. There are some of studies in chemical reaction with pigment, but needle stimulation of tattooing is still not revealed. We measured the depth of tattooed skin, and compared the pattern of the skin damage by histology images.

Medical Nano and Microtechnology

P-105 마이크로플루이딕칩에서 호흡기 상피세포의 뮤신 발현

김수환[1], 강진현[2], 정일엽[2], 정봉근[1]

[1]한양대학교 생명나노공학과
[2]분자생명과학부

We used a microfluidic gradient device for controlling mucin expression of NCI—H292 epithelial cells derived from lung tissues. Various gradient profiles (i.e., non—linear, linear, and flat) were generated in a temporal and spatial manner. NCI—H292 lung epithelial cells were exposed to concentration gradients of epidermal growth factor (EGF) in a microfluidic gradient deviceand their mucin expression was significantly affected by EGF gradient profiles. Therefore, this microfluidic gradient device could be a powerful tool for regulating the mucin expression of lung epithelial cells.

P-106 연잎 표면 구조에 대한 지방유래 줄기세포의 거동

박광숙[1], 차경제[2], 김동성[2], 이수홍[1]

[1]차의과학대학교 의생명과학과
[2]포항공대 기계공학과

We fabricated polymeric substrates with lotus leaf surface structure (LLSS) and investigated cell behaviors, including attachment, morphology, proliferation, and differentiation of adipose—derived stromal cells (ASCs). Compared to the flat substrate, the LLSS substrate induced higher cell attachment rate, but did not significantly change the cell proliferation rate. In addition, ASCs on the LLSS substrate exhibited less organized cytoskeleton, there by resulting in smaller sizes of cells than those on the flat substrate. On the other hand, the LLSS substrate induced higher adipogenic differentiation of ASCs than the flat substrate, while chondrogenic and osteogenic differentiation were decreased.

P-107 RGDS 펩티드를 이용한 CdTe 양자점 표면의 개질 및 섬유아세포와의 상호작용

최문정[1], 한승진[2], 강인규[1,2]

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[2]경북대학교 고분자공학과

In this study, MIBA (3—mercaptoisobutyric acid) introduced cadmium telluride nanoparticles (CTNP) were prepared by reaction with cadmium telluride nanoparticles followed by immobilization of MIBA. Then, peptide ligands were introduced to the surface of the CTNP (RCTNP) to realize receptor targeting and molecular imaging. The surface properties of CTNP and RCTNP were characterized by UV—vis, XRD, FT—IR, TEM, DLS and zeta potential. To evaluate the cell compatibility and cytotoxicity of CTNP and RCTNP, human fibroblast cells were cultured in the presence of nanoparticles. Interaction of CTNP and RCTNP with cells were also observed by fluorescene microscope, MTT assay and Live/Dead staining.

Neural Engineering

P-108 감광화된 포유동물의 이온채널과 나노입자의 접합
방법에 대한 연구

방용빈[1], 미나이-테라니 아라쉬[2], 조명행[2], 송윤규[1]

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Light induced neuro-stimulating tool, such as channelrhodopsin-2 (ChR2), enables the research of neural circuit function with cell-type-specific and temporally accurate neuro-modulation. In order to optically excite ChR2 expressed neurons, it requires high power lasers or LEDs. In our group, the AviTag sequence was cloned to N-terminal of ChR2 channel, which allows conjugation of biotinylated metal nanoparticles or organic dyes to the light-sensitized ion channels. The conjugated metal nanoparticles would induce surface plasmonic resonance effect to increase the efficiency of optical stimulation with much less optical power.

P-109 후각 뉴런의 기능적 공간적 선택에 따른 후각 신경
디코딩 성능

김아영[1], 유경진[1], 이현주[2], 랑이란[2], 임창균[2], 고진수[2], 신형철[2], 신현출[1]

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We present performance of olfactory neural decoding depending on functional and spatialneural selection. Multi-channel extra-cellular single-unit recording were done by micro-wire electrodes implanted in the mitra/tufted cell layers of the main olfactory bulb (MOB) of anesthetized rats to obtain neural responses to various odors. All neurons are divided in three groups based on the number of odors causing each neuron' sactivation. The neural decoding accuracies are presented for the three groups. Also we exploit the decoding change depending on the spatial selection of neurons. The results indicate that the performance of odor inference is highly dependent on the neural selection.

P-110 생체모방 압전 청각센서를 이용한 완전 이식형
인공 와우 시스템을 위한 디지털 회로 설계

강민규[1], 김진호[2], 이원희[2], 김성준[2], 송윤규[1]

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The cochlear implant typically consists of microphones, a speech processor, a transmitter, a receiver and a stimulator. In the case of totally implantable cochlear implant system using a biomimetic piezoelectric-acoustic sensor with an artificial basilar membrane, the signal conversion process to frequency domain is not required, because the sensor can do the signal processing by itself. Hence, we designed a fully customized CMOS integrated circuit for totally implantable artificial cochlear systems, which is functionally optimized to process data with frequency information from an artificial basilar membrane.

P-111 움직임 이전 시점의 신경신호를 활용한 손가락
움직임의 신경디코딩

윤종훈, 유경진, 임선주, 신현출
숭실대학교 전자공학과

In this paper, we present neural decoding results of finger movements using M1 neural activities before finger movements. In the central nerve system, motor commands in brain are produced in advance before motor movements. This issue has been studied widely in terms of electroencephalogram, so called readiness potential. It is observed that neural responses in M1 motor cortex happen prior to motor movements. Data used for neural decoding are collected from 0.5 sec. to 1 sec. when the actual finger movements happen around 1 sec. With 30 randomly selected neurons, we obtained the decoding accuracy as high as 95%.

P-112 전기 자극에 의한 Cortical stem cell의
Synchronized bursting 패턴 변화에 대한
연구: HSMM을 이용한 bursting 패턴 검출

김도형[1], 송인호[1], 김인영[1], 이상훈[2], 김선일[1]

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[2]고려대학교 생체의공학과

In present study we investigated the effects of electrical stimulation on proliferative neural progenitor cells (embryonic days 12.5). we compared two groups with burst detection method using HSMM (Hidden Semi Markov Models). The stimulated group showed more bursty characteristic, have more active electrode number and spike number per bursting periods.
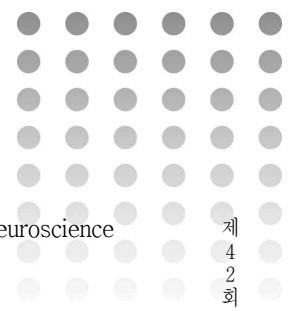
P-113 뇌심부 자극에 따른 시상하핵의 발화패턴 분석

박은경, 송인호, 김인영

한양대학교 의용생체공학과

Deep brain stimulation (DBS) is an effective surgical treatment for Parkinson's disease and other neuropsychiatric disorders. The subthalamic nucleus (STN) or the globus pallidus internus (GPi) has been used as surgical target for DBS. The pedunculopontine nucleus (PPTg) has been suggested an alternative target for DBS in recently studies. In this paper, we analyzefiring rate of STN before and after stimulation of PPTg using intact rats.

P-114 세포친화성 고분자 미세 광패터닝 기술

백남섭, 이지현, 김용희, 김국화, 이봉준, 김익현, 정명애, 정상돈

ETRI 융합기술연구부문

A facile microfabrication method was developed via the photodegradation of cell-adhesive modified-poly (ethyleneimine) for guided neuronal growth. Using UV irradiation, a clear line and cross-line patterns of m-PEI covalently attached to an ITO substrate and the neuronal networks were obtained as a result of the photodegradation of m-PEI. The photopatterned m-PEI layer on the ITO surface provides well-defined and stable patterns and can effectively guide neurite outgrowth and control neurite extension.

P-115 미세전극칩에 배양된 해마 신경 세포에 대한 칼슘 이미징

이석영, 남윤기

KAIST 바이오및뇌공학과

MEA (microelectrode array) is the most widely used noninvasive device for detecting electric signals from *in vitro* cultured neural network. However, nonuniform cell-electrode coupling had been a difficult problem to solve for researchers even until now. Calcium imaging method can be an alternative way to investigate neural activity from single cell level to neural population. In this study, we introduce our custom designed calcium imaging system based on LabVIEW, and representative results such as comparison between electric signal and calcium signal, electric stimuli evoked calcium responses. Simultaneous usage of calcium imaging with

MEA can be a better platform for *in vitro* neuroscience study.

P-116 정상 및 파킨슨병 쥐 모델의 기저핵 신경신호의 발화패턴 비교

류상백[1], 배은경[1], 황용섭[2,3], 장진우[2], 김경환[1]

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[2]연세대학교 신경외과 뇌과학 연구소
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Deep brain stimulation (DBS) is widely used for the treatment of motor symptoms associated with Parkinson's disease (PD). However, its functional mechanism remains unclear. In this study, as a preliminary step for studying its mechanism, we investigated neuronal firing patterns in several basal ganglia nuclei, STN, SNr, GP, which are known to play important roles in motor regulation. Our purpose was to find significant differences in firing patterns between normal and PD model rats, and to quantify these.
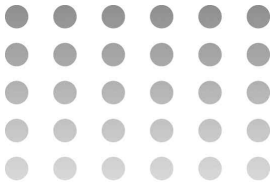
P-117 2채널 동시자극에 응답하는 변성망막 신경절세포 네트워크에 의한 시공간적 시각정보 인코딩

류상백[1], 예장희[2], 구용숙[2], 김경환[1]

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The purpose of retinal prosthesis is to enable visual perception by spatiotemporal electrical stimulation. Since simultaneous electrical stimulation by multiple electrodes may cause distortion of spatial information due to current spread, details of the stimulation should be carefully controlled. In this study, we investigated whether the reconstruction of spatiotemporal visual information is possible when a retinal ganglion cell network is stimulated simultaneously by two channel pulse trains modulated by two independent time series.

P-118 청각적 oddball 작업 시 주의 부하에 따른 대뇌 영역간 기능적 연결성 변화

최정우 배은경 이종구 김경환

연세대학교 의공학과

We investigated the changes in inter-regional functional

connectivity due to attentional load during auditory oddball task, using phase synchronization (PS) and graph theoretical analysis of event—related EEGs. Significant differences in spatiotemporal pattern of gamma—band PS were found between low and high attention loads. Stronger and earlier gamma—band PSs were identified for low load. Moreover, for low load condition, the PS network pattern was closer to 'small world network' which is considered as the most efficient architecture for inter—regional interaction.

P-119 완전이식형 인공와우용 생체모방 압전청각센서를 위한 증폭단 설계

김진호[1], 박정환[1], 강민규[2], 이원희[1], 송윤규[2], 김성준[1]
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The purpose of this study was to design the analog amplifier stage for biomimetic piezoelectric—acoustic sensor of the totally implantable cochlear implant. The sensor can replace the function of both a microphone and a frequency analyzer of conventional cochlear implants. We adopted CMOS two—stage operational amplifier for amplifying a relatively weak electrical signal from the sensor. Designed operational amplifier showed good characteristics suitable for the biomimetic piezoelectric—acoustic sensor.

P-120 뇌경막하 전기 자극의 모델링을 이용한 연구

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[1]GIST 정보통신공학부
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Cortical stimulation therapy is increasingly used in various neurological disorders as an adjunct medical therapy. Especially, subdural cortical stimulation is appealing, because it can electrically stimulate at relatively accurate position without a great loss. However, it is unclear how the cortical anatomy and the shape, size and configuration of the electrode affect current flow in the cortex. We developed a 3D computational model simulating subdural cortical stimulation over the precentral gyrus using a disc electrode or a ring electrode. In this study, we found the effectiveness of a ring electrode comparing with a disc electrode.

P-121 신경세포 세포외신호 측정용 저잡음 고이득 다채널 증폭시스템 설계

명준오, 남윤기
KAIST 바이오 및 뇌공학과

As one of Neuron—on—a Chip technologies, Micro—electrode Array (MEA) is currently the fundamental tool for measurement and analysis of extracellular action potentials. This signal is called to 'Spike'. Spikes transmitted via synapse in neural network include a lot of information about neuron. So, it is important to measure and analyze the signals. However, it is not easy because this signal's amplitude is very small and noise may be added to spike from external environment. So, multichannel systems for amplifying signal and minimizing noise are required, which are amplifier and filter. By designing these systems, it is possible for us to detect the signals with low noise level in microscopic view and to analyze accurate signal patterns in macroscopic one.

P-122 표면 세포흡착분자 패턴을 이용한 신경 세포의 신경돌기 성장 유도

장민지, 남윤기
KAIST 바이오 및 뇌공학과

Various shapes of micropatterns printed on the surface have been proved that could control cellular behaviors. Here we designed micropatterns for controlling neuronal behaviors such as neuritogenesis and axonal protrusion which are important to generate neuronal circuitry *in vivo*. We found that neuritogenesis preferentially initiated at the corner of micropatterns. Also a major neurite which highly becomes an axon preferentially protrude from the long—axis corner. This study is the first attempt to control the direction of neuritogenesis and axonal protrusion using micropatterns which could be easily applied to platforms for analyzing neuronal networks such as multielectrode arrays.

P-123 전압자극과 전류자극에 의해 유발된 정상망막과 변성망막 신경절세포의 반응 비교

예장희[1], 류상백[2], 김경환[2], 구용숙[1]
[1]충북대학교 의과대학 생리학교실
[2]연세대학교 보건과학대학 의공학과 신경공학연구실

Despite photoreceptor degeneration, preservation of 2nd order neurons in retinitis pigmentosa (RP) patient enables

retinal prosthesis as a rescue strategy by stimulating the remained neurons electrically. Since optimal stimulation parameters are one of the most important requirements for the successful prosthesis, we measured RGC responses to voltage- or current-modulated stimulationparameters and compared threshold charge densities between normal and *rd1* mice retina.

P-124 동물 심부 뇌 자극용 액정폴리머 일체형 이식 시스템의 개발

이성은, 이승우, 민규식, 정준수, 엄경식, 김성준

서울대학교 공과대학 전기컴퓨터공학부

In this paper, we present the fully implantable system for animal deep brain stimulation (DBS) using Liquid Crystal Polymer (LCP) and related technology. LCP is semiconductor process compatible and biocompatible material (class IV). LCP also has lower moisture absorption rate than polyimide which causes delamination of polymer layers resulting in system failure. This study describes a fully implantable integrated system including a depth-type electrode, a lead wire, a planar-coil system, and a system package as monolithic structure. Preliminary characteristic tests of each module and animal behavioral test with neuropathic pain model mice have been performed.

P-125 동적 신경영상을 이용한 다양한 인간 의도의 분류

황한정, 임창환

연세대학교 의공학과

The aim of our study was to classify various mental tasks using cortical source activity rather than using scalp potentials. Four participants took part in our experiment and they were asked to perform four different mental tasks. EEG data were recorded at 32 electrodes attached on their scalp during the mental tasks. Spatiospectral patterns of the acquired scalp potentials and its cortical rhythmic activity were extracted and a unique fitness evaluation technique was applied for the classification. The mean classification accuracy obtained using the spatiospectral patterns of the scalp potentials was 69.68%; while that obtained using the cortical source activity was 79.5%. These results suggest that various cognitive tasks can be discriminated with increased classification accuracy by using dynamic neuroimaging.

P-126 웨이블릿을 이용한 성인들의 수면무호흡시 수면단계에 따른 뇌파의 분석

김민수[1], 조영창[2], 서석태[1], 손창식[3], 박희준[4], 구정훈[4], 조용원[5], 김윤년[6]

[1]계명대 생체정보기술개발사업단
[2]경운대 정보통신공학과
[3]계명대 의료정보학교실
[4]계명대 의공학과
[5]동산의료원 신경과
[6]동산의료원 심장내과

Detection of sleep apnea is an important issue, are known to reduce the quality of sleep and cause daytime sleepiness. In sleep stage, electroencephalograph (EEG) is acquired from polysomnographic recordings. We aimed at developing based on a wavelet analysis of EEG to measure or quantify the stage of sleep. We obtained the wavelet transform coefficients of four EEG channels around sleep stages and identified the frequency information that show the most change during arousals. This study is to elucidate whether the results of quantification analysis of sleep EEGs in sleep apnea.

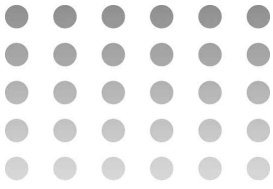## P-127 기능적 자기공명영상의 능동파라다임에서 내정모드 추출에 대한 연구: 운동선수와 일반인의 비교

나성민

경북대학교 의용생체공학과

Intrinsic connectivity components (ICN) continue during task conditions, a correlation during task performance probably represents some combination of underlying Intrinsic connectivity components (ICN) and traditional task-related responses related to stimulus input. The aim of this study is to investigate for possible isolation of the intrinsic connectivity component (ICN) during the performance of a motor task and to evaluate the difference in ICN between expert archer group and control group.

P-128 뇌의 기능적 인과성 분석에 기반한 뇌-컴퓨터 인터페이스의 특징 추출

임정환, 황한정, 정영진, 임창환

연세대학교 의공학과

The aim of this paper was to verify whether the features derived from functional causality analysis of human brain would be promising feature candidates that can enhance classification accuracy of mu-rhythm based brain-

computer interface (BCI). To this end, we classified left and right hand motor imagery tasksusing the features derived from directed transfer function (DTF) method as well as the conventional features derived from power spectral density (PSD) and phase locking value (PLV) analyses. As a result, the highest classification accuracy was obtained in seven out of nine subjects when the DTF features were used, thereby demonstrating that the DTF features could be utilized as one of the promising feature candidates capable of enhancing the perfor-mance of BCI systems.

P-129 인공 망막을 위한 PC 기반의 전기자극패턴 제어 시스템 개발

김현석[1], 장민혜[1], 박광석[2]

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[2]서울대학교 의과대학 의공학교실

Artificial retina is a device which restores vision to blind people by stimulating retina using implanted microelectrode. To achieve this, images encoding method for stimulus chip and an interface device for changing parameters of stimulus chip are needed. The aim of this study was to propose a PC-based system to control parameters and patterns of electrical stimulation easily. The system consists of two parts: an user interface for adjusting parameters of stimulus pulses and control board which is the interface between PC and stimulus chip by our own communication protocol.

P-130 인공 시각 시뮬레이션에서의 익숙한 얼굴 인식: 경계 추출법의 응용

장민혜[1], 김현석[1], 박광석[2]

[1]서울대학교 협동과정 바이오엔지니어링
[2]서울대학교 의과대학의공학교실

Retinal prosthesis provides visual information for the blind using micro electrodes. But because of the physical and mechanical problems, it needs to improve quality and quantity of the information by image processing. We investigated another application of edge extraction and applied it to familiar face recognition. Blocked image with Edge extraction was subtracted from blocked image with Contrast Enhancement. Consequently we could get images enhanced in detail of features such as glasses. Also subjects recognized feature more precisely and more quickly with 12×12 and 16×16 images.

P-131 프로그램 가능한 다중 채널 전기 자극 시스템 구현

전아영, 나재석, 유주연, 박근철, 전계록
부산대학교 의공학교실

In the study, multi-channel electrical stimulation system was implemented to stimulate peripheral nerve and to treat neuropathological diseases. A variety of electrical stimulation pattern generated by LabVIEW 2009 was transformed and programmable electrical stimulation was implemented by using Microcontroller. In the further study, the pattern of electrical stimulation recorded Micro-controller would be selected by users, and the signal will be converted by DAC. The converted signal will be transmitted to multi-channel electrodes through shielding transformer.

P-132 프로그램 가능한 자극 패턴 발생기 구현

나재석, 전아영, 유주연, 박근철, 전계록
부산대학교 의공학교실

Amplitude modulation (MA) has been commonly used in the clinical field, although there are electrical stimulation (EA) would be changeable according to amplitude modulation (MA), frequency modulation (FA), pulse width modulation. In the study, programmable stimulation pattern generator was implemented to apply EA to a variety of fields. In the implemented software, user can choose the channel of hardware and type of signal by pressing the buttons. As the pattern of the signals is selected, parameters can be controlled by users. The selected pattern signal is simulated and transmitted to hardware. As a variety of stimulation pattern can be selected by user, the implemented software would be used in many fields. In the further study, more parameters will added and the hardware will be developed.
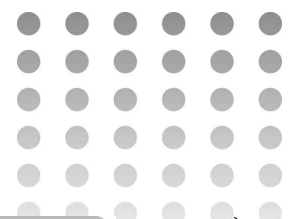
P-133 P300 Detection and Classification Using Fast ICA and SLP

Murtaza Aslam, Ki Tae Park, Young Shik Moon
Department of Computer Science and Engineering,
Hanyang University, South Korea

Brain Computer Interface allows human to control devices through electroencephalographic (EEG) brain signals, only by mere thoughts. The proposed idea removes all embed noises of frequencies ranging from 0-60Hz from

Pz and Fz for P300 Detection using Fast ICA. Fast ICA is based on maximizing non–Gaussianity as a measure of statistical independence using fixed–point iteration. Classification with single layer Perceptron as linear threshold units into target and non target, gives promising results.

P-134 중풍환자에서 침 자극이 뇌의 알파파에 미치는 영향

김태민[1], 선종인[2], 윤가영[2], 이재동[2], 최도영[2], 한승무[1]

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[2]경희대학교 한의과대학교 한의예과

Acupuncture has been used as an alternative method in curing diseases such as Stroke by inserting filiform needles to certain acupoints. In this study, we have investigated the modulation of α–wave activity of the brain for Stroke Patients in a prolonged time of before, during, and after acupuncture. The effects were examined via alpha power levels and alpha power maps on four different Stroke patients. Our results indicate that the α–wave is generally increased with acupuncture in Stroke Patients during six to nine minutes of acupuncture, confirming some relaxation effect of acupuncture.

Orthopedic and Rehabilitation Engineering

P-135 비복근의 등척성 운동시 [31]p–Magnetic Resonance Spectroscopy와 근전도를 이용한 피로도 추적에 관한 기초 연구

김강수[1], 손두범[3], 최흥호[1], 문치웅[1,2]

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Representative phenomenon of muscular fatigue could be confirmed as increasing the electromyogram signal amplitudes at low frequency and moving the signal power spectrum to low frequency domain. To quantify this phenomenon, the ways that used MDF (Median Frequency) and MNF (Mean Frequency) are attempted by a lot of researchers. It is possible to measure changes of the phosphorus (P) in living body non–invasively using MRS (Magnetic Resonance Spectroscopy) after exercise as another way to measure the muscular fatigue.
In this study, we recognized the muscular fatigue related to isometric exercise at Gastrocnemius muscle by measuring the shifting of EMG signals to low frequency domain and the changes of the actual energy metabolism.
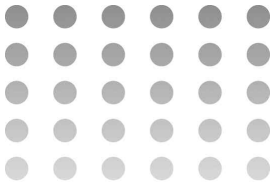
P-136 개인별 및 집단별 운동량 추정식의 타당성 분석

이희영[1,2], 김승현[1], 손종상[1,2], 박선우[1,2], 김영호[1,2]

[1]연세대학교 의공학과
[2]연세대학교 의료공학연구원

Estimation of the energy expenditure during physical activities has been consistently studied for a long time. Various supplies based on these studies were developed, however they were focused to match the acceleration values to the metabolic energy. The purpose of this study was to investigate the relevance of the prediction equations which were derived from the previous study. 7 male subjects participated, and were required to walk and run on the treadmill with gas analyzer and a triaxial accelerometer. To find the relevance for individual and group equation, the error rate between measured and predicted values was used, and then Mann–Whitney test was performed a statistical analysis.

P-137 레그프레스 운동 시 외부 부하에 따른 무릎관절 운동범위 결정

손종상, 황선홍, 김영호

연세대학교 의공학과, 연세의료공학연구원

In this study, an EMG-driven model for knee joint was used to estimate the joint moments and suggest proper range of motion according to the external loads during leg-press exercise. One elderly was participated in this pilot study. The dynamometer tasks were performed to develop the subject's own model for maximum voluntary isometric contractions (MVIC) for flexors and extensors. EMG signals were also measured simultaneously. After the dynamometer tasks, 3D motion data were captured during leg-press exercise. In all cases, the maximum joint moment was generated at the knee joint angle of $45.01\pm1.71°$. We expect that this approach will be employed to design the exercise protocol in elderly exercise.

P-138 보행보조 FES 적용을 위한 자극시점 검출 센서 시스템 및 알고리즘 개발

박선우[1,2], 김정윤[1,2], 손종상[1,2], 이동엽[1], 류기홍[1,2], 김영호[1,2]

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[2]연세대학교 의료공학연구원

Walking assistive FES which is the most efficient method to prevent drag foot and foot drop that cause pathologic gait for hemiplegic patients needs sensor system that can accurately detect stimulation timing. In this study, sensor system utilizing tilt sensor and accelerometer as well as detecting algorithm are developed. In addition, the effects were proven by conducting comparing experiment with existing system (foot switch) in the hemiplegic gait. The rate of detecting stimulating timing when hemiplegic gaits was significantly higher (p=0.049) than existing system. Based on 340 steps to be a standard, existing system was 83.8% while the developed system was 97.1%.

P-139 완전 이식형 보청기의 마이크로폰에 생체동잡음이 미치는 영향

우승탁[1], 신동호[2], 이정현[3], 조진호[2]

[1]경북대학교 의용생체공학과
[2]경북대학교 대학원 전자·전기·컴퓨터학부
[3]경북대학교병원 의공학과

Recently, fully implantable hearing devices (FIHDs) have been widely studied to solve the problems of conventional hearing aids. The microphone of FIHDs is implanted under the skin at the temporal bone. So, it's characteristics can be affected by bone-conducted noise, such as chattering teeth and eating food. In this paper, we investigated the effect of bone-conducted noise on implanted microphone. To verify the noise effect, we fabricated the physical model using the artificial bone and silicone. And we measured the microphone output with stimulated by bone-conducted noise. As a result, it confirmed that output signals are modified by bone-conducted noise.

P-140 앞으로 걷기와 뒤로 걷기 시의 하지 관절의 운동형상학적 비교

이민현, 박선우, 손종상, 황선홍, 김영호

연세대학교 대학원 의공학과, 연세의료공학연구원

The use of backward walking is a common rehabilitative technique improving strength and balance. Although, there are few experimental results and no generalized values of backward walking compared to forward walking. The purpose of this study was to analyze the difference in the joint angle during forward and backward walking. Four subjects were required to walk both forward and backward. The patterns of the joint angle were different due to discordance of the gait events. These results implied that the patients who had the stroke could be controlled the balance and strength.

P-141 정원창 구동 보청기를 위한 전자기형 진동체의 구현

신동호[1], 우승탁[2], 성기웅[3], 조진호[1,3]

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[2]경북대학교 대학원 의용생체공학과
[3]경북대학교 첨단감각기능회복장치 연구센터

In this paper, we proposed a new electromagnetic type transducer for round window driving hearing devices. The transducer was designed for vibrational displacement enhancement by minimizing leakage flux and was consisted of two permanent magnets, three coils, and a vibrational membrane. The vibration characteristic of fabricated transducer was measured using the vibroscope, and compared with those of normal human stapes and floating mass type transducer. From the
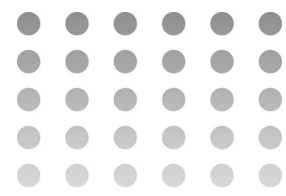
experimental results, the displacement of the proposed transducer was higher than those of human stapes and older transducer. Therefore, the proposed electromagnetic transducer will be appropriate to round window driving hearing devices.

P-142 관성 센서와 지자계 센서를 사용한 인체 각도 추적

최호림[1], 김제남[1], 유문호[2], 양윤석[2]
[1]전북대학교 헬스케어공학과
[2]전북대학교 바이오메디컬공학부,

This study propose a human body orientation tracking system by inertial and earth magnetic sensors. These sensors were fused by indirect Kalman filter. The proposed tracking system was configured and the filter was implemented. The tracking performance was evaluated with static and dynamic tests. In static test, the sensor was fixed on the floor while its static characteristics was analyzed. In dynamic test, the sensor was help and moved by a human hand for 30 seconds. The rotation included x, y, z axis rotation, and elbow flection/extension which mimics drinking motion. For the all dynamic motions, the tracking angle error maintain below 4.1 degree on average. The proposed tracking method is expected to be useful for various human body motion analysis.

P-143 자전거 프레임 조절이 페달링 수행에 미치는 영향

오호상, 강민성, 최진승, 강동원, 방윤환, 탁계래
건국대학교 의료생명대학 의학공학부

The purpose of this study was to quantitatively evaluate how to effect to the movement of lower limb, muscle activation and heart rate when bicycle frame was optimized subject's body. The bicycle frames were changed for making right body posture that make effective performance to use bicycles through which subject was measured inseam to change properly bicycle frames. Thirteen healthy adults who do not have any problem of their body to use bicycle participated this experiment. The result of this study is that ROM, normalized jerk of knee, activation level of Vastus lateralis and heart rate were decreased after fitting.

P-144 트레드밀 보행 시 산술 계산 과제에 따른 보행 가변성의 변화

김한수, 최진승, 강동원, 정순철, 탁계래
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The purpose of this study was to identify effects of the secondary task while treadmill walking on gait variability. Seventeen subjects, 10 men and 7 women, participated in this study. Experiments consisted of two trials for each other. One is normal walking, the other is with a secondary task while walking. For comparing, Coefficient of variance (CV) represent amount of variability and detrended fluctuation analysis (DFA) represent self-similarity from fluctuation were used. As a results, showed that secondary task may influence gait variability during treadmill walking. Further study is necessary to compare this result with that of elderly people.

P-145 생체역학적 요추 배양 시스템을 이용한 생체 외 복합하중에 따른 골다공증이 유발된 척추운동분절의 변화 관찰

박지형[1], 김치훈[1], 조승관[1], 이법이[2], 김한성[1]
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To mechanobiologic analysis about degenerative disc disease through induced osteoporosis 2 Functional Segment Unit cultured by media in Biomechanical Lumbar Control System, only compression load or complex load of compression and shear load condition is applied to situation of progress of degeneration intervertebral disc. Specimens were scanned before cultured in BLCS (0 week) and a week after culture in BLCS by using high resolution in-vivo micro-computed tomography. To observe intervertebral disc change with histological method, we implemented H&E and Safranin-O staining. We tested compression and shear load condition of everyday life applied to induced osteoporosis 2 FSU by BLCS.
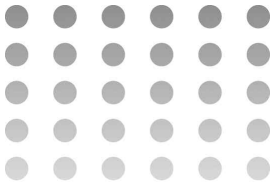
P-146 치과 임플란트 동요도 측정 시스템 개발

김대승[1], 이우진[1], 최순철[2], 이삼선[2], 허민석[2], 허경회[2], 이원진[2]
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Dental implant mobility is one of the important parameters that estimate the success of the dental implantations. Implant mobility measurement is the basic tools for quantitative analysis of implant stability. In this study, we have developed a system for measurement of dental implant mobility to evaluate the implant stability and diagnosis of implantations. Dental implant was fixed into the hole of an acrylic experimental stand with dental impression materials of different solidities. Implant was consecutively tapped with a constant amplitude and frequency and movement of implant was recorded with a sensor. The recorded sequential movement of implant was analyzed in the frequency domain.

P-147 체내이식형 약물주입장치의 일박출량 제어

남경원[1], 김광기[1], 김대현[2], 조영호[1]

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Internal pressure of medication reservoir of the gas−compensated intrathecal infusion pump decreases when medication is discharged, and thisdischarge−induced pressure drop can decrease the volume of medication discharged. To prevent this reduction, the volumes discharged must be adjusted to maintain the required dosage levels. In this study, we developed an automatic control algorithm for an intrathecal infusion pump developed by the National Cancer Center.

P-148 호핑 시 착지방법에 따른 하지 관절 강성도 분석

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연세대학교 의공학과

During hopping and jumping, our legs exhibit characteristics similar to those of a spring. When humans hop in place or run forward, they adjust leg stiffness to accommodate changes in stride frequency or surface stiffness. The spring−mass−model has been often used to describe this type of movements, i.e. hopping, which consists of a body mass supported by a spring. Leg stiffness, joint stiffness were calculated from kinetic and kinematic data. The purpose of the present study was to determine how humans adjust leg stiffness over the difference between soft landing and stiff landing.

P-149 스포츠 마사지의 동작 및 가압력 분석

유제성[1,2], 손종상[1,2], 황선홍[1,2], 송성재[3], 김영호[1,2]

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[3]강릉원주대학교 기계의용공학과

In this experiment, the circular friction massage technique was performed on the trapezius, the levator scapulae, and the deltoid muscles to collect the information on massage pressures and positions, and thus to utilize it in professional massage system design. Massage motion was measured with the 3−D motion capture system and finger pressures were simultaneously obtained with grip sensors. Massage motions and pressure patterns were different on each muscle, and the motion trajectory was similar to the ellipsoidal shape. The trapezius had higher pressure than other muscles. These results could be useful to design a massage system based on biomechanical analysis.

P-150 족관절에 인가한 진동자극이 계단 하강 동작에서 관절각도의 변화에 미치는 영향

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[2]전북대학교 공과대학 바이오메디컬공학부
[3]전북대학교 고령친화복지기기연구센터
[4]전북대학교 헬스케어기술개발사업단
[5](주)식스티플러스

The purpose of this study was to investigate changes in the joint angles. The participants in this experiment were 5 elderly people, each of which was asked to descend staircases of three different heights (8cm, 16cm, and 32cm). As they climbed down the stairs, they received vibration stimulation on the ankle joint. The change of joint angles was analyzed during the stance phase. The joint angle differed according to vibration stimulation conditions. These results mean that ankle joint, knee joint and hip joint were influenced by the vibrations on the ankle joint as the participants descended the stairs. It was concluded that the vibration stimulation on the ankle joint allowed the participants to efficiently climb down the stairs.

P-151 승마가 노인의 균형 능력에 미치는 영향

김동현[1], 최민주[1,2]

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[2]제주대학교 의과대학 의학과

The purpose of this study was to investigate the effects

of horse riding on balance ability in the aged. Fifteen people over 70 years old were chosen to participate in a horse riding program for 30 minutes a day, three times per week for 8 weeks. Their balance ability was evaluated using Berg Balance Scale (BBS) and Balance Performance Monitor (BPM). Paired t-test was carried out to test difference in their balance ability following the horse riding. The results showed significant improvements in BBS (p=.000), sway area (p=.000), sway path (p=.016) and maximum velocity (p=.000) after the horse riding. This suggests that horse riding can be used as a means to improve the balance ability of the aged. Long term studies are required with more subjects before horse riding is taken to clinical application.

P-152 계단 하강 동안 체성 감각 자극에 따른 관절 토크 변화 분석

곽기영[1], 소하주[1], 김성현[3], 김남균[4], 김동욱[2,5]

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[2]전북대학교 공과대학 바이오메디컬공학부
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[4]㈜ 식스티 플러스
[5]전북대학교 고령친화복지기기연구센터

The aim of present study was to describe lower extremity joint torque changed by somatosensory stimulation during stair descent. Subject performed stair descent at four conditions, which are non-stimulation, tibialis anterior tendon stimulation, Achilles tendon stimulation and tibialis anterior-Achilles tendon stimulation. 3D optoelectric motion tracking system is used to capture stair descent motion. The captured motion data was used to build a stair descent simulation model. The result show that the lower extremity joint torque changed with somatosensory stimulation.

P-153 힙업기능이 적용된 승강의자의 생체역학적 평가

배주환, 문인혁

동의대학교 메카트로닉스공학과

Lifting chair is a typical assistive product to aid for standing up and sitting down for persons with disability, and it is particularly useful for the elderly persons whose muscular system is weakened by degenerative joint disease. This paper describes a biomechanic assessment of lifting chair with hip-up function. In experiments we measure 3D motion data and electromyographic (EMG)

signal on the femoral muscle when subjects perform standing motion at three initial seat heights. The experimental results show that 15 degree of the hip-up angle is adequate for the hip-up function, and that the higher seat position is more effective to assist for standing up motion.

P-154 흡수성재질의 골절합용나사의 평가가이드라인 개발

신창훈, 서무엽, 이승영, 최승호, 맹은호
한국화학융합시험연구원 헬스케어 연구소

Bioabsorbable implants are widely used in orthopedic surgery in the current and the worldwide market includes in S. Korea is expanding rapidly. In spite of the popularity of these implants, there are no evaluation guidelines in S. Korea. The purpose of the study was to develop an evaluation method for mechanical performance, physicochemical property and biological safety of bioabsorbable bone screw which used for intra-articular and osteochondral fracture. The development of subjective and harmonized with international standards evaluation guideline was final object of the study.

P-155 기능성 전기 자극으로 인한 심층근 활성도 증진의 욕창 예방 효과 검증을 위한 유한요소모델 개발 및 검증

최혜원, 전경진, 임도형
한국생산기술연구원 실버기술개발단

Functional electrical stimulation (FES) has been proposed as a means to prevent development of pressure ulcers through the redistribution of the internal stresses within the deep tissue of the buttock, which were achieved by the change of the muscle thickness, particular in the gluteus maximus. The objective of the current study was therefore to identify if the FES application may efficiently reduce the incidence of deep-tissue injury, by evaluating the internal stress relief through the change of the gluteus maximus muscle thickness using finite element analysis.

P-156 파워리프트 사용 시 소지구(小指球) 압력분포에 따른 자쪽 신경 질환 유발 가능성 및 손상 감소를 위한 핸들 설계 요소

한바울[1], 최현호[2], 전경진[2], 김한성[2], 임도형[#1]

[1]한국생산기술연구원 실버기술개발단
[2]연세대학교 보건과학대학 재활공학과

Power-lift was developed for carers when they transfered

the elderly people or the patients who were not able to move easily their body. The aim of our study is to analyze the pattern and degree of pressure which is produced from hand over the power−lift handle. Hence, We propose the handle design elements in power lift according to the result from the data. Furthermore, we analysed possibility of ulnar nerve disease in carers by quantitative measurement of the pressure over the hypothenar region. In this study we demonstrate that pressure distribution of hypothenar region varied as the handle shape.

P−157 고령친화용 욕조 시스템 개발에서 간병인의 근골격계 질환 예방을 위해 고려되어야 할 필수 기능 제시

최현호, 전경진, 임도형

한국생산기술연구원 실버기술개발단

This study was aimed at identification of the hypothesis that musculoskeletal disorders (MSDs) can be occurred to caregivers by repeated bath care. One young healthy man was participated in experiments. The joint torque and muscle fatigue were measured using a 3D motion capture system and EMG sensors. The appropriate height of senior−friendly bathtub systems and docking function with power lift reduces the MSDs occurrences.

Respiratory Engineering

P−158 점증부하운동 중, 실시간 환기역치 지점 검출을 위한 알고리즘 개발

최우혁, 김태균, 신태민

연세대학교 보건과학대학 의공학과

Ventilation threshold (VT) is estimated by a variety of methods, such as V−slope and D−max, but these methods have their limitations that can be only applied after the termination of exercise. For this reason, in this paper, it was designed that the algorithm can detect VT and can make exercisers a feedback in real−time, using heart rate. As a result of the verification of VT time determined by real−time algorithm, it has produced the significant result in comparison with VT time determined by respiratory gas analyzer.

P−159 호기−흡기 시간 비율 분포를 이용한 수면 단계 추정

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[2]서울대학교병원 수면의학센터
[3]서울대학교 의과대학 의공학교실

Polysomnography, which needs many sensors attached to patients and complicated processes, is currently widely used to assess sleep quality. In this paper, we noticed sleep−stage−related changes in ex−inhalation time ratio of respiration and suggest the method of sleep stage estimation using ex−inhalation time ratio. All participants underwent polysomnography. We showed that variation of ratios had a tendency to decrease as sleep stages were getting in deep sleep from light sleep. Thus, we used the index based on Shannon entropy in order to quantify the variation of ratios. It could be useful method of estimation of sleep stages. Because respiration is the signal that can be easily measured by nonintrusive way, we expect that proposed simple approach can be used for alternative method for sleep stage estimation.

P−160 자기공명영상장치 내에서의 호흡 모니터링을 목적으로 하는 시온안료를 이용한 광섬유 호흡센서의 개발

유욱재, 장경원, 서정기, 허지연, 문진수, 이봉수

건국대학교 의료생명대학 의학공학부, 의공학 실용기술 연구소

In this study, we have fabricated a nasal−cavity attached fiber−optic respiration sensor that can monitor the respiration of a patient during MR image acquisition. This respiration sensor can measure the temperature variation of air−flow usinga thermochromic pigment. We have measured modulated light guided to photodiode− amplifier system in the MRI control room via plastic opticalfiber due to the respiratory movement of the patient in the MR room, and the respiratory signal of the fiber−optic respiration sensor is compared with that of the BIOPAC® system.

P−161 종양 억제에 관한 대식세포 기능의 수학적 해석

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[2]연세대학교 의공학부

This paper deals with a cellular level model of tumor dynamics in competition with macrophage, which is a main ingredient of immune system. We modeled tumor and the immune system as four populations: tumor, macrophage, immune cell, and extracellular matrix. The model is developed with probabilistic methods analogous to those of kinetic theory. By changing the coefficients related with macrophage in the model, we analyzed the function of macrophage on the control of tumor proliferation.

P−162 지연보급방정식을 이용한 종양의 정량적 분석

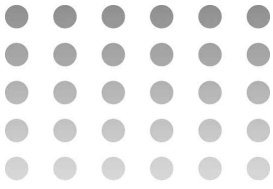박호[1], 김은지[1], 전희철[2], 권기운[1]

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[2]연세대학교 의공학부

The aim of this paper is to analyze the quantitative analysis of tumor proliferation in macroscopic level. Since tumor proliferation has some common appearance with population growth model. The logistic equation is used as one of the most popular modeling equation of the population model. However, it is reported that the number of EAT (Ehrilch ascites tumor) cells in a mouse decreased in some time interval. To compensate the defect of logistic equation about the decreasing interval, delay logistic equation was developed and the mathematical and numerical analysis is given. Numerical verification of the equation for various parameters is implemented.

P−163 심실보조장치 치료 시 심장 에너지 소비에 대한 수학적 연구

임기무, 심은보

강원대학교 기계의용공학과

The benefit of counter−pulsating LVAD in cardiac recovery is still controversy. Reduction of myocardial energy consumption during LVAD support is one possible mechanism of myocardial recovery. Therefore, it is

important to analyze how the LVADs can reduce myocardial energy consumption. We employed three dimensional finite element electromechanical model of failing canine ventricles, which incorporated biophysical representation of cardiac myofilament dynamics and was coupled to a lumped model of the circulator system and LVAD. Using this model, we compared left ventricular peak pressure (LVPP) and total ventricular ATP consumption between pulsatile and continuous pumping conditions. At the optimal counter-pulsation phase, LVPP and ATP consumption decreased to 12% and 50%, respectively. Counter-pulsating LVAD therapy saved 10% more ATP usages as well as unloading 38% more pressure than continuous one. In conclusion, counter-pulsating LVAD will provides more possibility for heart failure to be recovered.

the variation system. The applied frequencies and accelerations were measured and compared using LVDT sensor and 3-axial accelerometer. The statistical treatment techniques of the obtained data were used for the mean, standard deviation, standard error, variance, coefficient of variation. As the statistical treatment values seems to be similar each other. Therefore, these values were fairy similar to the gravity acceleration and vibration frequency from function generator according to the frequencies. As a result, the system is able to apply to the animal experiment. In a further study, clinical experiment will be carried out with the authorization of IRB (institutional review board) so that the role of high frequency and low strain stimulation in osteogenesis and osteonecrosis would be investigated.

P-164 동적조영증강 MRI에서 전립선암 위치 추정을 위한 다종 약물동력학 모델링 기술 개발

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[2]서울대학교 의과대학 영상의학교실

This study illustrates the value of parametric images based on multifarious pharmacokinetic modeling techniques for tumor localization in prostate DCE-MRI by assuming a linear and nonlinear relationship between signal intensity (SI) and contrast agent (CA) concentration. The linear approach described tissue SI enhancement using time-to-peak, wash-in slope, three-time-points method and Brix model. The nonlinear approach was applied to tissue CA concentration change by using Tofts model, Hayton-Brady model, combined Tofts and Brix model, reference region model and open two-compartment model. All kinetic parameter maps were created allowing synthetic assessment of prostate cancer MRI kinetics.

P-165 고주파 저스트레인 골자극 인가용 진동 시스템 개발

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[3]부산대학교 의학전문대학원 의공학교실

In this study, the usefulness of vibration system was evaluated, a variety range of frequencies and accelerations were applied from function generator to

P-166 랜드마크를 이용한 귀의 부분 모델 생성

강세정[1], 안종훈[1], 한종희[1], 이종실[1], 김인영[2]
[1]한양대학교 생체공학과
[2]한양대학교 의과대학 의공학교실

Constructing a three-dimensional computational model from two-dimensional medical images is accompanied by hardships in a few points. In this study, we suggest another approach that simplifies needed steps for the generation of models. For that we manually define landmark points according to some mathematical property of the parts of human ear, for instance, a high curvature point or an extreme point. Then, submodels of the various parts in human ear are generated separately on the basis of the geometric parameterization. In spite of the fact that the consequent mapping is nonlinear, it can take advantage of linear algebra, which gives a closed-form solution.

P-167 폭발에 의한 고막 유한요소 모델의 스트레스 분석

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The tympanic membrane in human ear is especially sensitive to changes of sound pressure. Even though there exist apparatuses to protect it, it is basically susceptible to damages from a considerable change of pressure. Besides, it is quite difficult to observe its responsive behavior as well. Therefore, some forms of simulation are required so that we can understand a

physics of the tympanic membrane. In this study, we carried out them by using a simplified finite-element model of ear that includes external auditory canal, tympanic membrane, and ossicles. Some relevant results are shown and discussed.

P-168 인간 외이도의 3차원 유한 요소 모델링

조아라[1], 강세정[1], 박영민[1], 김도현[1], 박관수[1], 안종훈[1], 김인영[2]

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One of mainstays for understanding a biomedical system is the construction of a computational model that describes it. Its successful construction initially depends on reliable real-world data and efficient ways of extraction. In this context, we generate three-dimensional finite element models of the parts of human ear from cadaver histological section images. We report a series of tasks that are needed to create them, and demonstrate them.

P-169 휴대기기를 이용한 간단하고 신속한 자가 청력검사 방법

박규석, 안홍섭, 이상민

인하대학교 전자 공학부

The automated hearing test takes a lot of time, and it is required concentration of subject. The purpose of this study was a speedy self-test with expectation of hearing level using average and scope in each frequency. We are able to expect that the hearing level of the normal is similar to other frequencies or exist in regular range. Based on the expectation of hearing level, pure tone was generated from device. Under the hearing level of subject, test in some frequency could be skipped. It is able to save the whole time as reducing steps in each frequency.

P-170 넓어진 청각필터 특성을 고려한 난청시뮬레이터에 관한 연구

안홍섭, 박규석, 이상민

인하대학교 전자공학과

The algorithm test for digital hearing aid should be performed with hearing impaired listeners. However it takes a lot of time and high cost, and clinical test for person obtain IRB approval. So it is not easy to test often. Therefore it is required to study of hearing loss simulator. The purpose of this study is to reflect widened auditory filter in the hearing loss simulator. In order to show the widened auditory filter effect we made auditory filter corresponding three and six times of ERB. As a result the frequency of processed signal is smeared and sound pressure is decreased.

P-171 인크레틴 효과를 고려한 혈당 및 인슐린 조절의 수학적 모델 구현

이정찬[1], 김성완[1], 조영민[1], 김희찬[1], 김명선[2]

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The prevalence of type 2 diabetes (formerly non-insulin dependent diabetes mellitus) is increasing worldwide at an alarming rate. Approximately, 10% of Korean adults are suffering from type 2 diabetes. One of the characteristics of type 2 diabetes in Korea is decreased pancreatic beta cell capacity to secrete insulin, which is essential in lowering blood glucose levels. In this regard, the role of incretins, which are secreted after meals and enhance insulin secretion from pancreatic beta cells in a blood glucose dependent fashion. Considering the pathophysiological characteristics of type 2 diabetes in Koreans, a mathematical model is being used to represent relationship among the dynamics of body's blood glucose, insulin, and incretins. In this study, a model is developed to accommodate the changes in these parameters and the model is used to simulate the responses to 50g and 100g oral glucose loads under normal conditions. The model could be further utilized in developing a tailoredclosed-loop control algorithm based on the patient's diabetic characteristics.

P-172 Effect of Inter-Distance in Stimulating Electrodes Designed for Electrical Impedance Plethysmography

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Electrical Impedance Plethysmography (EIP) is one of the ways to detect the pulse rate of the heart. In EIP technique four electrodes are used to detect the electrical impedance variation from the radial artery. The outer electrodes are use to inject the current in the body while the two inner electrodes measure the change in the electrical impedance. The Inter-distance of the stimulating electrode is very important to deliver the current in the radial artery effectively. This paper explains the simulation results of inter-distance between stimulating electrodes utilize for electrical impedance plethysmography using Maxwell simulation software. The result shows that maximum current density reaches the radial artery when the inter-distance between the stimulation electrodes is 12 mm. which is suitable for electrical impedance plethysmography.

P-173 전기용량을 이용한 소장에서 장 운동 측정방법 제안: (전극 및 캡슐 제작)

황대근[1], 웨이췬[1], 지아모이우딘[2], 김태완[3], 원철호[4], 김명남[5], 조진호[1]
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[2]경북대학교 의용생체공학과
[3]경북대학교 수의과대학
[4]경일대학교 첨단의료기학과
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This paper presents the design of a capsule that was created for bowel movement detection from inside the intestinal tract. In order to find out the feasibility of the detection from a small mouse, which had a 2~4 mm diameter small intestine, the size of the capsule was designed as Φ and length of 5 mm and 3 mm and implemented with a rapid prototype (RP) method. Electrodes were designed for flexibility and they could be attached to the circular shape of the capsule. The materials polyimide and gold-coated copper were used to increase the biocompatibility of the electrodes. The capsule worked successfully in the small intestine, and there was no visual evidence of corrosion or melting of adhesive on the capsule.

Tissue Engineering and Biomaterials

P-174 설치류의 두개골 재생을 위한 폴리이미드 기반의 전극 디자인

김정훈[1], 조태형[2], 김인숙[2], 황순정[2,3], 김성준[1]
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[2]서울대학교 치과대학 치의학 연구소
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In this paper, we designed a polyimide based electrode for rat skull regeneration. This electrode is made up with biocompatible material. The electrode has two circular bases which has a site shaped star mark. The electrode can be folded and stimulate the entire scaffold by forming 3D electrical field. Also, the area except electrode site, electrode has a sufficient size of pore for cell inflow. This design of electrode can allow the entire stimulation and cell inflow.

P-175 바이오프린팅 시스템의 미세 반력 측정 및 피드백을 위한 연구

송승준[1,2], 최재순[1,2], 박용두[1,2], 이정주[1,2], 홍소영[1,2], 선경[2,3]
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[2]고려대학교 한국인공장기센터
[3]고려대학교 의과대학 흉부외과

Bioprinting is an emerging technology for constructing tissue or bio-artificial organ of complex 3D structure, which provides with high precision spatial shape forming ability in larger scale than conventional tissue engineering methods and with simultaneous multiple components composition ability. It utilizes computer controlled three-dimensional printer mechanism for the three-dimensional biological structure construction. To implement measurement of the hardness and rigidity of the printed bio-structure in a hydrogel-based bioprinting system, a study on the mirco reaction force measurement and feedback has been performed by force sensor.

P-176 PDMS 전극의 생체적합성 처리 방법

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[2]고려대학교 보건과학연구소

Neural interface technology is based on hybrid
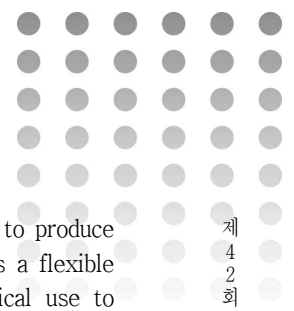
technology such as neuroscience, signal processing and neural electrodes. Neural electrodes is essential technology of neural interface and required must have long−term biocompatibility. In this paper, we present the biocompatibility treatment methods to the PDMS based electrode. For the stable immobilize the anti gliosis agent, we have used the swelling effect and mixing process of PDMS. 7β−hydroxycholesterol and 7−ketocholesterol was used anti gliosis agent. The treated PDMS was confirmed immobilize the anti gliosis agent by FT−IR.

P−177 세포 적층 기법으로 제작된 하이브리드 3차원 지지체의 골연골 조직 대체 가능성 평가

한정윤[1], 박소희[1], 김동화[1], 신지원[1], 김수향[1], 강윤경[1], 신정욱[1,2,3]

[1]인제대학교 의용공학과
[2]인제대학교 First Research Team/고령자라이프디자인 연구소
[3]인제대학교 심혈관 및 대사질환센터

The purpose of this study is to fabricate and evaluate 3−dimensional hybrid scaffolds for osteochondral defects utilizing rapid prototype processing. For this, alginate and poly−caprolacctone containing 10 wt% hydroxyapatite powder were used to make the hybrid scaffold. Mesenchymal stem cells (MSCs) were seeded on the hybrid scaffold and cultured in cocktail media. Also, intermittent hydrostatic pressure was applied to reconstitute mechanical micro−environment. To evaluate the regenerative potential, DNA contents and GAG assay were performed. From the results, the hybrid scaffold could be useful for osteochondral differentiation of MSCs.

P−178 유연하고 변형이 가능한 파라필름의 세포배양기판으로서의 응용: 쥐의 해마 신경세포를 이용한 가능성 연구

유상진, 남윤기

KAIST 바이오 및 뇌공학과

A variety of materials has been applied to cell culture substrate to provide pertinent growth condition and to control the cell properties. Herein we show the Parafilm® canbe novel layer as a culture substrate. The development of hippocampal neurons in culture demonstrate that Parafilm® is not only biocompatible substrate, but there are no constraints of shape and kinds of substances to cell culture due to the its completely stretchable and

moldable properties. Moreover, it is simple to produce microstructure surface, because Parafilm® is a flexible thermoplastic. Our study, thus, have practical use to brilliant cell culture substrate.

P−179 XFEM을 이용한 생체 복합 물질인 인간 치아 에나멜의 파괴 인성 평가

다네시와 미시라, 박창용, 유승현

아주대학교 기계공학과

This work is focused on developing a numerical model for upper layer of human tooth, 'enamel' in FEM tool ABAQUS considering its functionally graded micro structure and material property and evaluated fracture toughness in terms of Stress intensity factor and J−Integral and simulate crack growth with various crack geometry and orientations. The fracture toughness estimate for enamel suggests it is location dependent rather than one material property like most of the artificial materials. The crack bridging behavior was simulated very efficiently by spring elements which show partial crack closure and overall increase in fracture strength at location of the crack.
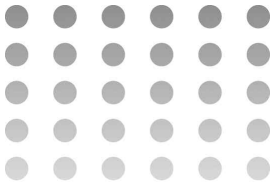
P−180 프로그램형 약물전달을 위한 이식형 마이크로칩

이승호[1], 박민[2], 박천권[2], 이지은[1], 최영빈[1,2,3]

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[2]서울대학교 바이오엔지니어링 협동과정
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We fabricated implantable poly (methyl methacrylate) (PMMA)−based microchip designed for programmed drug delivery. The microchip was manufactured by the microfabrication technology, where the microwells and the microchannels of precisely controlled geometry could be successfully prepared. The channels were filled with biocompatible polymer (polyethylene glycol) and were employed as a drug diffusion barrier. The wells were filled with fine powder of the drug. We have prepared the microchips with five different channel lengths and are now testing their drug release profiles.

P−181 펄스형태의 약물전달을 위한 이식형 튜브 디바이스

박민[1], 박천권[1], 이승호[2], 최영빈[1,2,3]

[1]서울대학교 바이오엔지니어링 협동과정
[2]서울대학교 의과대학 의공학교실
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Tubular devices were fabricated by assembling individual tubes filled with a model drug or polyethylene oxide (PEO), which act as either a drug reservoir or a diffusion barrier, respectively, for pulsatile drug delivery. The tubes of various lengths were prepared by filling them with PEO to vary the onset time and the sustained period of drug release. In vitro drug release study showed that as the length of the tube filled with PEO increased, the lag phase of drug release became longer, showing pulsatile drug release profiles. Therefore, we conclude that pulsatile drug release can be achieved and also be accurately tailored using the tubular devices with controlled geometry of the tubes designed as a drug diffusion barrier.

P-182 인간 지방유래 줄기세포와 다공성막을 이용한 인간배아줄기세포의 배양법

황승태[1], 강선웅[1], 이수홍[1]

[1]차의과학대학교 의생명과학과

For clinical application of human embryonic stem cells (hESCs), it is critical to develop hESC culture techniques that completely exclude the use of animal feeder cells, mitotic inhibition, and enzyme treatments used in conventional hESC culture systems. Toward this goal, we attempted to maintain hESCs and induced pluripotent stem (iPS) cells on porous membranes (PMs) with proliferative human adipose—derived stromal cells (ASCs) seeded on the bottom surface of inverted PMs. This culture condition will ensure that the two cell types are separate from each other, yet retain the ability to interact through the pores of the membrane. We found that hESCs and iPS cells can be maintained stably and mechanically transferred without the need for enzyme treatment.

P-183 실런의 농도가 지르코니아와 레진시멘트의 결합강도에 미치는 영향

하정윤[1], 권태엽[1,2], 김교한[1,2]

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[2]경북대학교 치과대학 치과생체재료학교실

Similar to any restorative material, successful cement— ation of zirconia is important for the clinical success of the restoration. Good adhesion is important for high retention, prevention of microleakage, increased fracture and fatigue resistance, and is mediated by the use of resin—based cements. The shear bond strength between the resin cements and zirconia was significantly high in 1% silane primer group, independent of the resin cements used. Using silane primer, the resin cement of better degree of conversion was effective in bonding to zirconia. Without a silane primer, the resin cements containing MDP were effective in bonding to zirconia.

P-184 일반소환과 급소환으로 주조시 크라운 접확도의 비교

이용수[1], 하정윤[1], 권태엽[1,2], 김교한[1,2]

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[2]경북대학교 치과대학 치과생체재료학교실

The purpose of this study was to evaluate the crown accuracy between accelerated procedure and conventional procedure in using pattern resin and ringless method. This study was measured with marginal gap, surface roughness and thermal expansion. The average maximum temperature and average time was analyzed with a thermometer. There was no statistical difference in the marginal discrepancy and surface roughness of cast crowns made by using accelerated technique as compared with conventionally made crowns. Clinically acceptable complete castings can be obtained with the accelerated technique.

P-185 치과용 임플란트 어버트먼트 스크류의 기술적 개선

최일경[1], 권태엽[1,2], 김교한[1,2]

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Implant abutment screws are frequently used in the constructing process of secondary frames for dental implants. Many times, secondary framing fails due to the fast wearing and abrasion of the implant abutment screw. Testing was done by changing the shape of the hexagonal screw head, and also by using a combination of hexagonal wrench and slot (flat) wrenches to measure the differences in abrasion and loosening. Results showed that through these technical changes, loosening was significantly decreased —after frequent use.

P-186 Shell형 탄성체 약물주입기의 주입압 및 주입량

강성민[1], 최성욱[2]

[1]강원대학교 기계의용공학과

The drug—infuser is developed for the continuous drug
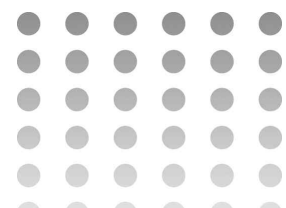
delivery to the patients at home. Electrical-mechanical ·implantable·elastic drug-infuser have already been used for the continuous drug delivery. However, they are expensive and inconvenient for the patient to carry without a cart or stand. but the elastic drug-infuser is inexpensive and simple structure, and It doesn't maintain the flow rate due to end-depressure. In this paper, a shell-shaped elastic drug-infuser is designed to solve end-depressure and the controller is devised to be able to change the position, according to controlling flow rate. They measured the accuracy of flow rate by in-vitro.

P-187 니페디핀의 선형전달을 위한 나노섬유시트 기반의 시스템

박천권[1], 김은지[2], 박민[1], 박정환[3], 최영빈[1,2,4]

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[2]서울대학교 의과대학 의공학교실
[3]경원대학교 바이오나노대학 및 가천바이오나노연구센터
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Nanofibrous sheets were fabricated by the electrospinning method for linear delivery of nifedipine. To obtain 100% nifedipine release during 24 h, we first prepared the tablet with a blend of nifedipine and polyvinypyrrolidone (PVP), which in turn, was covered and sealed with the nanofibrous sheets. The sheets of different thicknesses were prepared to vary the rate of drug release. In vitro drug release tests showed that as the sheet thickness increased, drug release was more retarded, where a lag phase of drug release became more evident. A combination of the two tablets capped with the sheets of different thicknesses exhibited linear release of nifedipine during 24 h.

P-188 정전분무 스피닝법에 의한 지르코니아 섬유의 제조 및 *In-Vitro* 시험

황규석, 강보안, 김옥균, 김승대[1], 황보승[2]

남부대학교 의료공학과
[1]상계직업학교 비파괴 품질 검사부
[2]호남대학교 광전자공학과

Polyvinylpyrrolidone/zirconium isopropoxide composite fibers were prepared by using sol-gel processing and electrostatic spinning. After heat treatment at 500C for 30 min in air, zirconium dioxide fibers with a diameter of 40~60μm could be successfully obtained. Crystallinity and surface morphology of the fiber were analyzed by using an X-ray diffraction θ-2θscanning and field emission-scanning electron microscope. Bioactivity of the samples was evaluated by immersing the specimens in a simulated body fluid.

P-189 외과적 창상의 통증 경감을 위한 이부프로펜 전달기능 생체흡수성 봉합사 개발

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

[1]서울대학교 의과대학 의공학교실
[2]서울대학교 바이오엔지니어링 협동과정
[3]서울대학교 의과대학 성형외과학교실
[4]서울대학교 의학연구원 의용생체공학연구소

We developed biodegradable sutures with pain-relief functionality in this work. To retain the original mechanical strength of surgical sutures, our approach was to employ the original sutures and just to modify the surfaces for delivery of pain relieving drug, ibuprofen. Therefore, we prepared drug-loaded nanofibrous sheets by the electrospinning method, which are covered and attached to the surface of the biodegradable sutures. As a result, the coated sutures could be loaded with 98.9 μg ibuprofen per 4 cm of its length. In vitro drug release tests are in progress to examine the sustained drug-delivery property of the coated sutures.

U-Health, eHealth Technology

P-190 기능성 이식형 의료기기의 가이드라인 개발 연구

김성민, 정재훈, 박성윤

동국대학교 바이오시스템대학 의생명공학과

In this study of 'implantable cardiac pacemaker' and implantable defibrillators' and 'implantable infusion pump' in implantable medical devices develop guidelines. Guidline based on the relevant international standards through a comparative review of safety and performance tests and performance ratings derived proceed to evaluate the validity of entries and assessment methods were set up, user notes and additional design and construction considerations and aims to develop guidelines for each commodity.

P-191 SVM을 이용한 잡음신호의 특징추출

서상완, 한종희, 지윤상, 홍성화, 이상민, 김동욱, 김인영, 김선일

한양대학교 의용생체공학과, 성균관대학교 의과대학 이비인후과교실, 인하대학교 전자공학과, 삼성종합기술원 바이오헬스연구실

In the surrounding noise environment, the hearing aid uses the various noise reduction algorithms and in order to enhance the higher speech recognition rate it has to use the environment according to the noise environment changing rapidly. Accordingly, when applying to the noise environment which noise feature extraction and changes rapidly, then it makes. This experiment by using ZCR, STE feature extraction from the time domain frequency domain Spectral flux, and MFCC feature extraction. By using the SVM of WEKA, the environment was classified the stationary noise and non stationary noise by and the accuracy about this was confirmed.

P-192 난청시뮬레이터를 이용한 압신기법의 성능 연구

황윤수[1], 한종희[1], 지윤상[1], 홍성화[2], 이상민[3], 김동욱[4], 김선일[1], 김인영[1]

[1]한양대학교 의용생체공학과
[2]성균관대학교 의과대학 이비인후과교실
[3]인하대학교 전자공학과
[4]삼성종합기술원 바이오헬스연구실

People with sensorinerual hearing loss often have difficulty in understanding speech in noise environment. To enhance speech recognition in noisy environment, spectral enhancement technique has been developed. In this paper, we simulated NAL-NL1 and combined companding to examine moderate-to-severe hearing loss on the intelligibility of speech in speech-shaped noise. Companding algorithm was used by four types of filterbank. We evaluated cepstral distance measure (CEP). Consequently, using NAL-NL1 combined with companding algorithm was better CEP than NAL-NL1 for different SNRs (0, 5, 10, 15dB).

P-193 Non-Uniform FFT를 사용한 다채널역동범위압축 시스템

김희평[1], 한종희[1], 이상민[2], 김동욱[3], 홍성화[4], 김선일[1], 김인영[1]

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[3]삼성종합기술원 바이오헬스랩
[4]성균관대 의과대학 이비인후과교실

In this study, we suggest a wide dynamic range compression (WDRC) using optimized least-square non-uniform FFT (OLS-NUFFT) for matching the frequency resolution of DHA to the frequency resolution of bark scale. WDRC using OLS-NUFFT was based on the side-branch compression structure. OLS-NUFFT is used to supply non-uniform spacing in frequency domain and a memory efficient approximation. We used model based design using Simulink for easy modification and integration with other algorithms. This study aim is enhancement of speech intelligibility and quality by WDRC using OLS-NUFFT.

P-194 안드로이드 기반의 스마트폰을 이용한 실시간 생체신호 모니터링 시스템

한영면[1], 노연식[1], 정재훈[1], 황인섭[1], 윤욱진[1], 정인철[1,2], 윤형로[1]

[1]연세대학교 의공학과
[2](주)누가의료기

This study designed real-time monitering system using Android-based smartphone. Biosignal Acquisition Module to support Bluetooth acquire subjects' vital signs, such as RR-Intnerval, QT-Interval, body surface temperature, data of three axis accelerometer. And The application of smartphone is designed to search Biosignal

Acquisition Module, Pairing, Connection, Data transmission. Thus, Subjects' vital signs are monitored in smartphone. As a result, u Health Care − Services in the development of Android−based mobile platform in preparation for the development of the existing barrier was found to be low.

environmental conditions were classified into four classes such as babble noise, car noise, traffic noise and white noise. From powers of the 9 melbands, features were extracted and fed to support vector machine (SVM) using linear kernel to classify the environmental conditions.

P−195 Design of a MISO PID Controller for Real−time Biofeedback Exercise system

황인섭, 노연식, 윤욱진, 정재훈, 한영면, 정인철, 윤형로

연세대학교 의공학과

This study designed MISO Proportional−Integral−Derivative (PID) for exercise system in real−time biofeedback. It consists of Biosignal Acquisition Module for measuring subjects' vital signs, Control PC for controlling, and Exercise unit for presenting treadmill speed (exercise prescription) to the subjects. Targeting 6 healthy subjects, the experimental protocol was performed with 5 minutes for Resting, 10 minutes for Exercise, and 5 minutes for Cool Down. As a result, it proposed Target HR as exercise quantity, which was established by subjects' age with the exercise quantity in line with each individual of subjects, compared its difference through Current HR and HRV, and gave feedback to subjects with treadmill speed.

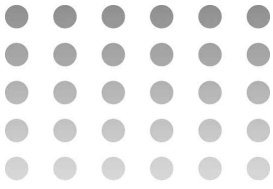## P−197 개인별 음성전달 특성/예측을 위한 Head−Related Transfer Function 모델링

박찬범, 김민지, 조경원, 김희평, 한종희, 김인영, 김선일

한양대학교 의용생체공학과

Head−related transfer function (HRTF) is generally used for three−dimensional (3D) sound analysis and reconstruction. Due to the different head shape, it varies from individual to individual. This paper proposes a method of modeling a personalized HRTF. The head and shoulder of a manikin were scanned in 3D and reconstructed into a 3D model. Putting this model on a virtual cubic room, a computer simulation of sound propagation was performed with an impulse sound source. For the evaluation, experiments on the sound propagation were performed in a real environment using a sound booth and the real manikin. To evaluate the difference between the simulation and experiment, inter−aural time difference (ITD) was calculated and compared. As a result, ITDs in both results showed a high correlation.

P−196 Simulink를 이용한 실시간 환경적응형 보청기 잡음제거 알고리즘 기술 개발

육순현[1], 한종희[1], 박관수[1], 이상민[2], 홍성화[3], 김동욱[4], 김선일[1], 김인영[1]

[1]한양대학교 의용생체공학과
[2]인하대학교 전자 공학과
[3]성균관대학교 의과대학 이비인후과학교실
[4]삼성종합기술원 바이오헬스 연구실

In digital hearing aids (DHA), noise reduction is indispensable to improve the speech quality and intelligibility. However, it is still required to develop a robust algorithm in various noise circumstances for DHA. This study suggests an adaptive noise reduction algorithm which combined an environment classification system and multiband spectral subtraction (MBSS) in order to adaptively subtract noise components by using Simulink in real time. For non−speech periods,

P−198 Mental Health Promotion System

J. S. Han, Umar Farooq, J. H. Park, S. H. Park

Dept. of Biomedical Engineering, Kyung Hee University, Korea

In this paper, we propose amental activity promotion system targeted for elderly people. The system consists of mental training and test sessions that evaluates life style of user, evaluates the possibility of dementia, and evaluates the cognitive ability of mind related to decision making ability, logical ability, concentration ability, and memory ability and in situations with time and space. The system is designed to be easy to use by the elderly people using intuitive interface.

P-199 청각을 이용한 시각재현 시스템 개발

김정훈[1,2], 이종민[1], 김덕규[2], 원철호[3]

[1]경북대학교 대학원 의용생체공학과
[2]경북대학교 대학원 전자전기컴퓨터
[3]경일대학교 제어계측공학과

The final goal of our research is developing not a simple collision alarm equipment for the blinded walkers. the apparatus (Audio-Vision System) which can Audio-vision based on auditory information so that the blinds can figure the three dimensional space in front of them. On the way to the final goal, in this study, simulation software was developed and verified.

P-200 가속도 센서를 이용한 낙상 및 활동 방향 검출

이해림[1], 박성민[1], 김종태[1], 노정훈[2], 전계록[2]

[1]부산대학교 일반대학원 의공학협동과정
[2]부산대학교 의공학교실

The aged are faced with increasing risk for falls. The aged have the easily fragile bones than others. When falls have occurred, it is important to detect this emergency state because such events often lead to more serious illness or even death. Compared obtained axis data of x and y and estimated fall directions and motions using compared data. The result of analysis, comparison of x and y data is flexible data for estimating fall directions and motions.

P-201 생체전위 측정을 위한 나노웹 섬유전극의 성능검증

이경신[1], 김태의[1], 위헌[1], 윤선[2], 오동인[1], 김갑진[2], 우응제[1]

[1]경희대학교 동서의료공학과
[2]경희대학교 고분자섬유신소재과

A ubiquitous health care system requires long-term monitoring of biopotential signals from subjects. Compared with conventional Ag/AgCl electrodes, textile dry electrodes are more suitable for a wearable sensor network. In this study, we report comparison of five different textile dry electrodes based on electrospun conductive nanofiber webs and metal plated fabrics. We evaluated five performance indices including the contact resistance, step response, noise, signal fidelity and long-term stability. We found that textile dry and washable nanofiber web electrodes are advantageous than metal plated fabric electrodes since they are more flexible,

comfortable and durable in addition to good electrical properties.

P-202 나노섬유 웹 전극을 이용한 생체신호 측정벨트

송성우[1], 김태의[1], 위헌[1], 윤선[2], 오동인[1], 김갑진[2], 우응제[1]

[1]경희대학교 동서의료공학과
[2]경희대학교 고분자섬유신소재과

We have developed a flexible fabric sensor belt including nanofiber web dry electrodes and piezoelectric sensors. The belt is apt for a ubiquitous healthcare system where long-term monitoring of biological signals in daily living environments is needed. We demonstrate measurements of ECG, pulse, respiration, and real-time EIT images using the belt. The belt allows simultaneous detections of cardiac and respiratory events providing with high stability and redundancy, which are desirable in biological signal measurements in daily living environments.

P-203 성문전도를 이용한 발화기본주파수 모니터링

김지혜, 이제현, 김호성, 박은주, 정동근

동아대학교 의과대학 의공학교실

Recently, professional voice user increased, so the public are interested in their voice. Voice is made by the coordination of respiratory, phonatory, resonatory and articulatory organs. Vibration of vocal cord could be recorded conveniently with electrocardiography (EGG) without any constraints of time and place. Furthermore, monitoring of EGG is effective to train the voice-disordered patients. In this study, we have implemented the monitoring system of speaking fundamental frequency of voice during verbal task.

P-204 무선 혈당 측정 및 전송 모듈 개발

최성수, 이인광, 김도경, 박미숙, 박경순, 정아름, 이한나, 차은종, 김경아

충북대학교 의과대학 의공학교실, CBITRC, 차세대 선도 의과학전문인력양성사업단, 충북대학교

Self blood glucose test is very important for diabetes management, and usually performed with the capillary
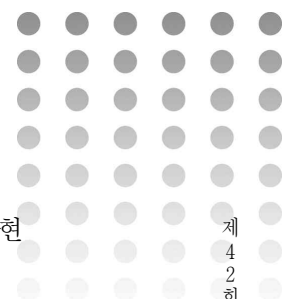
blood sampled from the finger. The conventional glucometer enables to simply measure the glucose concentration but with neither accumulation nor management of the measured data. The present study developed a module measuring as well as transmitting the glucose level in a wireless way by the zigbee protocol. User program on PC was also developed for monitoring the received data, which will be of great convenience to manage the diabetes.

P-205 무선 폐활량검사 모듈 개발

이인광, 최성수, 김도경, 한순화, 한정수, 정재관, 이수옥, 차은종, 김경아

충북대학교 의과대학 의공학교실, CBITRC, 차세대 선도 의과학전문인력양성사업단, 충북대학교

Asthma patients requires regular self spirometric test in addition to medication. The peak expiratory flow (PEF) meter has been used to monitor PEF only in a manual way. The present study developed a new electronic spirometry technique with a wireless transmission module to a nearby PC.

P-206 임피던스 변환회로를 이용한 능동 뇌파 전극개발과 성능 시험

고덕원[1,2], 이관택[2], 이찬희[3], 정영진[4], 김성민[4], 임창환[4], 정기영[1,2]

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[2]고려대학교 의과대학 신경과학교실, 안암병원 신경과
[3]고려대학교 노인건강연구소
[4]연세대학교 의공학과

Active dry electrode is an alternative to the wet type electrode as they can be applied without any skin preparation due to conductive electrolyte application. However self−generated noise from operational amplifier should be increase in proportion to its gain. The purpose of this study was to develop the active dry electrode using impedance converting circuitand to compare the performance during EEG with conventional Ag/AgCl electrode. EEGs were recorded on three young healthy subjects, and power spectra were analyzed. The EEG power spectra acquired by active electrode were comparable to those of conventional Ag/AgCl electrode.

P-207 보행 기반의 실내 위치 추적 시스템 구현

강구태, 박경태, 정동근

동아대학교 의과대학 의공학교실

Recently, determination of an accurate position has been a research issue for many years. To meet this need, many different location system and technologies have been developed. In this paper, we present a novel approach to location system under indoor environment. The key idea of our work is accurate distance estimation with walking−based location system. Finally, we suggest how this system can be used in various applications such as asset tracking and monitoring.

P-208 스마트폰 기반의 PPG 영상 시스템에 관한 연구

백현재[1], 김현석[1], 박광석[2]

[1]서울대학교 협동과정 바이오엔지니어링전공
[2]서울대학교 의과대학 의공학교실

With the popularization of smartphones, healthcare applications have been widely studied and developed. Recent remarkable idea showed that heart rate could be monitored without any external devices, only using embedded video recording system. The methodology is very similar with our previous PC based contactless PPG imaging system. Therefore, we briefly tested our previous method with off−line processing in videos recorded using 'iPhone4' and 'Galaxy S'. Experi− mental results showed that heart rate could be monitored using embedded video camera, even without LED flash as a light source. Future complete system with mobile programming may enable cost−effective portable system for heart rate monitoring.

P-209 SMS을 이용한 실시간 트레이닝 풀 온도 모니터링 시스템 설계

박성수, 엄태웅, 김기태

건국대학교병원 의공학팀

In this paper, we developed the real−time temperature monitoring system for training pool by using SMS (Short Message Service). The proposed system is able to monitor temperature of the training pool which uses rehabilitation of patients via temperature sensor and Labview application software. If the measured temperature is different from limitation, the system sends the cellular phone message to users to notify abnormal temperature
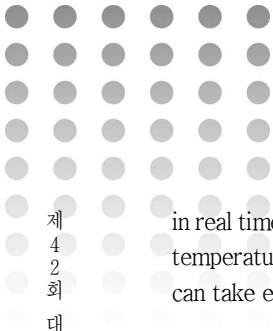
in real time. The proposed system can inform the abnormal temperature from the cellular phone message and users can take emergency measures.

P-210 전자기유도식 무선 전력 전송회로에서 안정적 주파수 획득을 위한 제어 시스템

천원주[1], 유순기[2], 김소희[1,2]

[1]GIST 의료시스템 공학학제전공
[2]GIST 기전공학부

In biomedical implant devices, researchers have used inductive coupling as an alternative to batteries to supply power. Although it is desirable that two coupled coils operate at the same resonant frequency, resonant frequency varies according to temperature change and physiological environment when the device is implanted. We propose a self−tuning resonance circuit to compensate for and maintain desired resonant frequencies within environments affecting resonant circuit components. The resonant frequency of the transmitter circuit was measured and controlled by means of parallelly added variable capacitances controlled via LabVIEW.

P-211 의료용 고주파 출력을 위한 에어 콘덴서 기술 개발

이범주, 오영준, 김동현

㈜제중메디칼 부설연구소

The aim of this research is to develop air variable condenser for precise output control of electrosurgical unit with high frequency. We introduce design of thin−film plate consisted of multi electrode layer and make the condenser through our design. And we also provide the result of analyzing of the output. We developed the air variable condenser which removed the damage of a short circuit and accumulated high capacitance through this research.

P-212 상반정리에 기반한 정전 용량식 유도

조성보

가천의과학대학교 의공학과

A capacitance formula was derived based on the reciprocal theorem, which can be utilized for various object structures or electrode sizes and configurations. By the finite element method simulation with a compound cylinder model, it was found that the capacitance values achieved from the derived formula were agreed with ones from the classical equation for the dielectric between two flat parallel conductive plates.

P-213 60Hz 전자기장 과민반응 증후군의 인지정확도

양동인[1,2], 남기창[2,3], 권민경[2,4], 김덕원[1,2,4]

[1]연세대학교 생체공학협동과정
[2]연세대학교 의과대학 의학공학교실
[3]세브란스병원 의료기기임상시험센터
[4]연세대학교 의과대학 의과학과

Electromagnetic hypersensitivity (EHS) is a self attributed syndrome caused by exposure to electromagnetic fields. In this study, we investigated perception accuracy for EHS and non−EHS to assess that EHS are able to distinguish between exposure to real and sham electromagnetic fields. Experiment consists of real and sham session and 60Hz 12.5uT magnetic field was on (real) or off (sham) to 15 EHSs and 16 non−EHSs. As the results, there was no evidence that EHS group perceived the EMFs correctly than the non−EHS group.

Biomedical Engineering Education and Career

P-214 국내 2등급 의료기기 인정규격 개발 연구

최병철[1], 손정만[1]

[1]춘해보건대학 의료공학과

we developed guidelines applicable to the domestic products, expansed plans have been arranged in standards recognized by the suggested medical devices. For development new recongized standards products, we had management of industrial-council for excavation, Finally we suggested recognized standards of medical devices (class Ⅱ) is written notice of the product.

For the efficient functioning of the assessment of technical files, currently conducted in a most unsatisfactory manner related to civil applications in the KFDA, it is proposed that a restricted number of technical personnel at the KFDA and the prompt performance of assessment procedures be implemented by transferring the assessment of technical documents for class II, low-risk medical devices to currently available registered testing & inspection institutions.

P-215 의료기기 품목별 기술문서 심사기준 지침서 개발 연구

최병철[1], 한현용[1]

[1]춘해보건대학 의료공학과

This studdy research and analysis with construction of 413's certification standard given by Japan's Ministry of Health, Labour and Welfare, and survey and analysis of class Ⅱ product in the domestic, comparative analysis with the class Ⅱ products in Japan and Korea, Founding of applicable medical devices products and derived products.

Screening guidelines of proposed resulting from the study will bring to ensure international competitiveness of domestic medical device manufacturers by pursuing a private validation system for validation specifications and allowing private institutions to perform certification affairs as well as having to assess technical documents, attempts were made to develop an certification system for medical devices.

P-216 접지가 의료기기 전자기파에 미치는 영향에 관한 고찰

서현원[1], 김원규[1], 김태종[1], 임효순[1], 김병태[1,2]

[1]삼성서울병원 의공학과
[2]성균관대학교 의과대학

Dependency of medical device is going up on environment of medical care. And, the time of exposure by medical devices is going up and happened more frequently. In this kind of situation, the worry regarding malfunction of normal medical devices is going bigger because of medical devices generating abnormal electromagnetic wave. So, in this paper, we identified that how the ground of medical devices used near by patients can affect to conducted emission electromagnetic interference (CE EMI) and considered the test results. Malfunction device (non ground for power and circuit) influenced value of CE EMI. The value of malfunction status rose up a little than normal status.

P-217 핵의학시설 설계를 위한 3차원 모사

이해준, 황경훈

가천의과대 길병원 핵의학과

It is very important to design the laboratory facilities considering the work-flow and patient-care in hospital design. Recently, 3-dimensional simulation methods are used in the design of hospital facilities. We used 3-dimensional tools in designing the nuclear medicine facilities of new hospital, considering effective workflow and patient-care. However, further effective methods may be warranted.

P-218 복강경 시스템 CO_2 공급장치 개선에 관한 고찰

김승엽, 이호석, 전석봉, 임효순, 김병태[1]

삼성서울병원 의공학과, [1]성균관대학교 의과대학

The CO_2 in sufflator for the laparoscope system is an indispensable part to keep the patient's abdominal pressure during an operation. The CO_2 insufflator using an external cylinder has been a typical system composition. But it is difficult for its users to manage the external cylinder in safe. In this paper, we reviewed the essential factors for changing the external CO_2 cylinders to the centralized CO_2 supply system.

P-219 의료용 원형가속기(Cyclotron)의 고장 유형 분석을 통한 주요 부품별 MTBF 분석과 가동률에 관한 고찰

천승민[1], 기선우[1], 서기홍[1], 임효순[1], 김병태[1,2]

[1]삼성서울병원 의공학과
[2]성균관대학교 의과대학

In medical technology, the cyclotron is a type of particle accelerator and cyclotron beams can be used to bombard other atoms to produce short-lived positron-emitting isotopes suitable for PET imaging. As the uses of PET increase steadily, the uses of cyclotron are also increasing. In this paper, we analyze MTBF and MTTR of major parts of cyclotron and present our own method for improving of operating ratio to get better.

전공소개 | 교육 | 연구/교수진 | 게시판 | 입학안내 | ENGLISH

전공소개 | 교직원 | 오시는 길

INTERDISCIPLINARY PROGRAM OF BIOENGINEERING
SEOUL NATIONAL UNIVERSITY COLLEGE OF ENGINEERING
INTERDISCIPLINARY PROGRAM OF BIOENGINEERING

서울대학교교공과대학협동과정
바이오엔지니어링전공

INTRODUCTION

전공소개
교직원
오시는 길

Home > 전공소개   top ▲

전공소개

15년 역사를 가지고 있는 공과대학 내 2개의 대학원 협동과정인 생물화학공학 전공과 의용생체공학 전공을 발전적으로 통합하여 2007년 3월부터 바이오엔지니어링 전공(Interdisciplinary Program of Bioengineering)으로 새롭게 출범하였습니다.

생명공학기술은 생물학, 의학, 물리학, 화학, 정보학, 전기공학, 전자공학, 화학공학, 재료공학, 기계공학 등 다학제적 융합 기술로 발전하고 있으므로 기존의 생물화학공학 전공과 의용생체공학 전공 참여 교수 이외에 타 단과대학 및 공과대학에서의 참여교수 확대하며 향후 5개의 전공모듈(바이오 전자, 바이오 기계, 바이오 재료, 바이오 분자공학, 바이오 정보학/시스템)로 발전할 것입니다.

바이오엔지니어링 전공

서울대학교
공과대학

• 바이오 전자
• 바이오기계
• 바이오 재료
• 바이오 분자공학
• 바이오 정보학/시스템

치과대학
의과대학
농생명과학대학
자연과학대학
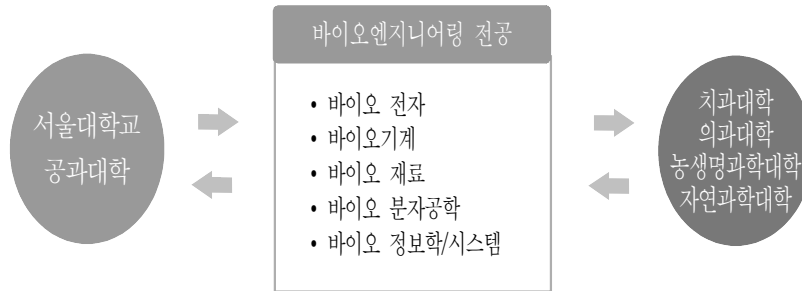
다양한 학문 융합분야의 전문화된 지식을 효율적으로 학생들에게 전달시킴으로써 바이오엔지니어링 분야의 세계수준 연구자를 양성할 수 있는 시스템을 제고하고, 바이오 관련 연구들의 긴밀한 네트워크를 구성함으로써 융합분야 연구 내용을 첨단화하여 연구결과의 세계적 경쟁력 확보를 유도 합니다.

top ▲

의생명계측
시스템

생체신호처리
의료영상
시스템

의료용재료
인공장기

바이오엔지니어링
전 공

환경보전
기술

재활 및
복지기기

화학소재
기능성소재

치료용단백질
바이오의약품
생산

EMG / EP SYSTEM

DIGITAL EEG/PSG SYSTEM

MAGNETIC STIMULATOR

CareFusion

GRASS TECHNOLOGIES An Astro-Med,Inc Subsidiary

magstim

Viking Select

- **8, 4, 2ch. 의 recording 능력**
- 자동적인 EMG & Audio 재생 가능한 live play 기능
- 편리한 모니터 조정 및 control panel 기능
- 검사하는 동안의 실시간 자료를 저장 가능한 producer 기능(AVI파일)
- NCV의 선택된 trace의 post avefaging
- Stim artifact 제거용 Enhance mode 기능
- 신호 Invert, rectify 기능 활용 가능
- Tremor, TST, back averaging, MUNE 측정가능
- 검사 순서대로 측정 할 수 있는 Studies 기능
- 신경전도 분포도 (CVD) 분석가능
- 결과 table 상에서 좌·우측 결과치 비교분석 가능

Comet

- **EEG 40채널까지, PSG 50채널까지 recording 가능**
- 시간 동기화된 digital EEG/Video 저장 및 재생 가능 (Video option)
- Amplifier만으로 LAN을 통하여 병원내 어느곳에서도 EEG recording 가능 (CCU, ICU 등 측정시 편함)
- 병원 내 어느 PC에서도 측정된 EEG / PSG / Video Review 가능 (Twin Look 기능)
- 무한정 Montage 편집 기능
- 자동 Sleep Scoring 분석기능, 자동 Sleep report 생성
- Brain Mapping(Potential/frequency) 분석가능
- EEG Power spectrum 분석기능

Amplifier

Magstim Rapid²

- 독립적인 2ch. 증폭기를 구비하여 근전도계 없이 MEP 측정 가능 [근전도계와 연결사용가능]
- 1Hz에서 100Hz까지 자극 주파수 설정 가능
- 환자 정보 입력 가능
- 자극 주기 및 환자 정보 자료의 Disk backup 가능
- 내장된 File Management 프로그램
- 환자 측정 데이터 저장 능력
- Coil Probe 상에서 자극 강도 조절 및 remote 자극 기능 보유

㈜영우메디텍 TEL : 02) 557-6578. EMAIL : ywkorea@chol.com

2011년도　제43회

대한의용생체공학회 **춘계학술대회**가

캠퍼스가 아름다운 학교,
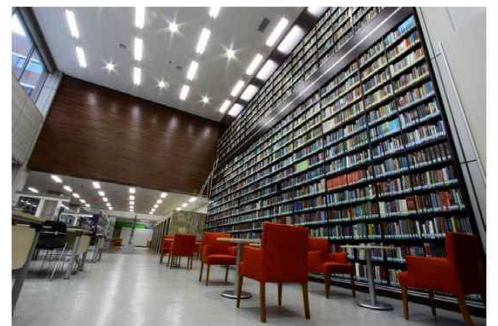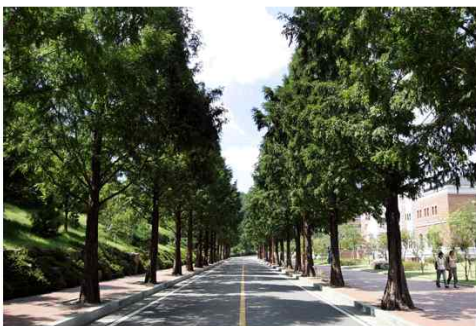세계를 향해 빛을 여는 **계명대학교**에서 열립니다.

| 일시 | 2011년 5월 24-25일 (예정)
| 장소 | 대구광역시 달서구 달구벌대로 2800 계명대학교 성서캠퍼스 의과대학
| 주최 | 대한의용생체공학회
| 주관 | 대한의용생체공학회, 계명대학교
| 후원 | 계명대학교 광역선도 IT융복합 의료기기 인재양성센터 외

| 문의 | 2011년도 대한의용생체공학회 춘계학술대회 조직위원회
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Value Creator, MEDISON

누구나 건강하고 행복한 삶을 누리게 하겠다는 생각. 그 생각을 엮어 혁신을 만들어내는 기술.
상상의 영역을 현실로 이끌어내는 첨단 메디컬 테크놀로지가 MEDISON의 오늘을 빛내고 있습니다.
발길 닿은 자리마다 피어나는 기술의 꽃으로 세상은 조금씩 더 아름다워지고 있습니다.
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