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▶ 3D 환자모델링
▶ 3D 형상 모델 처리기술
3D Patient Modeling

Automatic Orbital Wall Modeling

Existing method: manual operation on >100 images

→ Proposed method: ~1 min. (1/40 less time)

Semi-automatic 3D modeling of orbital wall

Comparison test of 3D modeling time (manual vs. proposed method)
3D Surgical Planning
3D Modeling of Surgical Guide
AI 기반 3D 의료용 S/W 기술

임상 빅데이터 → AI 진단 → AI 치료 계획 → AI 치료 분석

환자 3D 데이터 → Classification → 치료방법 추천 → 수술결과 분석
3D CNN 기반 어깨 관절 진단

학습
- Rotator Cuff Tear 진단
- Voxception-ResNet 네트워크 사용, epoch 110
- Train set 3573개 (None-RCT : 1749, RCT : 1824), Test set 200
- >95% 정확도

학습 진행에 따른 정확도 및 activation map 변화
3D CNN 기반 어깨 관절 (Rotator Cuff Tear) 진단
RESULTS: CLASS ACTIVATION MAP (TRUE POSITIVE)
국내 최초 발간!

The book is written in Korean. It discusses the VTK (Visualization Toolkit) and its applications in 3D printing software development. The book cover shows a web browser window with a GitHub repository for VTK examples.

https://github.com/vtk-book/example
3D simulation, 3D printing, AI, VR/AR → Medical application
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Epson MOVERIO

Personal
Powerful, affordable smart glasses for personal use.

Multi-user
Manage multiple devices, serve a variety of users.

Industrial
Smart headsets designed to withstand the rigors of the workplace.

https://epson.com/moverio-augmented-reality
Epson MOVERIO

Technical Information
Visit our MOVERIO developer site to access technical resources. Click here for comparison.

MOVERIO BT-200
Support Tools
Technical FAQ
Watch the Video

MOVERIO BT-300
Support Tools
Technical FAQ
Watch the Video

MOVERIO BT-350
Support Tools
Technical FAQ

MOVERIO Pro BT-2000/2200
Support Tools
Technical FAQ
Watch the Video

Webinars
Browse helpful videos on developing for MOVERIO. Watch more

Developing MOVERIO BT-300 Smart Glass Apps
Setup MOVERIO Development

Moverio BT-300 Hands On Review

Moverio & Bluetooth: Smart glasses for the Internet of Things
Evena Eye-On Glasses

https://evenamed.com/
Microsoft HoloLens
Microsoft HoloLens
Project Esper

An augmented reality project by 3D4Medical

http://3d4medical.com/
The Body VR: Anatomy Viewer

http://TheBodyVR.com/
3D Organon VR Anatomy

https://www.oculus.com/experiences/rift/872418872856459/
Motek

Why Use the C-Mill?
The ability to adjust your gait to the requirements of the environment is related to fall risk. Someone must be able to avoid a doorstep, puddle of water or other obstructive objects in order to walk safely in daily life. The C-Mill is developed to train these task specific gait adaptations by projecting visual cues on the walking surface. This results in a context specific environment to train and evaluate gait pattern and gait adaptability.

Adjust Gait Pattern
A therapist can decide to adjust a patient’s gait (e.g. step length or step width) by projecting cues on the belt of the C-Mill. The cues automatically appear based on a patient’s gait. The therapist can influence this pattern by changing the distance between the cues, thus altering and training the gait pattern.

https://www.motekforcelink.com/
Dental Simulation - 3D Smile Design (CEREC)
NeuroVR

- 신경외과 수술 훈련용 시뮬레이터
- 두개골 개폐, 뇌 내시경 수술 숙기훈련
Osso VR
Help Me See – Cataract Surgery (SOFA, InSimo)
SOFA (Simulation Open Framework Architecture)

Elastic registration: temporal registration using optical flow tracking
Virtual Training Simulation

Dental simulation

Laparoscopic surgery simulation

Intravenous injection simulator

Arthroscopic surgery training
da Vinci® Skills Simulator™

http://www.intuitivesurgical.com/products/skills_simulator/
Surgical simulator

- http://simbionix.com/
Laparoscopic surgery simulator

Simbionix / USA

Immersion / USA

SimSurgery / Norway

Surgical-Science / Sweden

Mimic Technologies / USA

Mentice / Sweden

Haptica / USA
Laparoscopic Surgical Training Simulation

Deformable body modeling
3D visualization / haptic rendering / collision detection
Gallbladder removal simulation

Gallbladder removal simulation
Haptic device for laparoscopic surgery simulation
Laparoscopic training simulator

Gallbladder removal simulation

KIST
Arthroscopic surgery simulator

Diagnostic and therapeutic knee / shoulder arthroscopy training in orthopedic surgery

ARTHRO MENTOR™
http://simbionix.com/simulators/arthro-mentor/
Arthroscopic surgery simulator

3D human body modeling (bone, muscle, ligament, …)
Realistic visualization: normal mapping (texture) + lighting
Arthroscopic camera simulation

3D human shoulder modeling

Arthroscopic camera simulation
Arthroscopic surgery simulator

Task:
Basic navigation skill, feeling of burr

Navigation, tool manipulation and orientation skills

Deburring

Navigation
Simulation for Craniopagus Surgery
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Tokyo Univ. (일본)
- 악안면 수술 환자 3차원 해부모델 AR
- 환자 치아형태 3D 매칭, makerless 실시간 트래킹

Pisa Univ. (이탈리아)
- 악안면 수술을 위한 AR 기반 네비게이션 시스템
- 수술계획대로 악안면 골 재배치 AR 수술계획 정보 제공
혼합현실 기반 원격 치료

Proximie (미국)
• AR 기반 원격진료 솔루션
• 아이폰/아이패드로 연결된 두 지점의 전문가 수술보조 서비스 제공

Google, University of Alabama at Birmingham (미국)
• AR 기반 원격수술 가이드 솔루션
• 구글글래스 이용
• Teaching surgeon의 술기를 AR로 보면서 수술진행
Nadine Hachach-Haram (TEDWomen 2017)
How augmented reality could change the future of surgery

Medical Education

The Visible Human Project

Visible Human Project (NLM, 1986)

Visible Korean (한국과학기술정보원, 2000)

Anatomage Table

Medical education (MS Hololense, 2016)
Live Surgery

Medical Realities, UK
Surgical Simulation

- Laparoscopic surgery (CAE, KIST)
- Arthroscopy surgery (VirtaMed)
- Eye surgery (HelpMeSee)
- Intravenous injection (KIST)
- Dental training (KIST)
Surgical Planning & Guide

Neuro surgery planning (UCLA)

Knee & Maxillofacial surgery planning (KIST)

AR-based surgical guide (Fraunhofer MEVIS Institute)
AR Navigated Spine Surgery: Scopis

Microsoft reveals prototype augmented reality glasses that don't look wacky

Jordan Novet | @jordannovet
Friday, 19 May 2017 | 9:38 PM ET

Compact AR Prototype

Microsoft
Microsoft Research screenshot
HTC Vive Is Getting A $220 Plug-And-Play Eye Tracking Peripheral Next Month
LINKFLOW

FITT360
Wearable 360-degree Camera for Everyone
FITT360 will be launched at KICKSTARTER on Jan, 2018
CES 2018
Jan 9 - 12, LAS, USA

http://linkflow.co.kr/
해상도: 2880 x 1600
전방 카메라 2대, 마이크 2대
가상공간: 10m x 10m
무선 어댑터 출시 예정
Future of VR

More realistic experience

- Hi resolution (8K), wide FOV (120), fast updated (120 fps)
- Multimodal stimuli (tactile, smell, ..)
- Seamless and precise tracking ( <10 ms latency, sub-mm)

HTC VIVE (2K resolution, 110 degree FOV, 90 fps, 2 controller, Tracking: sub-millimeter precision and < ~11ms latency)
Future of VR

More popular with new technologies

- Mobile VR
- Multi-view 360 video
- Social VR

Social VR (Facebook)

360 Panoramic video (YouTube, Facebook)
Future of AR

**Improved H/W and S/W**

- Lighter, Cableless, Brighter H/W
- Wide FOV (Field of View)
- Easy Calibration
- Accurate Registration
- AI for Improved Function

- MS HoloLens 3rd generation (2019)
- Magic Leap One (2018 spring)
Virtual Reality and Augmented Reality in Plastic Surgery: A Review

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¹Center for Bionics, Korea Institute of Science and Technology, Seoul; ²Department of Plastic and Reconstructive Surgery, Yonsei University College of Medicine, Seoul, Korea

Recently, virtual reality (VR) and augmented reality (AR) have received increasing attention, with the development of VR/AR devices such as head-mounted displays, haptic devices, and AR glasses. Medicine is considered to be one of the most effective applications of VR/AR. In this article, we describe a systematic literature review conducted to investigate the state-of-the-art VR/AR technology relevant to plastic surgery. The 35 studies that were ultimately selected were categorized into 3 representative topics: VR/AR-based preoperative planning, navigation, and training. In addition, future trends of VR/AR technology associated with plastic surgery and related fields are discussed.
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3D printing, 3D simulation, AI, VR/AR → Medical application