Ο ρόλος του Hololens στη χειρουργική εκπαίδευση και κλινική πράξη

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LLM Care Ecosystem & EIPonAHA 2* Reference Site

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**Immersive Tech and Magic**

- When *Religion* was strong and *Science* weak, men mistook *Magic for Medicine*;
- Now, when *Science* is strong and *Religion* is weak, men mistake *Medicine for Magic*...
- Immersive technology applied in Medicine makes this even worse...
- **Vision**: use that *Immersive Technology Magic* to improve *Medical Education* and impact of Technology on health

[https://www.amazon.com/Magic-Medicine-Coral/dp/B0000ALSDT](https://www.amazon.com/Magic-Medicine-Coral/dp/B0000ALSDT)
The Lab of Medical Physics is a major research and development hub in:
- assistive technologies
- applied neuroscience
- medical education technologies
- affective computing
- semantic web
- medical robotics
- brain computer interfaces
- space neuroscience
- radiation physics
- non-ionizing radiation.

Comprised of 10 research groups, leaders in their fields, recognised internationally for their research excellence ...

... funded by a wide spectrum of sources.
We are ...

Relevant Research Groups at the Lab of Medical Physics

- **Medical Education Informatics**
  - Exploring shifting paradigms in education and breakthroughs in information technologies for healthcare education

- **Neuroscience of Cognition and Affect**
  - Investigating human emotions Evaluating the effectiveness of non-pharmaceutical interventions of physical, cognitive, musical stimulation

- **Innovation & Technology Empowered Learning Group (I-TELG)**

- **Assistive Technologies and Silver Science**
  - Active and Healthy Aging as well as technologies for Assisted Living for special target groups.

- **Biomedical Electronics Robotics Devices**
  - Brain computer interfaces, sensors, biomedical electronics, software development, automation and engineering

- **Biomedical Engineering & Aerospace Neuroscience**

- **BEAN**

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We have... technical capacity

Educational Game Platforms for Autistic Persons – Edutainment

Expert knowledge (project AFFECTION) on affective computing and emotional understanding:
• Construction of affective avatars;
• emotionXML framework definition;
• Intelligent processing and data mining of neurophysiological recordings for real time emotion recognition and classification.

ExerGaming Platforms/services for Elderly – Active and Healthy Ageing

Co-ordinator of Long Lasting Memories/LLM project – an integrated ICT platform against elderly cognitive decline, using cognitive training, physical exercises, and e-home monitoring against falls
www.longlastingmemories.eu
Novel (home made) physical exercise and game platform development (exergaming): elderly edutainment;
Kinect, Wii based interaction through Web Services and html5.0; pilots in Smart TVs, Tablets, Mobiles
www.usefit.eu

Apps for Learning Disabilities and Game Based Training

Apps for monitoring and training ADHD children
www.whaamproject.eu/

Health Professionals (Uroschool, and Urologists network: http://www.imop.gr/}
we know how

the next big thing... after big data
we also do

Resources
Adverse drug events
Images/signals

Learning
knowledge
Innovation

discover
open
Ο γιατρός του μέλλοντος σήμερα;

Εκδημοκρατίζοντας την εκπαίδευση και αναστατώνοντας την κλινική πρακτική με την τεχνολογία

performed the world’s first virtual reality operation recorded and streamed live in 360-degree, or immersive, video in 2016. It was viewed live by 55,000 people in 142 countries and downloaded 200,000 times on YouTube.

The World’s most watched doctor!
Η μεικτή πραγματικότητα που κάποιες φορές αναφέρεται ως υβριδική πραγματικότητα, είναι η συνένωση του πραγματικού και του εικονικού κόσμου για την δημιουργία νέων περιβαλλόντων, όπου τα φυσικά και ψηφιακά αντικείμενα συνυπάρχουν και αλληλοεπιδρούν σε πραγματικό χρόνο.
Microsoft HoloLens
Προθέρμανση ... χειρουργών

Inguinal Hernia Repair  EGD

M Mon-Williams, Keynote, 3rd Int. Conf on Medical Education Informatics (MEI2018)
Innovations in Virtual Surgery Intelligence

ApoQlar, https://apoqlar.com/
Present - future

Dense EEG and mapping/connectivity networks

MEG/EEG data

Photoacoustic imaging
guided surgery

Courtesy of Dr Georgios Karagiannis

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Neuro-anatomy Mixed Reality video
Impact on Learning Gain:

Currently a number of methodologies to assess the learner gain:

- **Actual (raw) scores as percentage**
This project has received funding from European Union’s Erasmus+ Programme under Grant Agreement No 612444.
The need

A core need for medical students and residents is the hands on acquisition of pre-clinical and clinical skills, which is one of the most resource intensive endeavours in medical education (e.g. Anatomy, Surgery). Physical tangible resources and opportunities for such training are objectively inadequate due to the cadavers’ shortage worldwide.

There is a clear need for quality immersive medical simulation resources and episodes.
How is it done today?

Surgery and anatomy 3D models and VR/AR applications have been reported with studies highlighting their potential as equivalents for 2D images and cadavers.

However:

• In a series of Continuous Professional Development seminars held in UoL it was found that their VR/AR/MR resources did not address their specific learning objectives.
Major limitations

<table>
<thead>
<tr>
<th>HEIs</th>
<th>Content creation industries</th>
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<tbody>
<tr>
<td>Disjointed use of experiential tangible/intangible resources (3D prints/AR/VR/MR).</td>
<td>Large volume of topically overlapping content.</td>
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<td>Educational episodes do not accurately map on the resources created.</td>
<td>Inefficient content creation due to lack of educational integration.</td>
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<td>Limited curriculum penetration.</td>
<td>No provisions for medical education immersive content reuse and repurposing.</td>
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</tbody>
</table>

These diverse findings confirm the need for edu-centric content creation.
ENTICE Project Objectives

The project’s overall goal is to **enhance the quality of digital learning in Medical Education**, by bringing **learning objectives** to the forefront of **experiential episodes design** and organically integrate them as part of educational design.

**Specific objectives**
- Identify **methodologies and approaches** for use of immersive and tangible resources.
- Design and optimize a **co-creational workflow for collaboration between educators and developers in experiential content creation**.
- Create **education centric** experiential resources and educational episodes.
- Confirm all outcomes through multi-centric **evaluation**.
- Optimize and **exploit** the efficacy and economy of resources to be produced.
- **Disseminate** the outcomes in the wider medical community and industries.
Methodology and timeplan

This project has received funding from European Union’s Erasmus+ Programme under Grant Agreement No 612444.

ENTICE Project Presentation
Educational Models – Example Cases

• 3D Holographic Model of the normal Hepatic and Biliary Anatomy in order to teach:
  • Anatomy and surgical anatomy
  • Hepatic Physiology
  • Biliary physiology
  • Special emphasis on showing the interface and interrelationship between the anatomy and the physiology of these two organs, so that the pathological disease states that will be shown afterwards can be better understood.
Educational Models – Example Cases

• 3D Holographic Model of the Liver and the biliary system depicting gallstones at different parts of the biliary path.
• The goal is to discuss the pathology that can result depending on the position of the gallstones and thus, again, see how the interplay between the anatomy and the physiology explains the disease.
Educational Models – Example Cases

• 3D Holographic Model of the Liver and the biliary system depicting obstruction(s) at different points of the liver and the biliary system, which are the result of benign or malignant masses.
• The combination of the anatomy and the physiology allows a better representation of the disease aetiology.
Validation of a **systematic, integrative approach for education-centered experiential teaching episodes and resource content creation** for 3D printed models, and AR/VR/MR resources.

- Seamless integration of 3D printed models & AR/MR/VR with the educational episode for the first time is going to be implemented and evaluated for measurable increase in knowledge retention.
- The content creation process will be based on specific learning objectives. Thus educationally sound resources are expected to compound the learning efficacy and overall impact of learning episodes.
- Prototyping Knowledge Engineering methodology for education-centric immersive resources. An approach for VR content creation in medical education has been proposed using Knowledge Engineering.
## ENTICE Impact

### Short Term Impact
- Creating a network of SMEs/Universities
- Adopting an audience-centric approach
- Improving entrepreneurial & mentoring skills
- Curricula enhancement with modern & state-of-the-art educational material.
- Access to a large start-up ecosystem & pool of users of the educational material.

### Long term Impact
- Improving international research profile through quality publications
- Raising awareness on the collaboration between Universities and businesses in the medical education field.

### Industry
- Visibility & experience
- Project as a market indicator
- Network with HEI boosting their B2B activities.

### Third
- New educational tool for Students & educators
- Neuroanatomy as an enjoyable experience.
- Start-ups and companies able to develop similar “products” for other body regions.
Getting to know the team

Names of the associated partner organisations

University of Eastern Finland (UEF)
Tampere University of Applied Sciences (TAMK)
Dikaios Oy
ScioReality
Every day coaching at home.
Εξατομικευμένη Νοητική και Σωματική ενδυνάμωση με χρήση εικονικής πραγματικότητας … κατ’ οίκον

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ΕΥΧΑΡΙΣΤΩ!

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