Virtual Surgical Simulation

Dr. Tobias Hövekamp
Manager Strategy Fund Projects

Image Processing, Augmented and Virtual Reality
Chur, May 28th, 2019
AO Foundation - promoting excellence in patient care and outcomes in trauma and musculoskeletal disorders.

The AO Foundation is a medically guided, not-for-profit organization led by an international group of surgeons specialized in the treatment of trauma and disorders of the musculoskeletal system. It was founded in 1958 by 13 visionary surgeons.

Today, the AO has a global network of over 200,000 health care professionals. Each year it offers over 830 educational events around the world, which are supported by nearly 9,000 faculty and are attended by over 58,000 participants. It has 20,000 surgeon members working in the fields of trauma, spine, craniomaxillofacial (CMF), veterinary, and reconstructive surgery.

Our mission is promoting excellence in patient care and outcomes in trauma and musculoskeletal disorders.
Targeting the Highest Educational Outcome Level

Moore D, 2009
AO has a long history in simulation-based education.

**AO Surgery Reference**
- Comprehensive online reference in daily clinical life
  - Please select an anatomical area
  - Clavicle
  - Proximal humerus
  - Scapula
  - Humeral shaft
  - Spine
  - Distal humerus
  - Pelvic ring
  - Proximal forearm
  - Acetabulum
  - Distal forearm

**Surgery Reference**
- Cognitive simulation
- Procedural knowledge

**Skills lab**
- Basic technical knowledge and skills

**Practical exercise**
- Technical skills
- Dexterity
- Procedural knowledge

**Anatomical specimen workshop**
- High fidelity experience
Surgical Simulation

- **Real**
  - Practical exercise (eg, Medability, Phacon)
  - Enhanced physical models (eg, RealSpine)
  - AO Skills lab

- **Mixed Reality**
  - 2D VR + physical model (eg, Medability, Phacon)
  - 3D AR + physical model (eg, CAE Lumina AR)

- **Virtual**
  - 3D VR (eg, PrecisionOS)
  - 3D VR + force feedback (Strategy Fund Project)
  - 2D VR (eg, Touch Surgery)

→ Assessment of performance

Fidelity

high

low
Flight and virtual open-surgery simulation

Limitations:
Physics: Haptics of open surgery
Computation: scene rendering
Take home messages

• Targeting the highest educational outcome level
• Virtual surgical simulation has the potential to revolutionize surgical education
• Performance assessment as a cornerstone

Thank you for your attention!