



True Digital Surgery AEOS Surgical Training Tool

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Background

Optical microscopes are used in microsurgery so surgeons can magnify the small structures in the surgical area. True Digital Surgery (TDS) has a digital microscope called AEOS that has an assortment of features that make a traditional microscope incomparable. The problem is that AEOS is a huge departure from a traditional optical microscope. The challenge then becomes how to train existing surgeons who have experience with optical microscopes how to use AEOS. We have designed a training tool for the AEOS, the Core 5, that allows a surgeon to quickly become familiar with five of its core features:

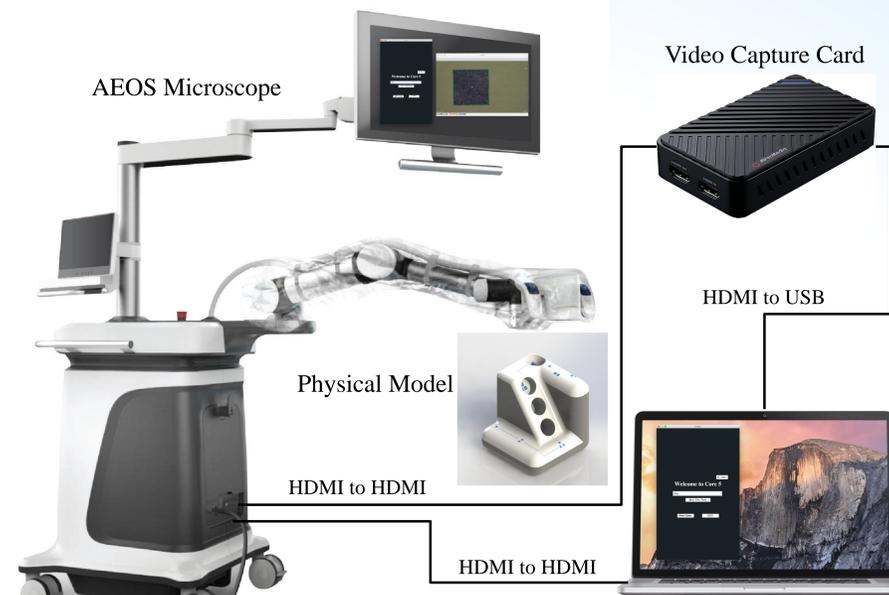
- Robotic arm movement
- Zoom-in / zoom-out
- Camera focus
- Lock-on mode
- Waypoint mode



Overview

- A physical model that provides an environment for the trainees to complete mini-games with AEOS.
- A software application that partners with the physical model as a visual component, which provides the experience of gamification. Uses capture card to access the image data from AEOS and enable real-time processing.
- The training tool is engaging and resembles more of a game than a tutorial on how to perform surgery. Training tool is fun and enjoyable for users.

System Operation



- The physical model is placed on a table and the AEOS microscope is situated above the model. The capture is connected to a HDMI output on the AEOS device and is connected to a laptop. Another HDMI is connected from the laptop to the HDMI input on the AEOS.
- The trainee uses the AEOS to look at different areas of the model. On the screen, the GUI is displayed showing them instructions to complete the mini-games.

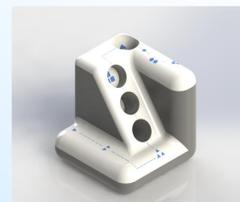
Key Components

Video Capture Card Device



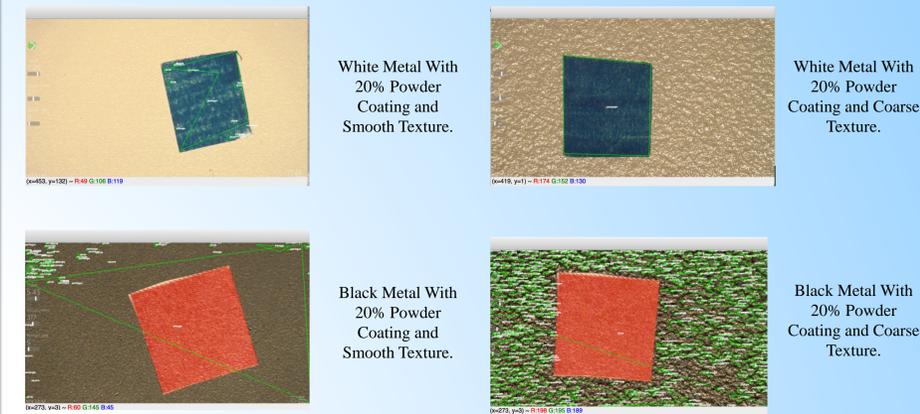
AVerMedia Live Gamer Ultra capture card takes in live video from AEOS, forwarding it to a computer where our image processing algorithms assess the gamer's performance and give feedback through a GUI.

Physical Model



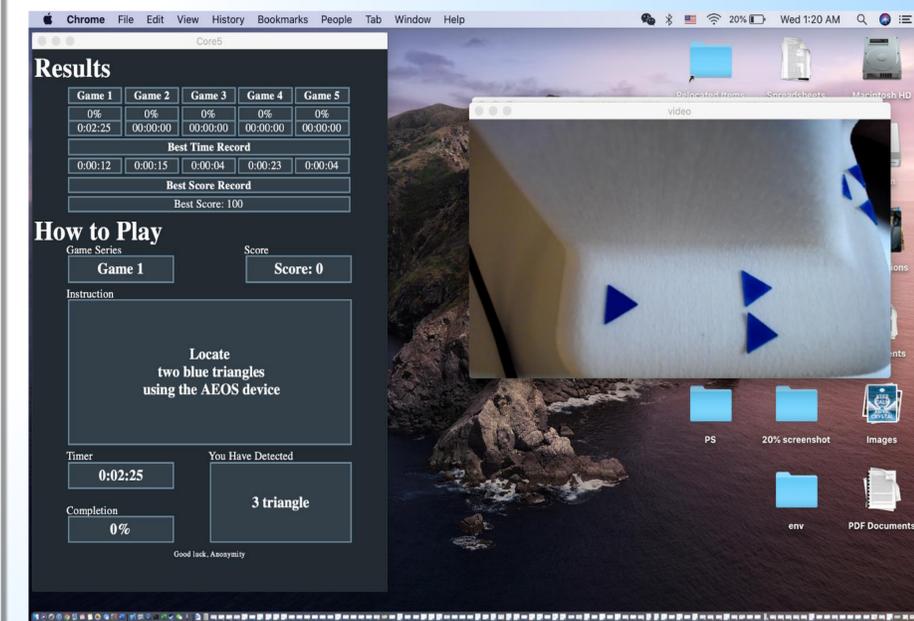
The model is made of aluminum and powder-coated white. The model resembles AEOS aesthetically and has a small form-factor for easy transportation.

Physical Model Test Result



The team chose a white powder coat with a coarse texture after testing different samples of powder coated samples. We tested the shape detection algorithm by placing different shapes on the different test samples, and determining which combination produced the best results. We concluded that a white powder coat with a coarse texture was the best choice.

Software Application Test Result



The above figure illustrates that the software application can work using a webcam without any error. AEOS behaves like a webcam, and based on previous testing with AEOS, the team can conclude that the software can also be used with AEOS machine.