ARnatomy: Tangible AR App for learning Gross Anatomy

Jinsil Hwaryoung Seo, James Storey, John Chavez, Diana Reyna
Texas A&M University
College Station, TX, USA
hwaryoung@tamu.edu

Jinkyo Suh
Simon Fraser University
Burnaby, BC, Canada
jks28@sfu.ca

Michelle Pine
Texas A&M University
College Station, TX, USA
MPine@cvm.tamu.edu

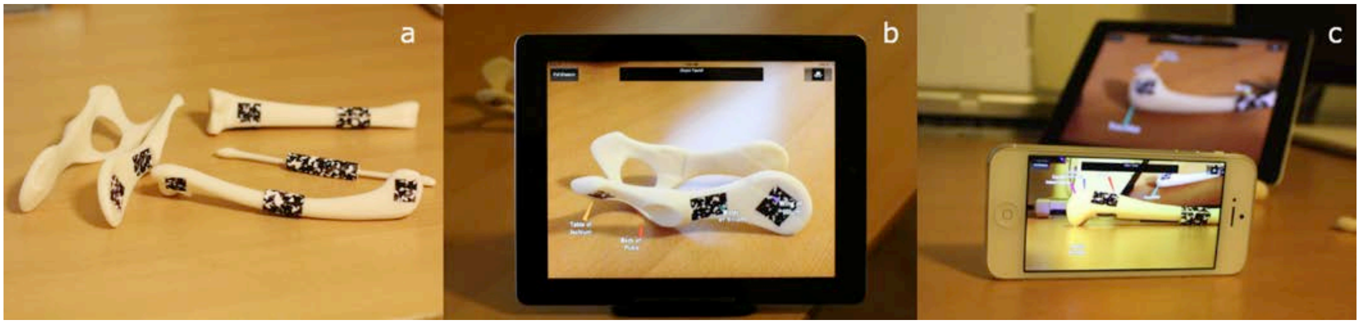

Figure 1. a. 3D printed bones: Pelvis, Tibia, Fibula, and Femur b. ARnatomy on iPad c. ARnatomy with iPhone

1. Introduction

Our goal is to develop a Tangible Augmented-Reality Interface for mobile devices to enhance the effectiveness of learning gross anatomy in a group and/or individual study settings. Learning anatomy is fundamental to every health profession and related domains (Dance Science and Visual Art). However, many students spend most of their time memorizing anatomical terms shown in 2D in a textbook without learning or understanding the spatial relationships. This is problematic in that the students do not completely grasp the relevance of the material, and therefore rapidly loose what they have memorized. It is believed that cadaver dissection is the optimal method of anatomy education [Winkelmann, 2007]. Cadaver dissection provides knowledge of the shape and size of the organs, bones, and muscles. In addition, it gives students a spatial appreciation on how individual body parts are positioned relative to the rest of the body. However it has limited accessibility beyond a lab setting. It is also getting difficult because of an increased recognition in animal rights issues. This prototype merges the textbook information on skeletal structures and the tactile interaction of physical bones. To accomplish this goal, we created a prototype that can recognize a variety of 3D print bones with visual markers. Once recognized the bones are populated with virtual text labels that move on the screen to match the video camera feed of the bones.

2. Our Approach

Many gross anatomy students use a dog bone box for individual study. This is very effective because feeling through our body increases a student's immersion into the anatomical context and helps to recall the information associated with a physical body experience. Integration of the traditional materials (bones) and augmented reality using mobile devices keeps the core quality of an embodied experience of using bones, and builds multimedia information around the bones in computational environment.

We created a system that can recognize a variety of 3D printed bones while a user holds and moves a bone in front of the camera of a mobile device or behind the camera. Once recognized the bones are populated with virtual text labels that move on the screen to match the video camera feed of the bones. The labels are clear and effective at pointing out regions of interest. In addition we created an additional mode that allows the user to see the recognized bone in context of the entire skeleton.

The system is separated into 3 main components. These elements receive data from the mobile device's camera. This data is provided to the Object Recognition and Tracking module. The spatial data is approximated and fed to the Unity3D Game engine in the Graphic User Interface step. Inside of the Unity3D application will be a collection of components that define the content of expected and recognized objects. All bones and learning content is stored and kept track of at this level. This collection of data describes and acts on the 3D scene that is presented to the user composite with the video feed from the camera.

The current prototype is implemented in focus of osteology terms. For the next step, we will include multiple layers of interactive visualization such as a nerve layer and a muscle layer.

References

WINKELMANN, A. 2007. Anatomical dissection as a teaching method in medical school: a review of the evidence. *Med Education* vol. 41(1), 15-22.

SIGGRAPH 2014, August 10 – 14, 2014, Vancouver, British Columbia, Canada.

ACM 978-1-4503-2958-3/14/08