

# Augmented Reality Bone Puzzle: Medical Augmented Reality System for Learning Human Anatomy

Project Management and Software Development  
for Medical Applications

## General Info

Project Title: Augmented Reality Bone Puzzle:  
Medical Augmented Reality System for Learning  
Human Anatomy

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## Project Abstract

Augmented Reality systems are useful for edutainment system: 3D visualization tells us more than 2D visualization does and people can keep their motivation with edutainment systems rather than education systems.

The aim of this project is to develop a medical augmented reality system for learning human anatomy, especially the structure of bones, as shown in Fig. 1. The project is managed by following agile development style [1].

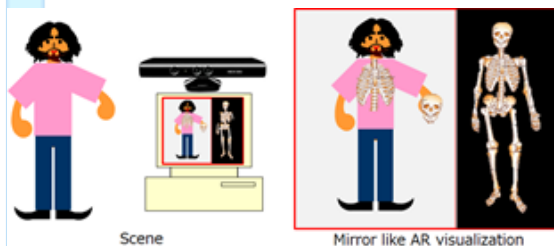


Figure 1: Our AR edutainment system

## Background and Motivation

There exist several tools for learning human anatomy [2-4]. One of the state-of-the-art learning materials is 3D visualization text book [2,3]. The feature of such material is to visualize data in 3D so that the users can get more information than we do from 2D one. Edutainment systems encourage their users to learn actively by providing video game like systems [4].

The motivation of this project is to develop a more intuitive system for learning human anatomy by introducing the concept of augmented reality and using a Kinect. Augmented reality concepts provide 3D visualization and the possibility of developing edutainment systems while Kinects let us interact with computers by gestures. Therefore, we can develop more intuitive visualization and interaction edutainment system.

## Student's Tasks Description

Students will join an ongoing project that is a collaborative work between the chair and Keio University, Japan. We have already developed basic augmented reality visualization function. The missing part for prototype release is (1) gesture recognition, (2) puzzle game component, (3) improvement of visualization function.

The project is fully managed by following agile development style. Each member is assigned different tasks according to his/her role. For example, one contributes as a developer while

another may do as a code reviewer. You can get further information from [1, 7].

We plan to develop a prototype until the middle of this semester. Then, we will have user test and improve the prototype.

### Technical Prerequisites

It is better that students have the following knowledge/experience (but not required)

- Augmented reality
- Kinect application,
- C#
- OpenNI [5] / NITE for gesture recognition
- Microsoft XNA [6] for visualization

### Administrative Info

Working Time: 10-20 hours per week until the end of the project (semester).

Project Location:

Required Equipment: A computer (with a high-end graphic card).

### Timeline and Milestones

We hope everything will be finished around new year and we use the remaining time for optional staffs. Our tentative plan is as follows:

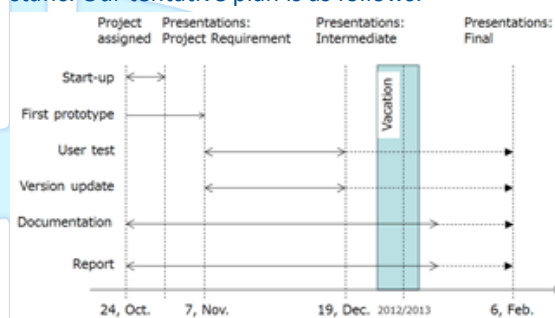


Figure 2: Rough time schedule

### References

At the end provide us some of the relevant and recent publications regarding this topic including those from your institute (up to 7 items).

[1] Agile software development: [http://en.wikipedia.org/wiki/Agile\\_software\\_development](http://en.wikipedia.org/wiki/Agile_software_development)

[2] Muscle & Bone Anatomy 3D, <https://itunes.apple.com/us/app/muscle-bone-anatomy-3d/id375105666?mt=8>

[3] Skeletal Anatomy 3D, <https://itunes.apple.com/us/app/skeletal-anatomy-3d-quiz-reference/id394284454?mt=8>

[4] Whack-a-bone (internet game of bone puzzle), <http://www.anatomyarcade.com/games/jigsaws/SynovialJigsaw/synovialJigsaw.html>

[5] OpenNI, <http://openni.org/>

[6] Microsoft XNA, [http://en.wikipedia.org/wiki/Microsoft\\_XNA](http://en.wikipedia.org/wiki/Microsoft_XNA)

[7] The Scrum Roles, <http://borisgloger.com/2009/03/02/scrum-roles-scrumlies/>