

CS6460 Educational Technology: Summer 2020

**Final Project**

**AR mobile tool for Engineering education**

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**1 VIDEO LINK**

<https://youtu.be/8UIrdF2x2EM>

**2 POWERPOINT PRESENTATION**

[https://gtvault-my.sharepoint.com/:f:/g/personal/mshrestha6\\_gatech\\_edu/EtDA-fmSCBdDiK6TRp\\_h55EB4LkIT1eseg2l\\_UEoYhraag](https://gtvault-my.sharepoint.com/:f:/g/personal/mshrestha6_gatech_edu/EtDA-fmSCBdDiK6TRp_h55EB4LkIT1eseg2l_UEoYhraag)

**3 LINK FOR APK**

[https://gtvault-my.sharepoint.com/:u:/g/personal/mshrestha6\\_gatech\\_edu/EYmxXFbtfz1DmOGGxUetA64BmfouDB8uQ3h96er1DHtkuQ](https://gtvault-my.sharepoint.com/:u:/g/personal/mshrestha6_gatech_edu/EYmxXFbtfz1DmOGGxUetA64BmfouDB8uQ3h96er1DHtkuQ)

If you are interested in using the app and providing feedback, you can download and test the apk in Android mobile device of version 10. Please note that for the marker-based object detection (Model on object) the mobile camera needs to focus on the images in the following link (car image for car engine and tire image for tire model).

[https://gtvault-my.sharepoint.com/:f:/g/personal/mshrestha6\\_gatech\\_edu/EtDA-fmSCBdDiK6TRp\\_h55EB4LkIT1eseg2l\\_UEoYhraag](https://gtvault-my.sharepoint.com/:f:/g/personal/mshrestha6_gatech_edu/EtDA-fmSCBdDiK6TRp_h55EB4LkIT1eseg2l_UEoYhraag)

For the marker-less object detection (Model on ground), you need to point the mobile camera to the ground and trace the white square bracket as shown in the figure below (marked with the red circle in the picture) and click on it to see the virtual 3D model of car engine.



Figure 1 — White square to track the ground plane on which the virtual 3D model is projected in the marker-less button in the app.

## 4 INTRODUCTION

Augmented Reality (AR) is a mixed-reality technology that can embed virtual objects in a real environment and provide an interface for interaction between them (Milgram, Takemura, Utsumi, & Kishino, 1995). With the recent development in both hardware and software, innovative technology like augmented reality technology and its applications are proliferating in various fields. The abundance of smartphones with sufficient computational resource, GPS, sensors, network hardware and display screen makes AR technology suitable for educational sector (Dudley 2015), (Chambers, & Worthen, 2019). Researchers have experimented the use of AR in education and found results that AR enhanced

learning and provided positive impact on teaching (Chiang, Yang & Hwang, 2014), (Martín-Gutiérrez et al 2015).

In this project, to aid in the ongoing development and experimentation of use of AR in education, an AR based app will be developed. The app will be able to integrate 3D models used in engineering education, mainly electronics and mechanical and allow students to view them in the context of real environment. The project will contribute in the field of educational AR apps by developing a new app as a supplemental tool for improving teaching. The current scope of the project will develop a prototype with limited opensource 3D models, interaction abilities, teaching content and quiz feature.

## **5 PROJECT OVERVIEW**

This project will develop an Augmented Reality mobile application to improve quality of teaching in engineering education. (While this project focus on using 3D models for engineering topics, the models can be for any education topic.) The app will display the models required to be taught in engineering courses in 3D interface. The students will be able to interact with the model using touch interface to rotate, translate and scale. For each model, a help menu will be provided on how to interact with it. Each model will also have a hotspot point on it where students can touch to find more information about that component. In addition, there will be a quiz mode where questions about the model will be asked to access student knowledge.

### **5.1 Main features**

The main features of the project can be listed as follows:

1. Develop an augmented reality mobile app based on Android OS
2. Integrate various 3D models used in engineering education in the app
3. Implement object detection to combine virtual model with real environment (E.g. Engine in a car)
4. Allow students to engage with the model with interactions such as rotation, scaling, translating etc. using touch and device orientation input
5. Provide help, tutorial, demo modes to help students use the tool
6. Provide hotspots on the model to get more information about the part of the model and overall information about the model

7. Provide at least two types quiz based on the models to access student learning
  - a. Multiple choice quiz on the overall model displayed
  - b. Multiple choice quiz to identify part/points of the model
  - c. Track the scores and provide feedback to students
8. Integrate 3D models with more than one component
  - a. Allow students to interact each component separately
  - b. Also have a mode to see how different components combine together to form a larger model
  - c. Allow students to view and interact with the components combined

## 6 REFERENCES

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