Tangible Augmented Reality Application Learning Tool for Robotic Systems

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# Title:

# Tangible Augmented Reality Application Learning Tool for Robotic Systems

# Key Words:

Tangible Augmented Reality, Augmented Reality, Learning, Robotics, Robotic Systems

# Introduction and Context Description:

Over the years teachers have had the consistent struggle of trying to get across a concept, especially in Computer Science and engineering, which would be better explained if the discussed object was in front of the whole class for the teacher to assemble, disassemble and reference to first hand in a way that is inherently more understandable and engaging to students. A workable solution to this problem would obviously be Augmented Reality (Cuendet *et al.*, 2013) where the teacher could instruct all students in a class to install an application on their phone which would be used in unison with smaller models to show a 3D, to-scale representation in front of the whole class whilst the students can watch the demonstration through their phones. This could also be used in labs where all students can use these models to solve a problem instructed by the teacher.

The project will be an application that uses augmented reality and tangible objects to explain how robotic components work independently and with each other. The app will allow to zoom in on different layers to see the interaction between different modules or between different components on one module or to show the functionality within a single component. This will result in a better understanding for the user of a complex robotic architectures which will allow the user to better visualize it and will in turn help the user to be further abled in using this tool for robotics.

# Deliverables:

The Deliverables for this project are as follows:

* Gather research on different augmented reality APKs to use with unity
* Register 3D objects as targets
* Design 3D models and text to display over targets
* Implement 3D models using unity in an augmented reality application
* Build a user-friendly experience to use the application

The first step towards this project is to find the optimal plugin to use along side unity for augmented reality 3D target recognition. After a suitable one is found the targets that will be used need to be scanned and registered within a database that will link to the application. The next step would be to design 3D objects and sprites to be augmented over the targets. After everything is designed unity will be used to put everything together and design an interactive user interface to use in hand with the augmented reality to teach the subject(Saenz *et al.*, 2015).

# Problem Definition:

Today, schooling is very much of the same thing no matter where you attend and in terms of robotics this is observable through the fact that nobody gets real components right away. A lot of the time labs and lectures are used to teach students on how to handle and use robotic components, however, these can be inaccurate or confusing and students still run into multiple problems once they start to work with the real thing. For these reasons, augmented reality in the classroom would be ideal where the teacher can demonstrate and pass around real components and students can interact with them without ever plugging them in(Gupta, 2017). the application will help students understand transferring of data, pin locations, components, short code for components, etc.

# Work Evaluation:

The project will be evaluated in three phases:

* 3D object recognition
* Augmented Reality accuracy
* Student survey

The first method to evaluate the robustness of the application will be its overall ability to recognise the 3D targets it is presented as well as how long it takes for it to recognise it is presented a target. The application will then be evaluated on the accuracy of the over-laid augmented reality objects over the specific points of the real objects as well as the integrity of the augmented reality once the real object is moved in a different position or further away from the camera. Finally, the application will be evaluated based on a survey that will be given once it is presented to and used by students in a lesson.

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