TEKNOFEST

AEROSPACE AND TECHNOLOGY FESTIVAL

EDUCATION TECHNOLOGIES COMPETITION

PROJECT DETAIL REPORT

PROJECT NAME

AR/VR Education

TEAM NAME

Wonders

APPLICATION ID

#45766

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Project Detail Report

1. Project Summary:

Our Project aims to create a smart classroom prototype that addresses many gaps and tries to provide an intelligent solution, we will be developing a smart mobile App with the help of AR/VR technologies and it could be installed on a smart phone, a tablet or AR/VR glasses. This mobile app will provide virtual models for practical works that requires the use of expensive machines and electronic boards, therefore students will be able to practice what they learned easily and safely on the virtual models. The virtualization of these practical works will make it more affordable for schools and universities, and it will attract students attention so they will no longer be bored of classes since they'll be having a fun, safe and effective learning.

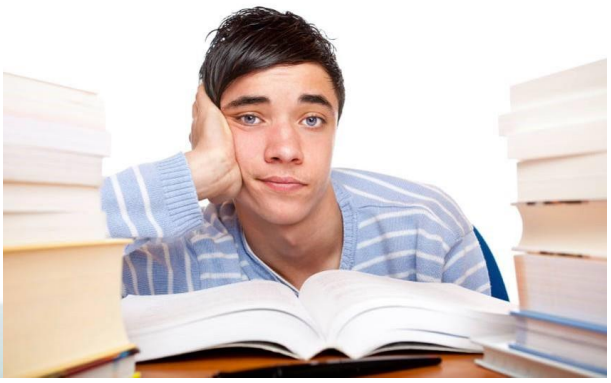
We will use Blender to make the 3d models and affect them in unity to configure the functionalities needed for each specific material and with the help of Vuforia to work with the augmented reality technology

2. Problem/ Issue:

The main problem we're facing here is that students are skipping classes and their educational levels and grades are descreasing due to the unattractiveness of the conventional teaching techniques becoming boring and lacking of interest, the lack of financing to get the expertise for training, teaching, supervision, … It becomes even more expensive to send students or to receive visiting professors or to provide some of the machines and electronic devices needed for some classes.

In addition, there are other problems like the massification of students enrolled in schools and universities, penalizing student who can't attend the face-to-face course because he will lose all the explanation and the recommendations from the teacher, and not to forget that even the available materials and machines that could be used for workshops are generally too old and ends up with malfunctions that could be dangerous for students.

Our appliaction is made for the majority of students and specifically for the ones enrolled in embedded and mobile systems. After searching about the augmented reality apps for education, we could not find one that targets electronics or embedded systems.



3. Solution

Our project idea is capable of solving all the mentioned problems by using a mobile app for smart learning in face-to-face and virtual scenarios for a selection of teaching subjects. This includes the use of innovative methodologies just as gamification and technologies such as VR and AR 3D experiences which will make it more fun to learn, plus it provides an innovative and attractive pedagogy since the use of AR technology for the creation of interactive learning scenarios helps with gaining student's attention and gets them involved in the learning process. Learning with virtual modules would be totally safe for students since it wouldn't end up electrifying or hurting them due to some malfunction and it helps with decreasing costs in terms of materials (better management and intelligent maintenance using a network management system that can give real-time indicators on the equipment health and predict future failures), human resources (task can from now on be automatically done) and bills (related to electricity, paper and printing costs). Not to forget facilitating the course accessibility beating the massification problem: our project proposes a new combination of face-to-face learning and e-learning systems. A student can attend the course in the classroom or remotely using the e-learning system (the course being directly streamed online). The teacher also can be in the classroom or in another similar classroom implemented in another school or university, and advanced accessibility for people with disabilities or time/space inconveniences.

We made different 3D models so we can drag and drop them freely without buying a single equipment.

In the first figure, we have the animation part of the line follower using Unity. In the second one, we find an example of making 3D models; we have a 3D model of a motor made by blender.

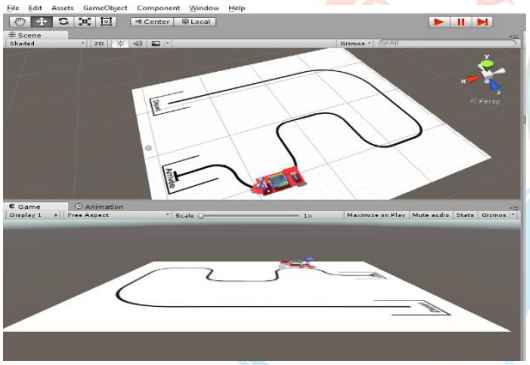


Figure 1 Simulation in Unity

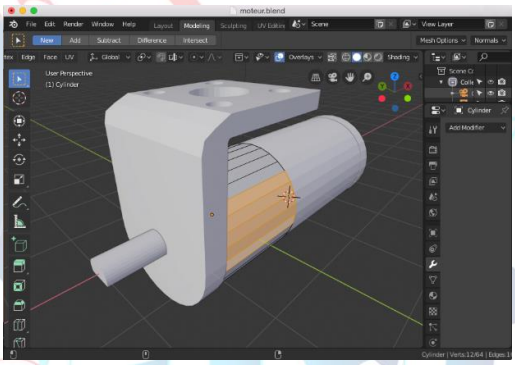


Figure 2 Motor 3D model

Problem	Solution	Contribution in Education
Lack of materials and unattractiveness of learning pedagogy.	3D virtual materials using AR technology.	No need for equipements, only a smart phone, a tablet or smart glasses will do the trick.

4. Method

In this section we find some examples of the different scenes in our application, the main goal is to properly wire the elements in each scene (using the drag and drop function), make their proper codes and testing them in their proper environments.

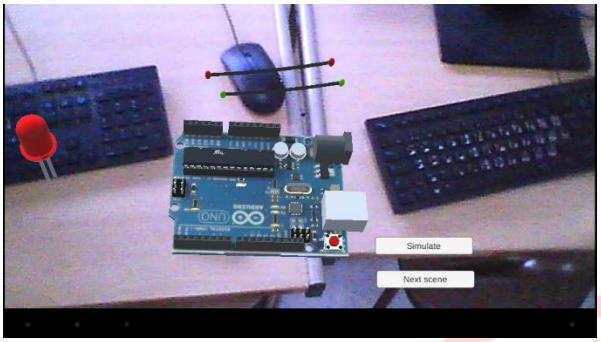


Figure 3 Led Scene

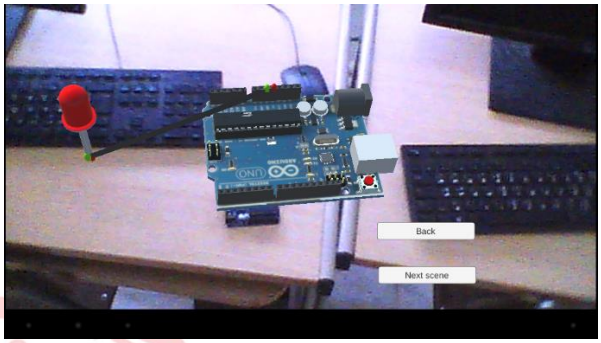


Figure 4 Wired Led Scene

In this scene we have an Arduino card and a led, and we need to properly wire these elements so that the led may work.

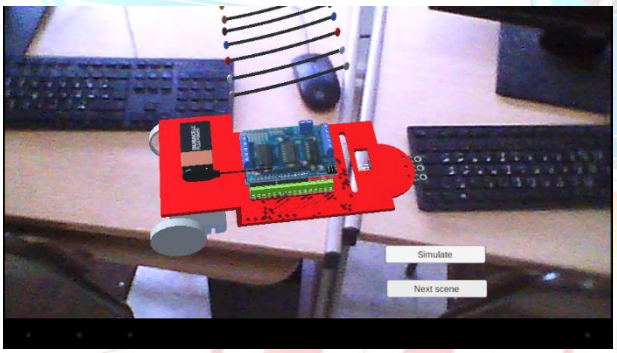


Figure 6 Line Follower

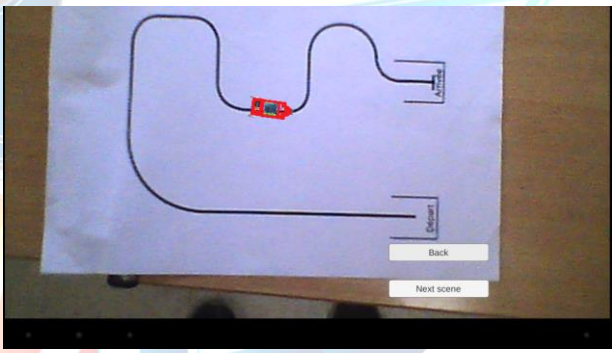


Figure 5 Line follower simulation

For this scene we find the line follower with its different elements, we have to wire them correctly and with the proper code we can move to the simulation field to view our line follower working perfectly.

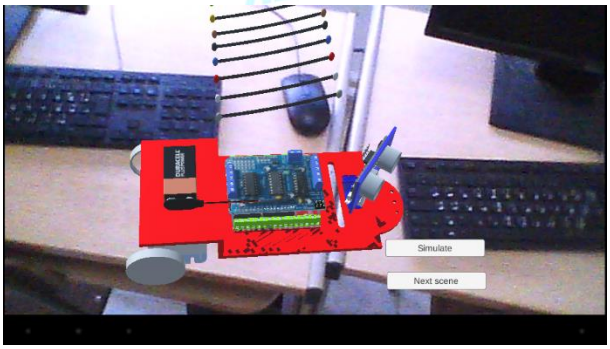


Figure 8 Obstacle avoider

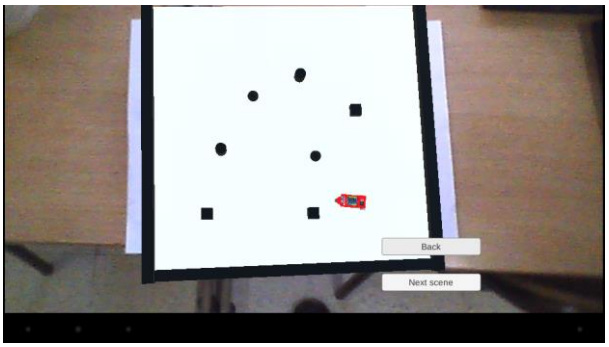


Figure 7 Obstacle avoider simulation

For this scene we have a obstacle avoider, it is mainly the same concept with the line follower, we find wiring and coding then the simulation field.

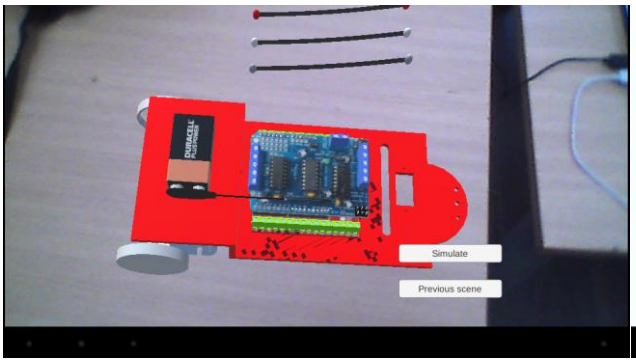


Figure 9 Teleguided robot scene

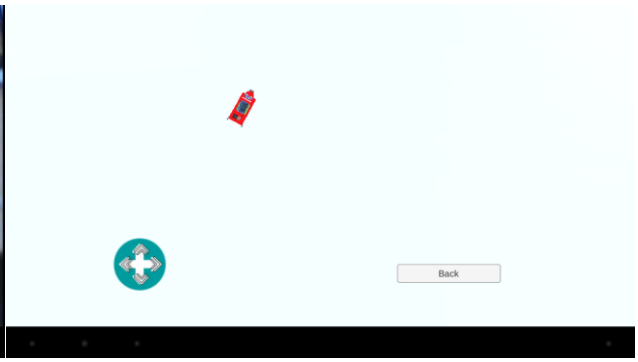


Figure 10 Teleguided robot simulation

In this scene we have a teleguided robot, it is the same with the wiring and coding then we have the simulation field.

5. Innovative Aspect

After a great research, we note that there is no application in relation to this topic in the electronics field and to be specific for the embedded and mobile systems branch. On the other hand, there are other applications in the field of science, math, architect...

For the realization part, we chose Unity and Blender as software and phones, tablets and smart glasses as hardware. Now, we will detail the software part:

- Unity: is a multiplatform game engine (smartphone, computer, video game consoles and web) developed by Unity Technologies.
- Blender: is a free 3D modeling, animation and rendering software.
- Vuforia: is one of the most popular platforms to help you work with the augmented reality development.

Specific aspects: Augmented reality (AR) is one of the biggest technology trends right now, and it's only going to get bigger as AR ready smartphones and other devices become more accessible around the world. AR let us see the real-life environment right in front of us (trees swaying in the park, dogs chasing balls, kids playing soccer) with a digital augmentation overlaid on it. For example, a pterodactyl might be seen landing in the trees, the dogs could be mingling with their cartoon counterparts, and the kids could be seen kicking past an alien spacecraft on their way to score a goal.

About the innovative aspect in our codes we can view the drag and drop function usnig the screen of your phone or tablet, using the headset controller of the smart glasses and we provide the use of your fingers to drag, drop or combine the different 3D models.

Artificial Intelligence has grown to be very popular in today's world. It is the simulation of natural intelligence in machines that are programmed to learn and mimic the actions of humans. These machines are able to learn with experience and perform human-like tasks. As technologies such as AI continue to grow, they will have a great impact on our quality of life.

It’s natural that everyone today wants to connect with AI technology somehow, may it be as an end-user or pursuing a career in Artificial Intelligence.

We are students in the computer science and we have the passion to know the novelty in our field and since augmented and virtual reality are technological innovations so they are poised to develop into the next computing platform and influence the lives of millions of people. And to properly prepare ourselfs we have studied the operating principles of the blender and unity software and the vuforia platform.

6. Applicability

We are using 3D models(Arduino cards, line follower...) constructed using blender, then we have multiple scenes in unity and we end it by generating an APK/IOS application.

Our project is an app for the students enrolled in embedded and mobile systems, its main goal is that we can do workshops without using a single material. İt can be converted into a commercial product because it is an educational application that can be used not only in class, but also anywhere by using the equivalent 3D models.

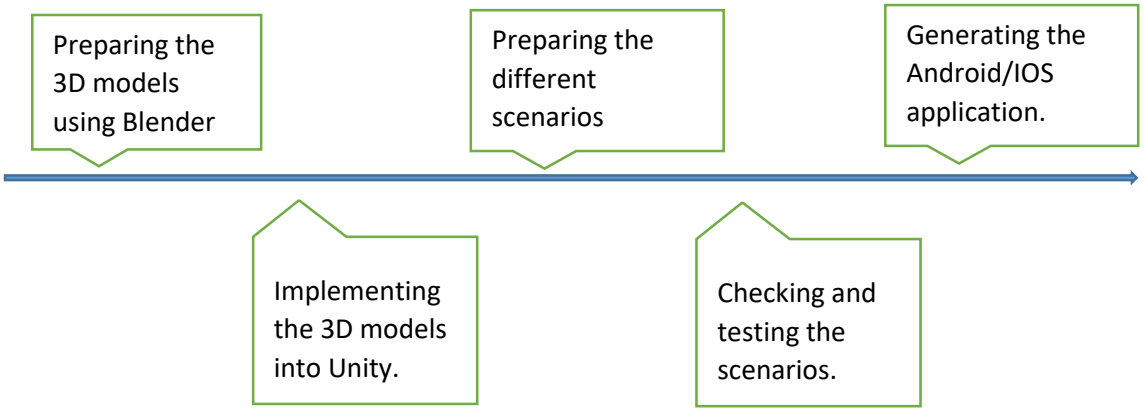
7. Estimated cost and Project Scheduling

Our project can be used on phones, tablets and smart glasses so we may need a smart glasses that supports AR/VR technologies.

This application can be generated at the lowest cost, but it can not be published without the account in each store(PlayStore/AppStore).

Materials	Cost
Epson MOVERIO BT-30C	499$

The most popular apps(Android and IOS) like GeoGebra, AugThat!, ARki, SmartReality+, Star Walk, Touch Surgery, Anatomy4D... are free on PlayStore and AppStore.



8. Target Group of the Project Idea (Users):

Our project is designated for the students enrolled in embedded and mobile systems, it is mainly about using our application instead of using different expensive materials.

The problem of the majority of the faculties is that they have a minimum budget for buying several materials, so our application can prevent that and offers the opportunity for having workshops without buying anything, just having a phone and our application is sufficient.

9. Risks

The problems that may arise during the implementation of the project are:

- Android version, which must be at least 4.4.
- The camera resolution should not be less than 5 MegaPixels .

Suggested solutions are:

- Try to update the Android version.
- Complaining to the technical service.

10. Resources

Epson MOVERIO BT-30C review - Augmented reality glasses under $500 (aniwaa.com)

11 Brilliant Augmented Reality Apps for Education in 2021 (reviewsxp.com)

What Is Augmented Reality? | The Franklin Institute (fi.edu)

Unity Game Engine Guide: How to Get Started with the Most Popular Game Engine Out There (freecodecamp.org)

About — blender.org

Best Augmented Reality SDK for AR development in 2018 - 2021 (thinkmobiles.com)