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Virtual Reality Lab for Mechanical Machines

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Abstract: Real education is getting experience form the practical performed by a student while learning. However, due to insufficient resources in educational institutes because of any reason it, developing proper scientific laboratories is not possible. A solution to this problem exists in emerging technology like Virtual Reality, which will help the institute to create a simulation of real laboratories. And the most expensive laboratories are mechanical laboratories which consist of several costly machines. We propose a Virtual Reality based solution to create the expensive mechanical laboratories which help students to perform practical on the machines and gather the experiences.
Keywords: Virtual Reality, HTC Vive, Unreal Engine, Blender, Mechanical Machines.

I. INTRODUCTION

This project aims to create virtual models of all Expensive lab instruments necessary for a particular experiment and store onto a server so that select users present at a remote location can access the models using virtual reality system and set parameters on these model and view the results on an interactive web page or mobile application in real-time.

A virtual reality system like HTC Vive is used for interacting with the remote models present on the server. Unreal Engine is used to create a virtual environment like a laboratory where the machine model is placed like a real machine. The user can interact with the model using HTC Vive Controllers and set parameters on the model, the system processes the parameters and computes the result and the user can see the animation on the machine like it is performing the task. The results can be viewed in a virtual system or can use the mobile app and the web platform for various purposes.

There are two main users in this system. The first one is the Faculty which will create a lab and add various machine models to it and add the specific mapping of parameters. The second one is the Student which will use the virtual reality system for interacting with the models and performing various experiments and the results are sent to the teacher and can be viewed by the student in the mobile app.

The virtual reality system consists of HTC Vive HMD (head-mounted display) it is a display which is wearable on the eyes and create a 360 Degree view in front of the eyes so, it feels like we are inside that view. Controllers are the interactive components of the system it has various buttons and uses them to interact with the virtual environment. Sensors are used to track the position of various components in the system. And a powerful computer consists of a high-performance graphics card.

Every model is created using multiple software like Blender, Maya, 3dsMax, etc. And then it is uploaded to the server, the teacher adds the model to the lab and adds experiment related to the model. The Unreal Engine is used for the environment creation like a lab room where the model is placed and the experiment is performed.

This Project will help the institute to provide various expensive machines to the student without investing money just to create the models of the machine and create experiments in the software virtually.

A. Objectives of Virtual Reality Lab

This approach aims at achieving the following objectives:

1) Provide simulates mechanical machines in the virtually created laboratories.
2) Provide a web portal for maintaining the labs and machines and recording the result of the practical.
3) Provide a platform to students where they can gather experience by performing practical.

B. Benefits of Virtual Reality Lab

1) Reducing the cost of laboratory development and maintenance, by creating virtually the machines which are expensive.
2) Students can do anything in a virtual laboratory without thinking of damaging the machines.
3) All the information on the Virtual Reality Lab is stored in the cloud and accessed using the web portal.
4) The space required by a Virtual Reality Lab is very much lower than that of a real laboratory.

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C. Basic Functionality

Building simulations of the mechanical machines which are not available and creating a Virtual Reality Lab to provide the experience that the student need.

II. WORKING MODULES

A. Virtual Reality Lab

Virtual Reality Lab with torsion testing, impact testing, and universal testing machine.

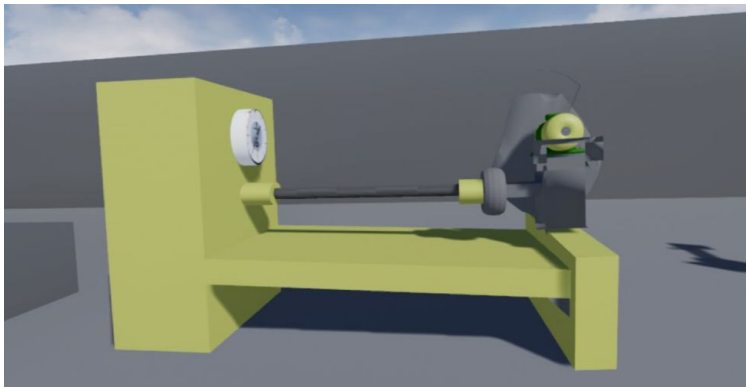


Fig. 1: Torsion Testing Machine in Virtual Reality Lab.

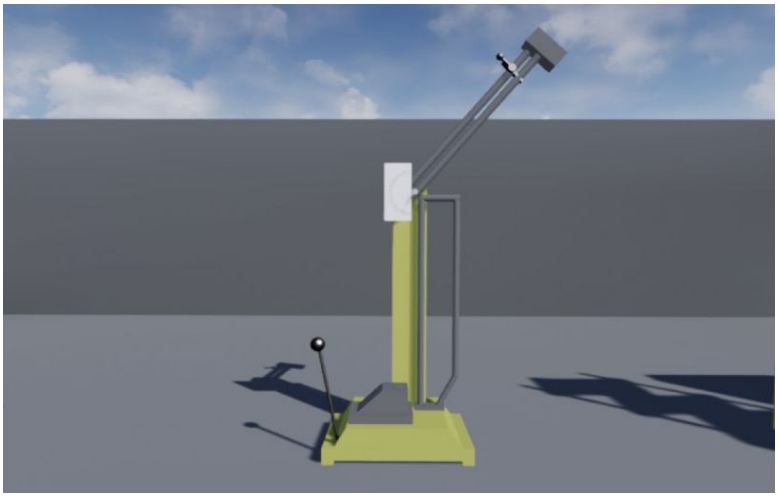


Fig. 2: Impact Testing Machine in Virtual Reality Lab.

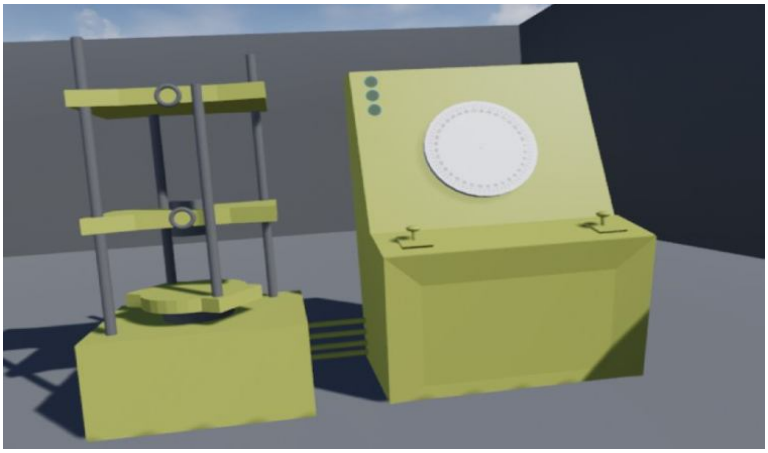


Fig. 3: Universal Testing Machine in Virtual Reality Lab.

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B. Web Portal

Web portal to manage the machines, labs, experiments, students, and faculties for Virtual Reality Lab.

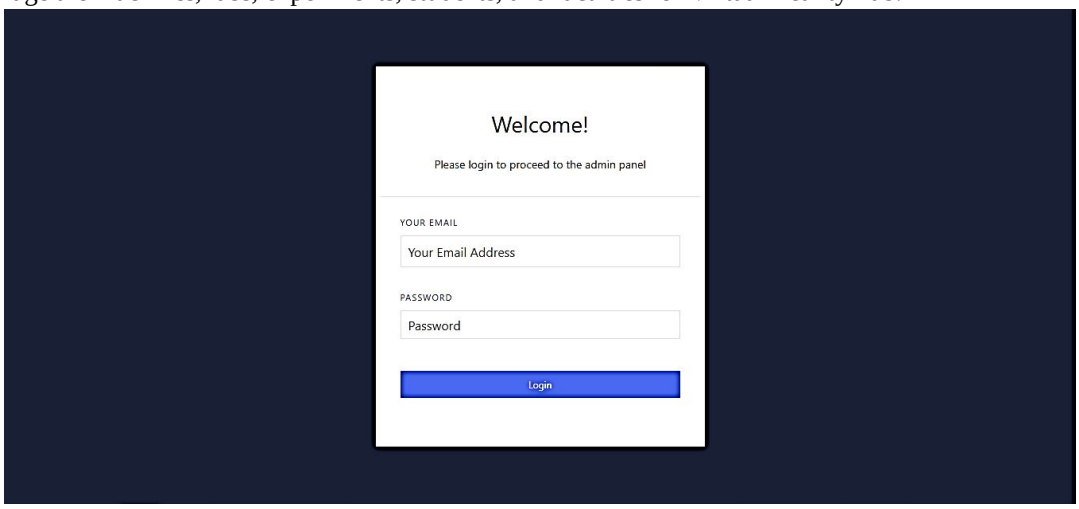


Fig. 4: Login Page

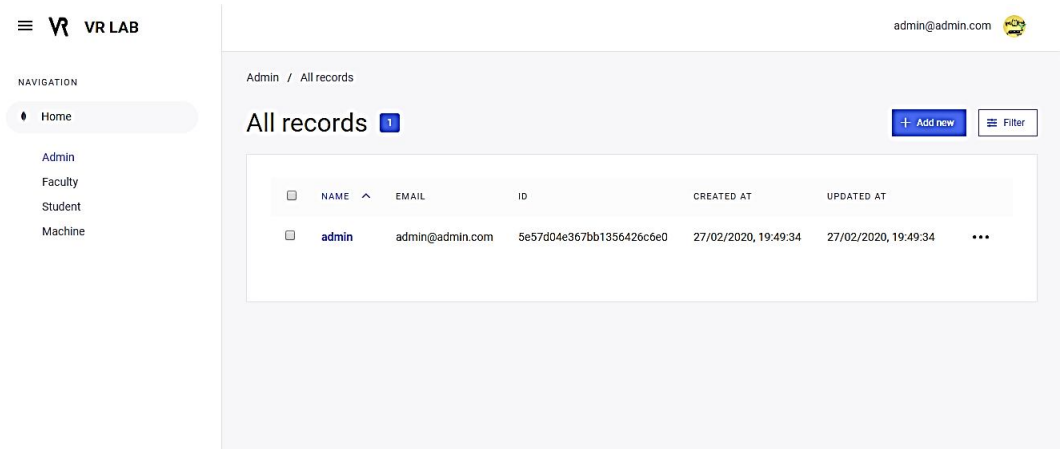


Fig. 5: Admin Panel

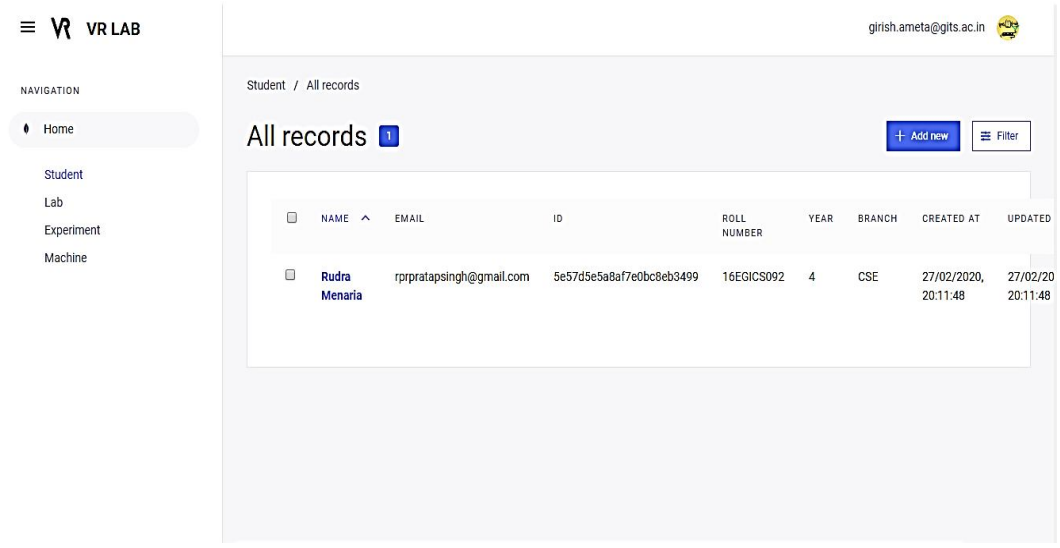


Fig. 6: Faculty Panel

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III. CONCLUSIONS

Virtual Reality Lab can become a good alternative for such expensive laboratories. Students can gather experience by using this system. And it will become more practical in the future. And can help institutes to help their students by providing a good alternative for this type of expensive laboratories.

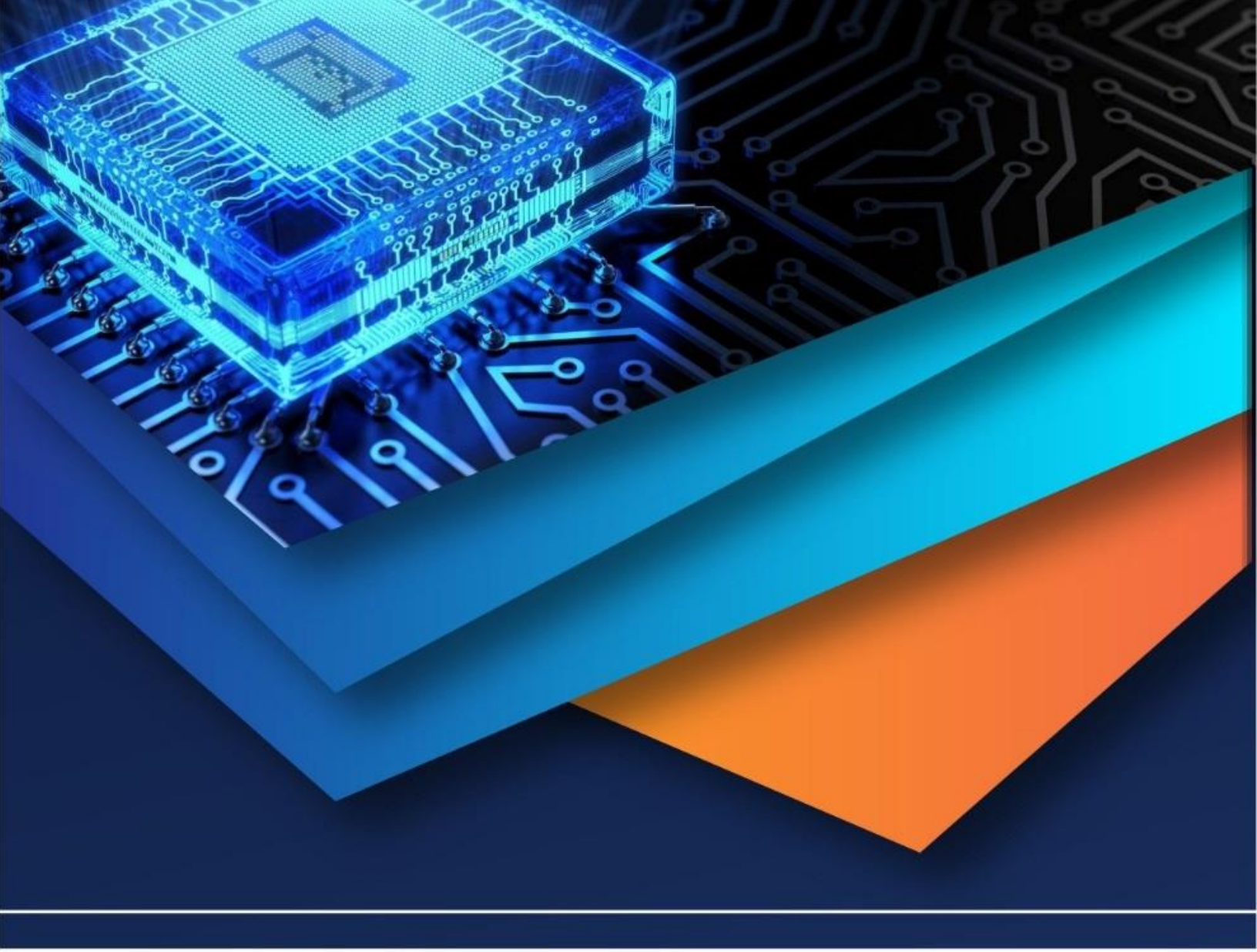
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