User Manual

Project: Physics Room

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Installation

The only installation required in order to run this application is an internet browser such as Google Chrome or Firefox.

In order to use the application, simply go to the URL provided below:

http://student.computing.dcu.ie/~reddinc3/Project/PhysicsRoom.html

User Guide

Introduction

- The purpose of this application is to aid the user's understanding of the laws of physics at a second or third level educational standard. This is achieved by answering exam questions from past papers. Furthermore, the user has the ability to manually change certain settings and observe the resulting changes within the simulation.
- Upon first starting the application, the user is presented with a display of a ball floating in the center of a room.
- To the top left, an interface can be seen which will provide the main controls for the application.
- To the bottom right, is a legend to be referenced by the user. This will provide insight into the meaning of certain lines and visual cue which appear within the application.
- Initially, the user is presented with "HIDE", "HOME" and "LIGHT SWITCH" buttons.
- The "HIDE" button hides the menu, preventing obstructing of the simulation.
- The "HOME" button brings the user back to the home menu.
- The "LIGHT SWITCH" button can be used to turn the shadows on and off. The reason for this feature is to free up processing power if the application in proving difficult to run for a given machine.

Getting Started

- An exam question can be simulated for the user in three steps:
  1. Choose one of the three education levels, either "Junior Cert", "Leaving Cert" or "Third Level".
  2. Choose the subject of the question.
  3. Choose from one of the questions available.
- Once the question has been selected, the user can click the "Show Q&A" button to see the question pulled straight from the exam paper. Clicking the button a second time will hide the question.

Using the simulator

- The user can zoom in and out of the environment through use of the mouse wheel.
- The user can click and drag the 3D space in order to rotate it. This allows the user to view the simulation from multiple angles as it runs.
- When the question has been selected, the user should click the "Start" button to begin the simulation. The user can then observe the ball as specified in the chosen scenario.
- When the simulation has finished running, relevant information and visual guides will appear:
  o The red line represents the max height the ball reached.
  o The blue line represents the displacement of the ball from its origin (vertical and horizontal).
  o The white line represents the path traveled by the ball as it moved.
  o The black spot represents the place where the ball first hit the ground.
- Once the "Start" button has been clicked, the user can then click the "Show Q&A" button to show the question again. However, this time the answer will also have been calculated by the simulator and will be displayed beneath it.
- The solution provided will clearly display the steps carried out in order to arrive at the answer to the chosen question.
- The user is given the ability to adjust them settings to any question in the application. This is in order to facilitate the user's understanding of how the laws of physics have been applied within the question.
- In order to adjust the settings, the user should click the "Build your own" button which can be found along with the question buttons and has been highlighted.
- Clicking the "Build your own" button will cause a new menu to appear in the top right corner of the screen. The options within this menu will vary depending on which education level the user has chosen.
- This menu will allow the user to alter the default settings of a given question such as velocity, acceleration due to gravity, stopping time (setting the stopping time to zero will cause the simulation to run until the ball comes to a stop), etc.
- Once the user has made their intended changes, they can then click the "Start" button to run the simulator with the settings that they have specified. The user can, once again, click the "Show Q&A" button to see how their changes have changed the answer to the question.
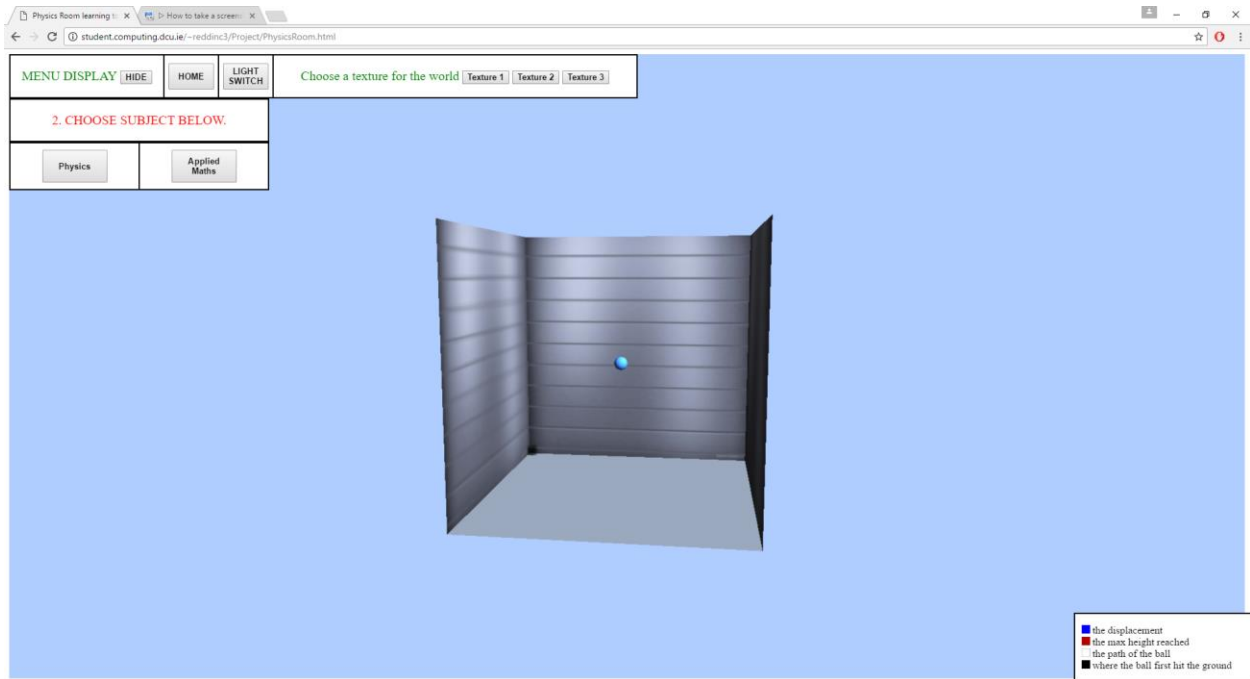
Screenshots

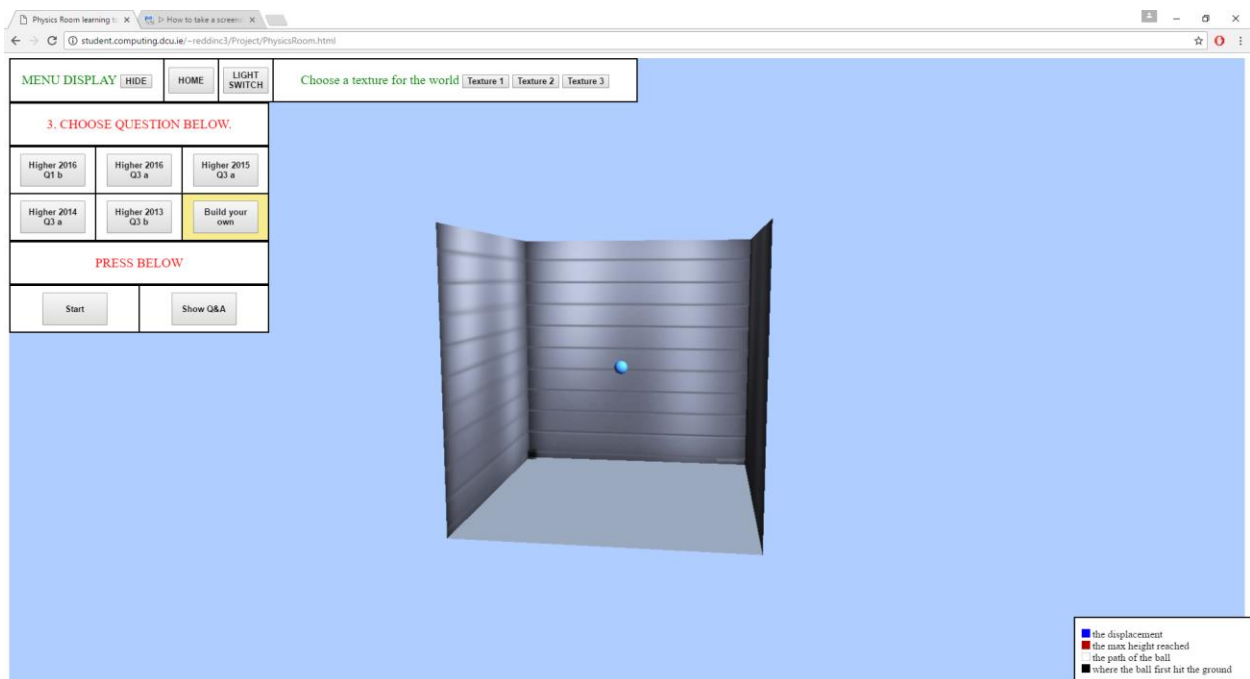Below shows, what is first presented to the user upon loading the application
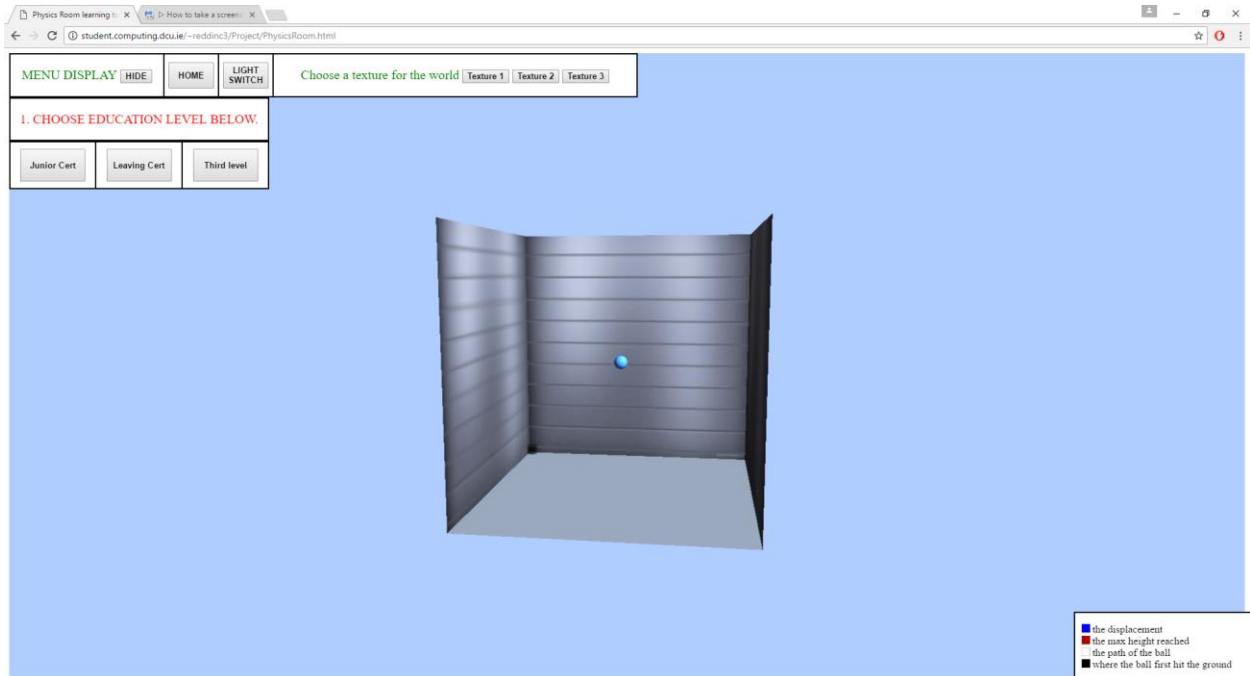
As can be seen below, the buttons along the top of the screen change the textures of the room.
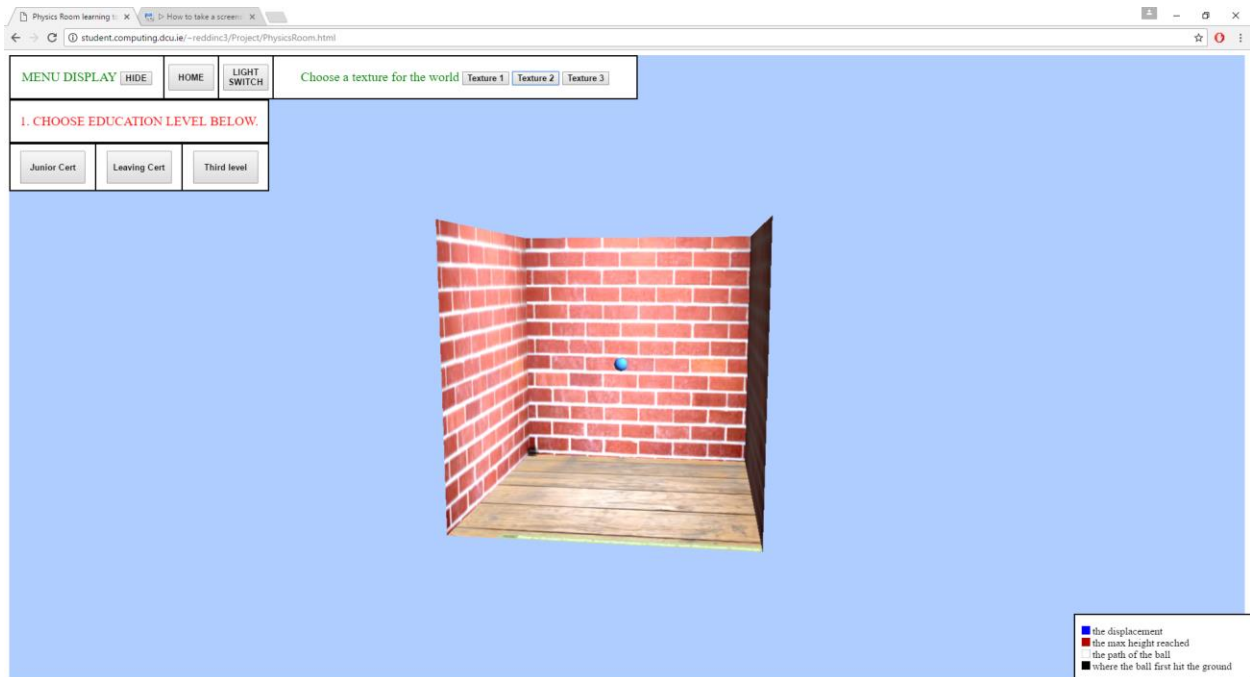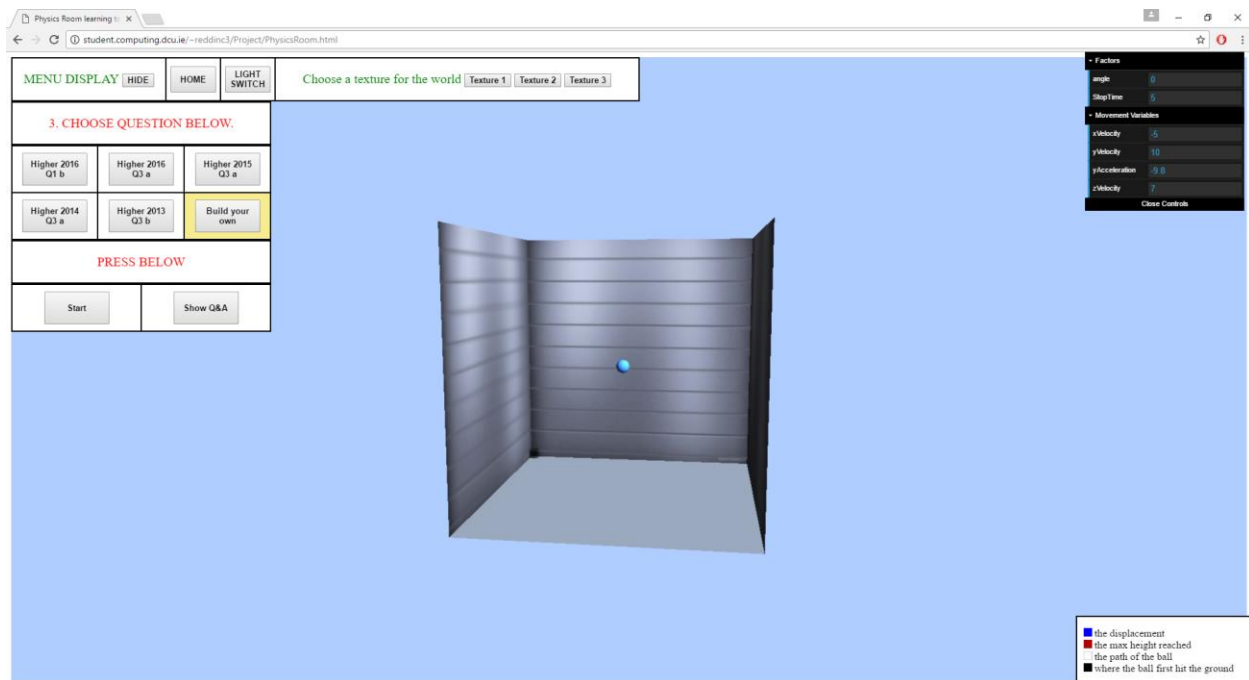
As shown below, the user chooses an education level followed by a subject.

Following this, the user is presented with a selection of questions.

As shown below, by clicking the "Build your own" button, the user opens a menu on the right hand side that can be used to alter the settings.

Once a question is selected, the settings are updated to the relevant inputs and the question can be displayed by clicking the "Show Q&A" button.
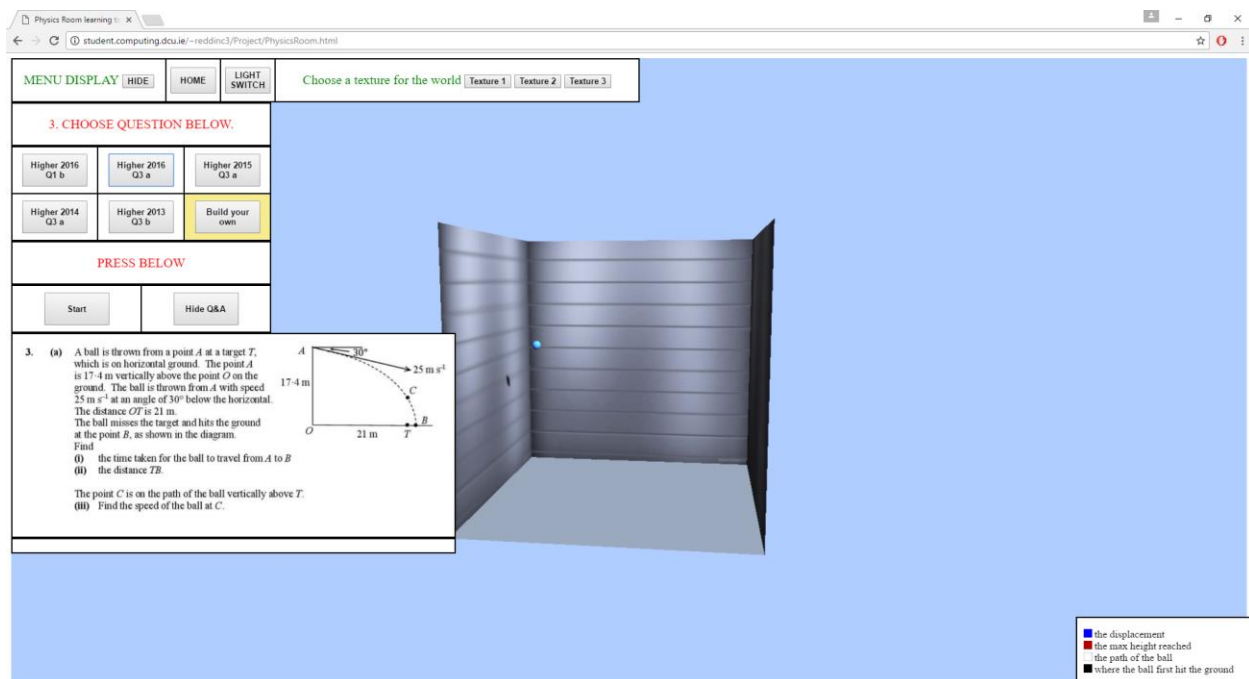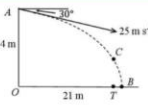
When the "Start" button is clicked the simulation is run and the answer is calculated below the question.

Clicking the "HIDE" button at the top will hide the entire menu.

Clicking the "LIGHT SWITCH" button will turn off the shadows.
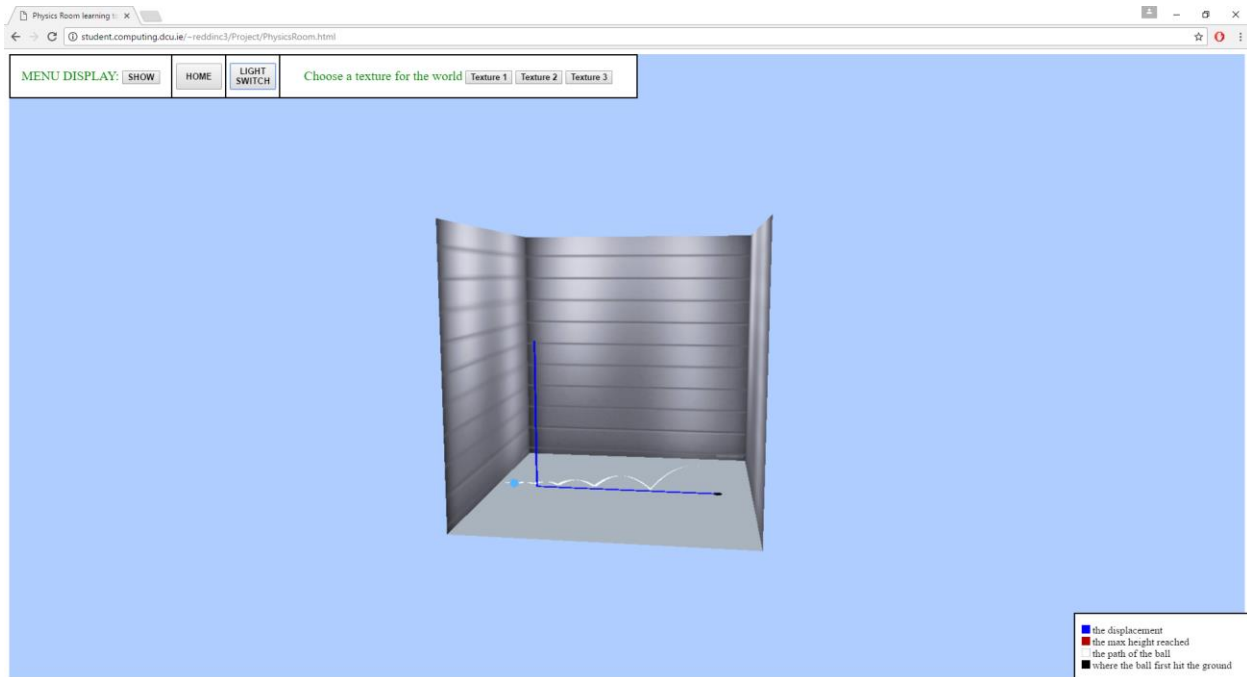
The white line shows the path that the ball followed. The red line shows the max height that the ball has reached. The blue line shows the vertical and horizontal the displacement of the ball (on hitting the ground). The black dot shows the spot where the ball first hits the ground. This is all shown in the legend in the bottom right corner of the screen.
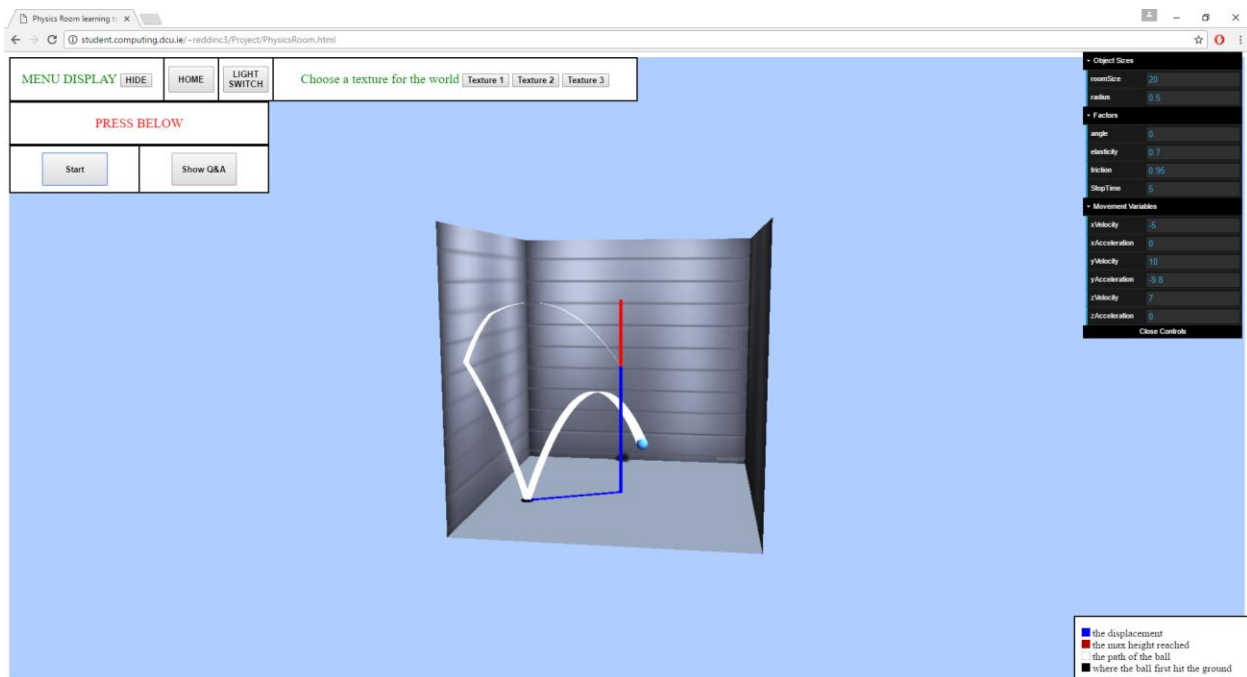
As shown below, the mouse wheel can be used to zoom.
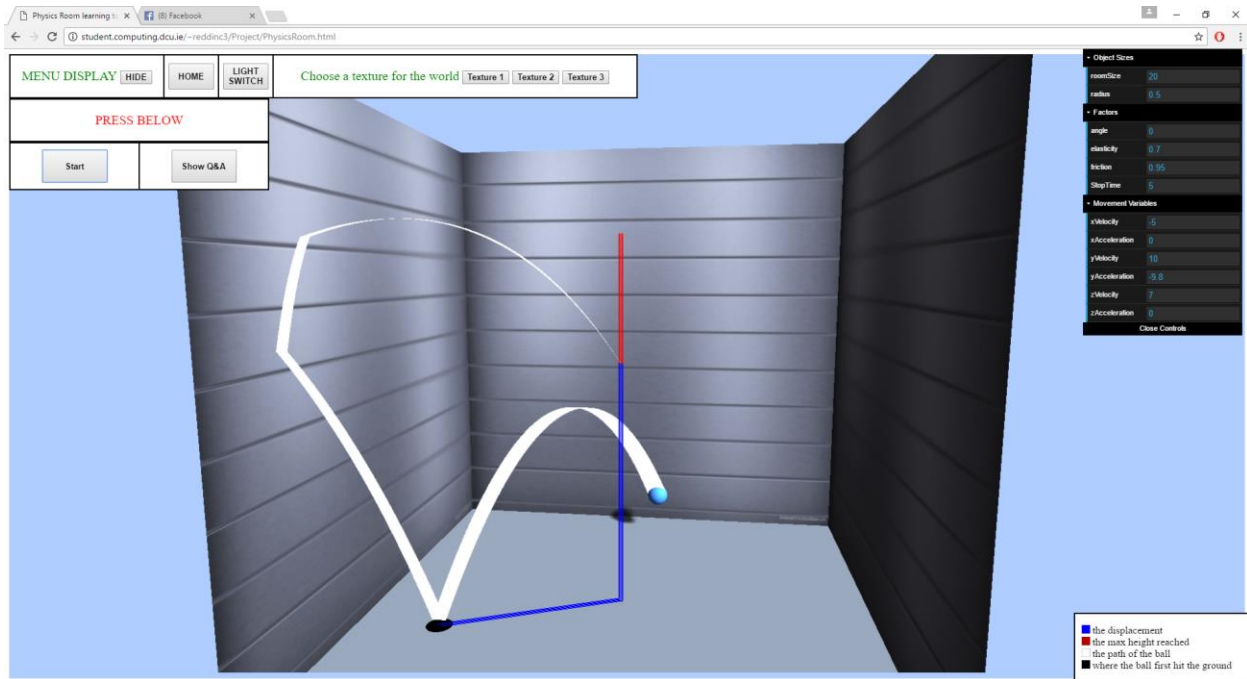
The user can click and drag the world to rotate it.