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Initial Project Plan

Project Title: Physics Lab - Teaching Package

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Project Description

The physics lab - teaching package involves the design and implementation of a visual simulation of a number of scenarios that would typically be encountered in a secondary school physics course. The emphasis of this project is on providing a way of visualising the actions of forces on objects and how these actions are reflected by the underlying equations. The package would be used as a teaching aid by an instructor to demonstrate the application of these equations, which would otherwise be difficult or dangerous to perform. This package should also provide a more engaging method of teaching students the mathematical concepts behind various applications of force and help students to better understand and apply these concepts.

Aims & Objectives

The overall aim of the physics lab - teaching package project is to produce an interactive and visually attractive physics simulation that would improve a secondary school physics students' understanding of and ability to apply equations of force and kinematics, which would otherwise be difficult to visualise. In order to achieve the overall aim, the project has a number of specific aims:

- To encourage students to engage with more challenging aspects of their course.
- To allow the course instructor to visually demonstrate the application of force and kinematics to students.
- To enable the package to operate in as many different lab environments as possible.
- To allow students and the course instructor to interact with the simulation and to modify the simulation as required.
- To improve students' understanding of the mathematics behind kinematics and forces.

The objectives of the project are as follows:

- To provide a range of simulations that demonstrate aspects of force and kinematics that would typically be assessed at GCSE/A-level physics.
- To provide an intuitive user interface that would be usable by a user who is not computer literate.

- To allow variables such as the initial velocity or amount of force applied to an object to be modified in a simulation, where appropriate.
- To allow a simulation to be paused, restarted, resumed or stopped at any point.
- To allow the interval at which a simulation is updated to be modified, where appropriate.
- To use visually stimulating graphics, to hold the attention of students.
- To include relevant equations and values in a simulation, updating them as the simulation progresses.
- To allow values to be hidden in the simulation, so that they can be derived by students for practice
- To provide calculating tools, so that examples can be worked through by an instructor

Interim Report

The interim report will contain the following:

- A requirements analysis, outlining in detail what the package will need to meet the aims and objectives of the project, as well as selecting an appropriate development model.
- A report into various programming languages that could be used to code the package, giving pros and cons of each and determining which of these are most appropriate to use.
- An evaluation of similar packages, outlining good and bad aspects of these systems, and how these aspects will affect the implementation of the final package.
- Research into A-level/GCSE physics courses, analysing areas that could be included in the system and concluding which of these will be used in the implementation of the system.
- The design and implementation of a basic prototype system which will include one simple simulation.

Final Report

The final report will contain the following:

- Designs and implementations of the user interface and remaining simulations, as well as any refinements on the prototype system.
- A test plan and results of testing the systems functional and non-functional requirements
- Planning and results of acceptance testing the software by an A-level instructor.
- Evaluation of the methods used throughout the project, how well the final solution met the requirements and a personal reflection on the project.
- A conclusion of whether the project was successful, highlighting areas that could be improved in future