

Draft Proposal for Self-Directed Embedded Systems Project

Team Name: 3 Little Pigs Went Out One Day

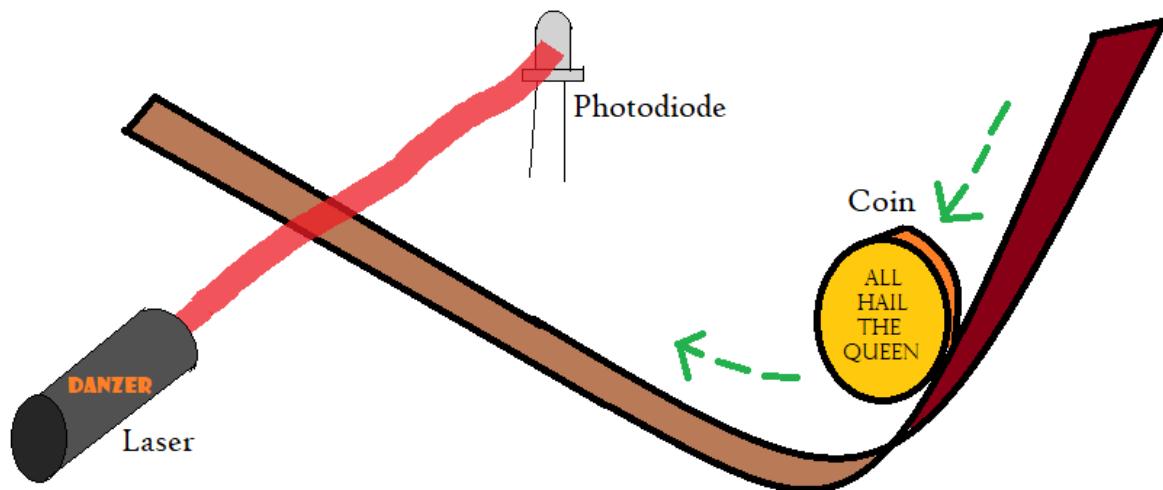
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Team Number: 35

Proposal Description

Vending machines are used in our day to day lives. We insert the coin, the vending machine identifies the coin, adds the coin's value to the required amount to buy the snack/drink, tells us how much money is still required and, if we insert too many coins, it calculates what change it owes us. The calculations are quite simple and require skills no more complex than that of a high school student. However, the trickiest part of the entire process is the very first step: identifying the coin.

Most vending machines simply have different sized holes in the slide through which the coin rolls, and according to its size it falls through one of the holes. We, however, decided to adopt a different approach. Our proposal is to build a "Digital Piggy Bank" which will use lasers to detect and identify the coins. The user will push the coin through the machine and the coin will roll along a sloped plane. There will be a laser and a photodiode at a certain point along the path of the coin. The program will measure the time taken for the coin to pass the laser light by keeping track of how long the laser does not reach the photodiode. The time taken for the coin to pass will be directly related (not necessarily proportional) to the diameter of the coin, and thus will correspond to the value of the coin. The program will then add that value to the overall balance of the piggy bank and this way will keep track of the amount of money and the distribution of coins in the piggy bank.



In order to determine what coin it is according to the time, we will need to do some physics calculations. However, we think a statistical analysis would be more useful and accurate in determining the coin. This is because there are likely to be additional quantities and random errors that we cannot predict and model using the theoretical model. Therefore, we have decided to use the statistical analysis primarily, but also use the theoretical model to verify the results with some amount of accuracy.

Equipment Needed

Equipment	Justification	Source	Cost
Raspberry Pi	To run program	ECE 150 Materials	\$0
Laser	To flash light	ECE 150 Materials	\$0
Photodiode	To detect the light	ECE 150 Materials	\$0
Operational Amplifier	To amplify the change in the voltage through the photodiode	ECE 150 Materials	\$0
Comparator	To compare the amplified voltage with a reference voltage	ECE 150 Materials	\$0
Miscellaneous Electronics	To set up the circuit	ECE 150 Materials	\$0
Cardboard structure	To create a box structure with a slope	Rapid Prototyping Centre	\$5 approx.
3D Printed Slope	Slope for coin to fall through	Rapid Prototyping Centre	\$7 approx. (\$10 per cubic inch)