Report

Design Cycle Challenge 2013/14

Team 32
Group Name: The Red Lantern
Ajew (G6), Aeneas (G6), Nan (G7), Sha Sha (G7), Samina (G8), James (G10)

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Problem

Create a Rube Goldberg machine that contains 3 actions, 2 potential energy sources, incorporates the assigned stimulus and also demonstrates your collaboration and creativity.

Responsibilities

- Ajew (G6) - Constructor, designer, researcher
- Aeneas (G6) - Constructor, designer
- Nan (G7) - Constructor, researcher
- Sha Sha (G7) - Constructor, researcher
- Samina (G8) - Constructor, designer
- James (G10) - Constructor, researcher

Machines that we are going to use in this project

- Pulley
- Lever
- Inclined plane

Design Specifications

-Must use at least 3 types of mechanism(lever, pulley, ramp, domino, suspension,....)
-Must use 2 types of self produced energy(kinetic, electric, heat,....)
-Must connect with other people's machine's mechanics so it can continuously run.
-Must in some way represent the group visual.

Tests:
-We will develop 3 mechanisms. And look at the machine with our eyes to see if the machine has 3 mechanism.
-We will see that it will have 2 energies available.
-We will see if the activation of the previous machine triggers ours and ours triggers the one after ours.
-We will ask people if our group's representation of the visual is acceptable.

Design:

1

This design was where the dominoes start a marble that rolls onto a lever and triggers another domino that activates the pulley that trigger another domino that ends the machine.

2

This design was where we had a domino that activated a pulley to drop balls down a ramp that will trigger books to fall and then connect to the domino.

3

This design was the design was where the dominoes start from a high place to drop a marble into a cup in a pulley and the other cup on the pulley will drop a marble onto the zig zag ramp and drops onto a lever that triggers a series of dominoes to end the machine.

Inquiry and Analyzing

Design Brief

Day 1 - Tuesday, November 12, 2013

Today, we planned our design of the Rube Goldberg machine. We planned to use a pulley, inclined plane, marbles, cups, strings, KIS dominoes, future board, marbles, books and woods. We started on building the machine in the auditorium by first creating a pulley and three types of inclined planes, which were pasted on a black box.

Day 2 - Wednesday, November 13, 2013

From period one to five, we improved the elements of our Rube Goldberg machine because some of them didn't work properly yesterday. We also added another element of the Rube Goldberg machine, which was stacking dominoes next to the lever, which two of them had small chopped wood pasted in the middle of them. We did this because when the marble slides down the lever, it will hit the two dominoes and one will move backwards and hit the dominoes.

Day 3 - Thursday, November 14, 2013

After the test from period one to three, our group scored zero out of five tries, meaning in total, we

earned zero points. We also added another pulley with two balloons that are tied to the string as well. When the string vibrates, it will hit the dominoes near it and then hit the car because the car will hit the other stacked dominoes.

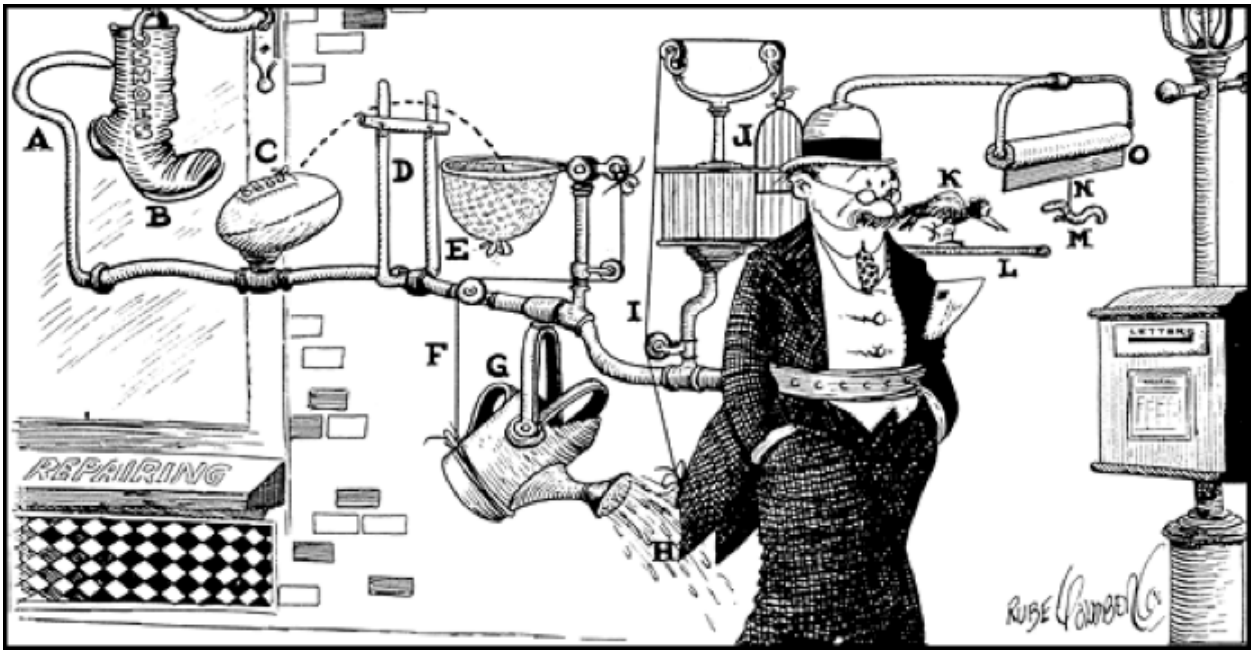
Research

Guiding Questions

- How is Rube Goldberg machine invented?
- What is Rube Goldberg machine?
- Who is Rube Goldberg?
- How do simple machines function? (pulley, lever, inclined plane, wheel/axle and gear)
- What are the examples of kinetic and potential energy that our group can use for our project?

How is Rube Goldberg machine invented? (Sha Sha)

At first, Rube Goldberg was a sports cartoonist who drew pictures of items that were used at homes, which did complex actions instead of simple ways to complete the objective, for example, a garbage opener without anyone opening it. He drew a bathtub, bumblebee, flower and an athlete. He had an opinion that many people prefer to do things in the difficult way instead of an easy one. For each of his cartoon inventions, he took more than 30 hours to finish it. The drawings he made were very popular so Webster's Dictionary explained that Rube Goldberg means "accomplishing by extremely complex, roundabout means what seemingly could be done simply" (History of Rube Goldberg). His first cartoon invention was called Automatic Weight Reducing Machine. It used a donut, bomb, wax, balloon and hot stove for entrapping an overweight person. It was completed in 1914. Rube Goldberg was interested in the advanced technology during his era and how it was funny to make other people lazier.



Automatic Weight Reducing Machine

http://mousetrapcontraptions.com/history-4.html
http://www.rube-goldberg.com/
http://www.thisgreedypig.com/home/design/rube-goldberg-machines/

What is Rube Goldberg machine? (Sha Sha)

Rube Goldberg machine is a machine that accomplishes a simple task in a very difficult way for safety and errors that might occur in the future. There will be a chain process of when a part of the machine makes the other object function. This will continue until it reaches the final object. The final object decides the objective of the machine. The objective is the simple duty that the machine will do.

http://2dhouse.com/rubeprocess.php
http://www.merriam-webster.com/dictionary/rube%20goldberg

Who is Rube Goldberg? (Nan and Sha Sha)

Rube Goldberg was an American cartoonist who lived in America. In 1904, Rube Goldberg had a career of creating sewer pipe designs for the San Francisco Sewer department. After a few month he changed into San Francisco Chronicle and the San Francisco Bulletin's sports writer and cartoonist. He had a prize of the Putziller Prize in 1948. His cartoon called Peace Days was very popular. He was born on the 4th of July in 1883. The place of his birth is San Francisco, California. He died on the 7th of December in 1970. He used to attend at University of California too. His original name is Reuben Lucius Goldberg.

http://www.biography.com/people/rube-goldberg-9314372

How do simple machines function? (Pulley, lever, inclined plane, wheel/axle and gear) (Sha Sha)

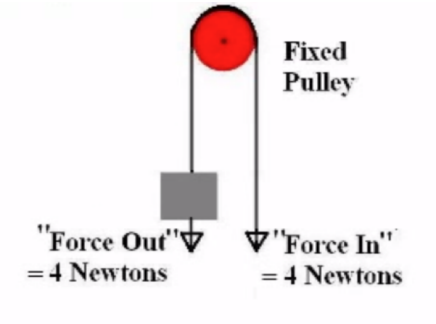
All of these simple machines make work that we have to do easier and faster. They also reduce the force of lifting or moving objects.

Pulley:

A pulley is a wheel with a grooved wheel around its area. There is a string fixed in the groove, which is for making it moves smoothly when the pulley drags items upwards while the groove spins. When we pull the string by our hands, it is called force in. The force that the machine creates is called a force out. This means that when the item is lifted, it is called force out. It can be used for lifting a flag. There are three types of pulley -

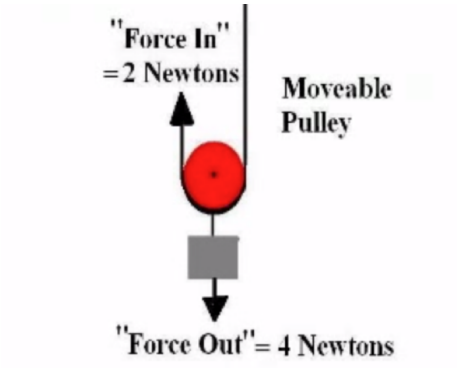
Fixed pulley -

It is a type of pulley that the string is inside the grooved wheel firmly and the grooved wheel doesn't move upwards or downwards.



Moveable pulley –

It is a pulley that the grooved wheel moves up and down with the item that it is lifting. Force in moves further than force out.



Compound pulley –

It combines the features of a fixed pulley and moveable pulley.

Chain hoist –

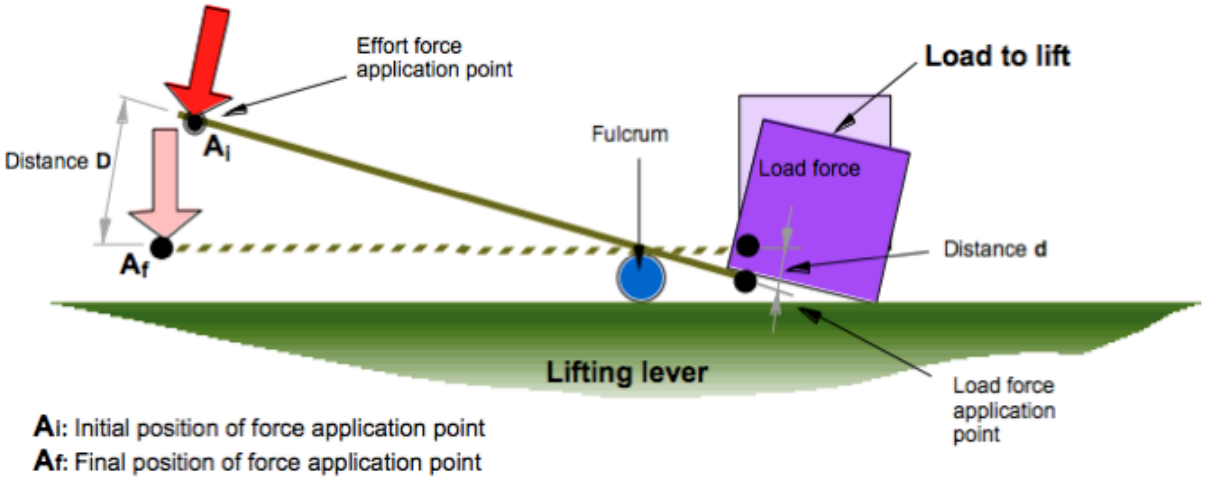
Chain hoist is a pulley, which uses chains instead of strings. At the bottom of this pulley, there is a moveable pulley, while the top has a pair of notched pulleys. Notched pulleys don't have the same diameter and aren't connected to each other but they are able to create a huge amount of force. It can be used for lifting a tractor.

A pair of notched pulleys

http://www.sciencekids.co.nz/videos/physics/pulleys.html

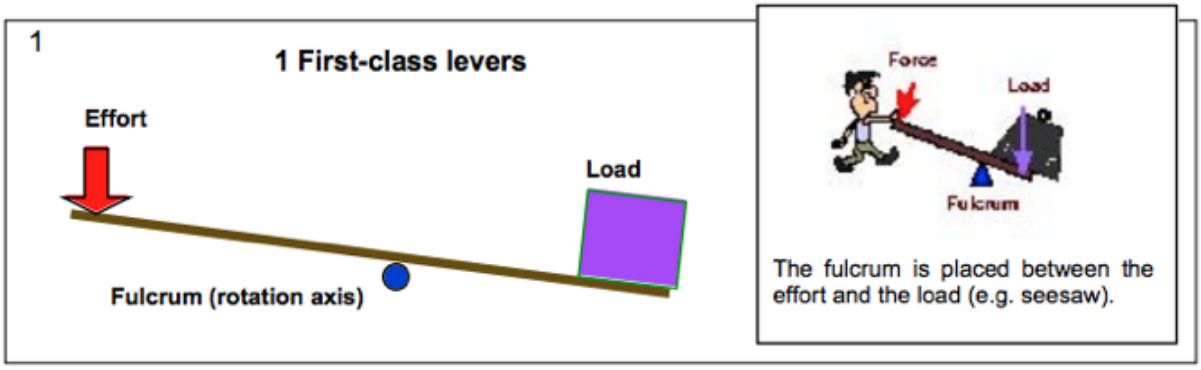
Lever:

A lever is an unbendable structure that can turn on a fulcrum (central point of the lever) and experiences two forces. The two forces are effort and load. When the force is put to a lever and has a mechanical advantage, the movement of the effort force is bigger than the load force. The machine will have a mechanical advantage if the force of the effort has a smaller amount than the load force.

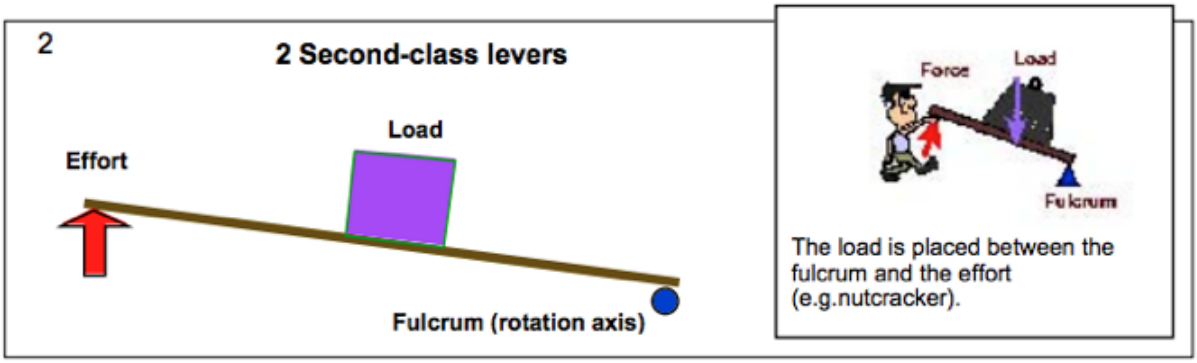


There are three types of levers.

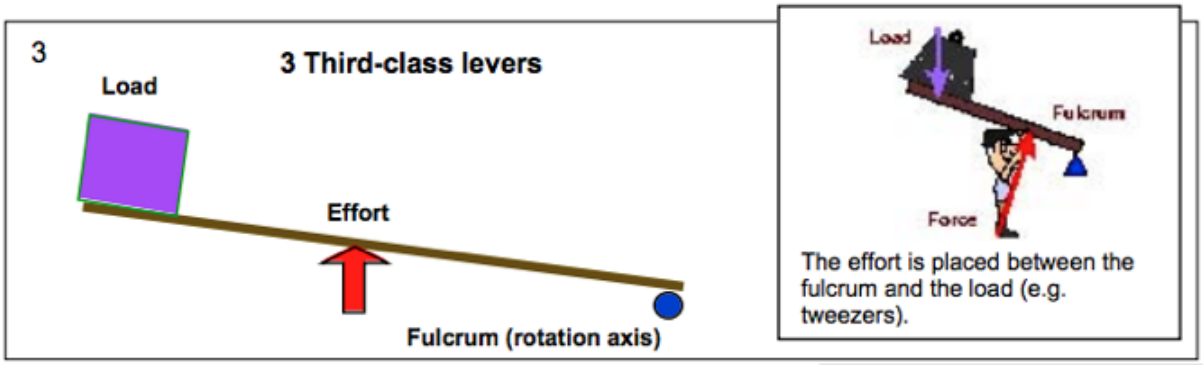
First class - A lever that has the fulcrum between the effort and load – example: seesaw



Second class - A lever that has the load between the fulcrum and effort – example: nutcracker



Third class - A lever that has the effort between the fulcrum and load - example: sugar tongs



http://www.cslaval.qc.ca/cdp/telechargement/anglophones/tech/levers.pdf

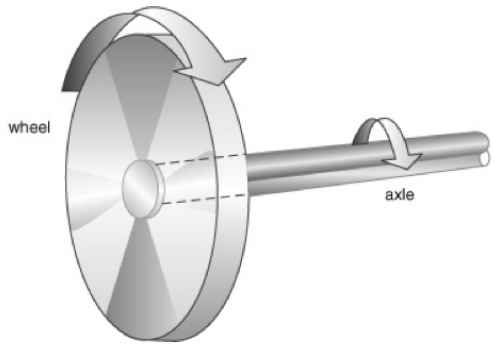
Inclined plane:

Inclined plane is a type of machine that has a sloped and straight surface. It works by rolling items upwards and downwards on it in order to place them to the other place. It is because this machine needs only a small amount of input force. If we don't use the inclined plane, we will actually carry the item, which is very heavy. The example of this is rolling a piano to the truck.

Force, Motion, and Energy - book

Wheel and axle:

Wheel and axle is a simple machine that uses a wheel and axle that both spins in the same axis. The examples of this are doorknobs and screwdrivers. It can be known as a type of lever as well. The radius of the wheel is similar to the force arm, while the radius of the axle is similar to the resistance arm. The axis of the axle is similar to the fulcrum. Those will make the wheel and axle spin easily.



THE WHEEL AND AXLE IS A WHEEL CONNECTED TO A RIGID POLE.

http://science.howstuffworks.com/wheel-and-axle-info.htm
http://www.education.com/reference/article/firefighter-exam-study-guide-wheel-pulley/

Gear:

Gear is a machine part that has the edges of teeth and connects with the other gear for transferring movement or modifying rotation direction. When the gear spins, it will give gear reduction to the machine that it is inside. It can also give more twisting force (torque) too. The example of the usage of this is electric screwdrivers. They have a huge about of gear reduction because they need a lot of twisting force for turning the screws. Even though they have already had a motor, it is still not enough for the screws to spin.

http://science.howstuffworks.com/transport/engines-equipment/gear.htm
http://www.thefreedictionary.com/gear

What are the examples of kinetic and potential energy that our group can use for our project? (James)

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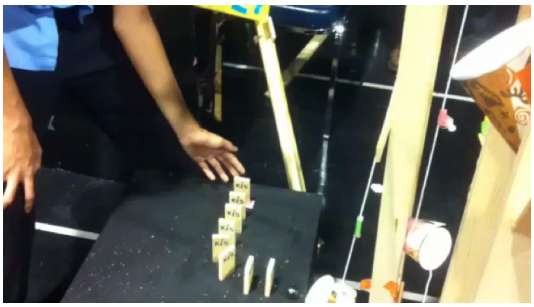
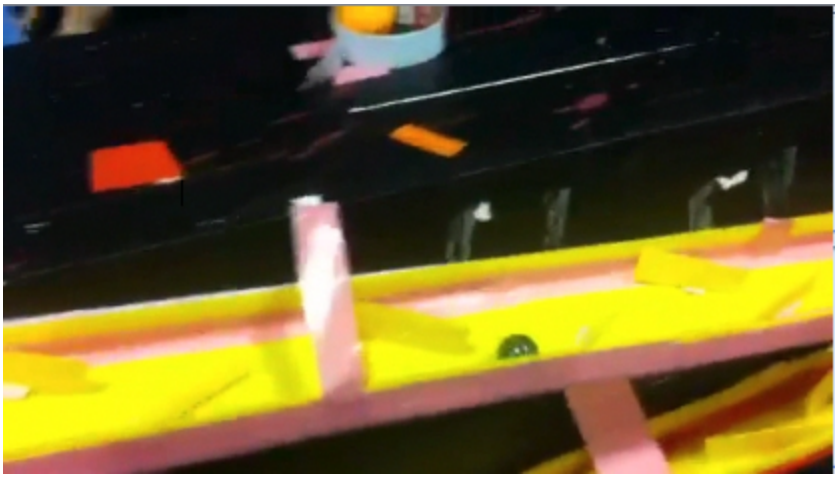
Developing Ideas

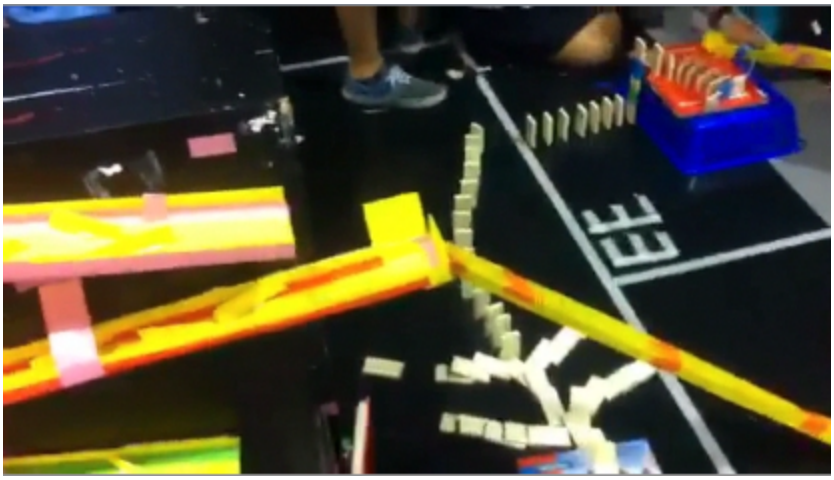
At first we drafted a lot of ideas on photoshop so we can easily erase and draw ideas. We drafted a lot of pulley systems, levers, dominoes, ramps, and a variety of different ideas. Some ideas were quite surreal to use in a context of student made machine so they were immediately discarded. However, we did put together some viable ideas that we deemed would be fun and entertaining to do.

Creating the Solution

We had to be very creative to come up with ways to make the machine work. The pulley had a lot of trouble so we had to fix it. We added 3 stabilizing ropes to keep the cup from wriggling. So the pulley works properly and the ramp also had attachments to catch the ball properly. The balloon was added to connect to the visual stimulus. We had trouble how to install it, but we had an idea. We attach balloon to pulley so it wriggles a line that shoto domino.



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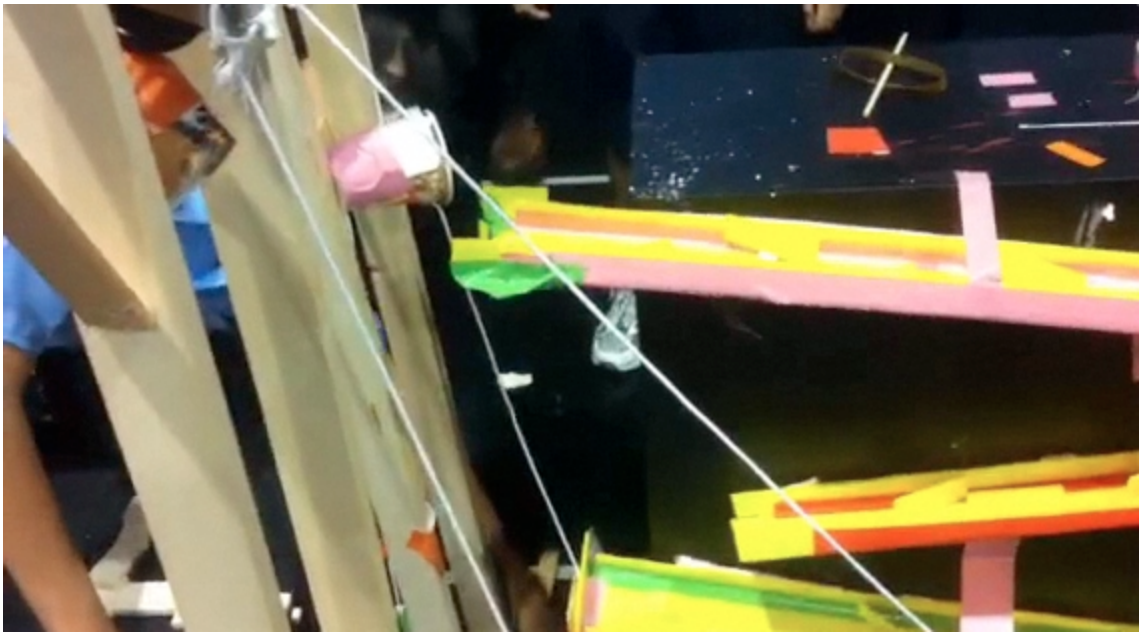

Evaluating

Our machine has a very good theory behind the mechanics but putting it through the action was a lot harder than expected. Of course because when we designed the machine we expected everything to succeed the expectations were very high but when we actually did the machine and set it up it failed to work half the time. However, we have been working on well and it works well in the end. We did good. Teamwork was good.
