Guelph Engineering Society

Report on _ *Ontario Engineering Competition!!!* at _ *Waterloo*
_ January 29th – 31st .

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1. *Outline of the Competition*

We competed in the Senior Design Competition. We were required to build a working prototype and present it in front of a panel of judges. We had 8 hours from 8:30 to freaking 4:30 in the morning to build it AND make our power point presentation. It was really tiring. We drank lots of coffee, and ate bulk barn foodz. The other teams were SOOOO jealous of us because they were hungry. And we had an all GIRLs team. We got interviewed for being an all girls team. It was great and kind of embarrassing. The next day, on Saturday, we had to present our prototype and how we designed it. A demonstration of its working-ness also happened Saturday.

2. *This Year's Task & How the Team Approached It*

We approached the problem using the **WWWSD approach**: What would Warren Stiver DO? This approach involves good team dynamics, remember to storm before you norm! We also enjoy using the 3 vectors, environmental, social, and economic benefits (or P^3 – people, planet, profit). It makes for a kick-ass presentation. We made a kick-ass presentation before we even got there because we were so on top of things. We tried on our presentation outfits before hand too, to make sure we would all look good and match. In terms of ppt-ing it up, we did not follow the Stiver philosophy – students may be subdued with drab backgrounds, but judges will be impressed with flashy colours! For this competition we had to design a mining vehicle, which descended an 80 cm mining shaft, and had to retrieve a Styrofoam mineral. The vehicle then had to return to the top of the mine. This had to be completely remotely controlled, using motors, batteries, and switches. This whole competition was to "reduce workplace injuries in the natural resources industry". Our design was different from others because we did not use the geared motors provided. These would have been helpful because they provided lower rpm and higher torque for the vehicle – more control. We built a very cute (aesthetically pleasing) 2-wheeled machine with an elevator to lift it up and down (there are pictures in the powerpoint). Our little car was made of Popsicle sticks and had spoons on the front to steer the Styrofoam to the elevator. He had motors on his wheels to make him go. Vroom vroom.

3. *Evaluation of Performance*

i) ***Conference Organizers***

The conference was fairly well run. The Saturday night social event was LAME (bowling, glow in the dark none the less). We wish it could have been better… They also managed to play a terrible joke on the winners of senior design, also a bad call…

The hotel was quite far from the University. It was also a little bit creepy.

The room we built our design in did not have very many working plugs. The socket blew air out of them instead of electricity and it didn't seem very safe.

ii) Team

Our team performed fabulously – working seamlessly like the well-oiled machine we are. We highly recommend forming task forces to divide up the components of the project for extreme building efficiency. We had a very successful presentation. We planned our entire design in the girl's bathroom because it was quiet and private and we were the only girl's team so no other teams could come in there and listen to us and steal our ideas. Also we could use 'the facilities' while we were planning so it was really handy. It was a good time management strategy. We learned about motors, and recommend future senior design teams be familiar with soldering batteries, motor types, and switches! We got a large cheer when our design didn't finish. It was close and probably would have worked if we'd had longer… or used geared motors. We learned a lot for next time. We now know how to use geared motors and our design would have worked super awesomely if we had known that when we were building. We did a great job and tried really hard. Go team. We now hate each other and still have to do design 3 together. The failure (but not complete failure- it mostly worked) of our design has destroyed our friendship. We never want to see us again. Just kidding. We're an even better, and more well-oiled machine now.

Design Demonstration Schedule

The design demonstrations will occur in RCH 301.

Time	Team in RCH 301
1:45	University of Toronto
1:55	University of Guelph
2:05	University of Waterloo A
2:15	Laurentian University
2:25	York University
2:35	University of Windsor
2:45	University of Waterloo B
2:55	Queen's University
3:05	University of Ottawa
3:15	Ryerson University B
3:25	McMaster University
3:35	Carleton University
3:45	University of Ontario Institute of Technology
3:55	University of Western Ontario
4:05	Ryerson University A

Dress code for presentation and demonstration is business casual.

There will be a question period after the problem is presented.

Theme

The objective of the 2010 Senior Team Design Competition is

"Using technology to increase safety in the workplace."

Scenario

To reduce work-related injuries and deaths in the mining industry, the government has contracted your company to design a remote controlled mining vehicle.

The mining vehicle should be able to descend a rope down the mine shaft to the mine floor, where it will navigate an uneven terrain to a designated loading area where it will have to retrieve its payload. In the case of obstacles, the vehicle can either push the object if small, or navigate around the obstacle. After locating and gathering the minerals, the vehicle should be able to navigate back to the mine shaft where it will ascend the rope to the surface.

attach it to rope in beginning

Can test as many times as like.

walk into testing room. obstacles in a different location

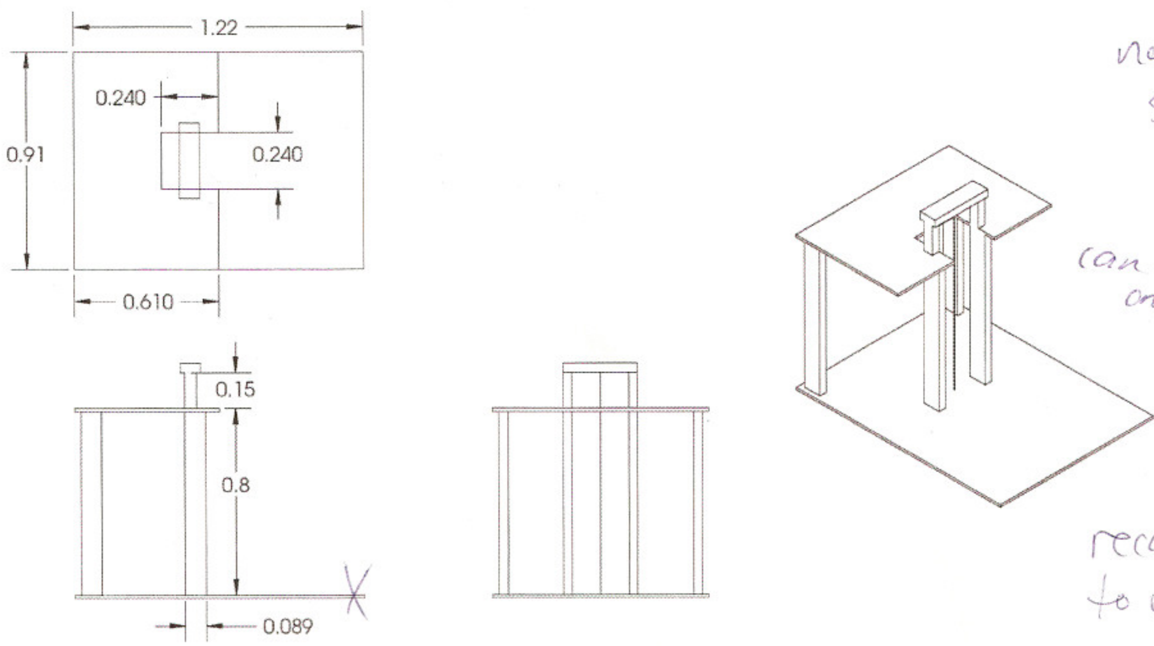
Objective, Requirements and Constraints

Design and build a working prototype of the mining vehicle which can be remotely controlled through a minimum of two (2) meters of cable using only the materials provided. The vehicle must be able to navigate the terrain described in the above scenario and transport a sample of mineral (spherical, diameter approx. 4.5cm). The mine shaft will be approximately 80 cm high (from ground-level to the mine's lower surface). The rope will be long enough to touch the bottom (unfixed) and will extend 20cm above the ground-level height (where it will be fixed). The vehicle must not exceed 20 cm x 20 cm x 15 cm (L x W x H) in dimension. Before starting the demonstration each team may have one (1) member setup the vehicle anywhere above "ground-level" on the terrain (i.e. the vehicle may start attached at the top of the rope, **as long as the lowest point on the vehicle remains above the top surface of the terrain**).

Styrofoam can you puncture yes

The remote control and the attached cable must not have direct physical impact on the mining vehicle, i.e. steering or levitating the vehicle by pulling is not allowed. Only one person is allowed to operate on the remote control at any time; another person can hold up the cable to prevent physical interference. Teams are not permitted to touch the vehicle during demonstration. The cost of the design prototype may not exceed $10,000.

Figure 1: Layout of the problem.



no nailing/stapling

can screw once in the shaft

recommended to use rope

3517 Testing Sample of Course

rope is dangling

Prototype Testing Rules

A portion of the terrain will be available for teams to perform prototype testing. This testing area will include a portion of the rope for testing ascending/descending as well as attaching/detaching from the rope. Testing periods are 10 minutes, and will be available on a first-come-first-served basis.

YP Mining Group Automated Mineral Retrieval System: Spoon Collector 1.0

Ontario Engineering Competition
Senior Design

Introduction

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Problem Context & Definition

- Goal: Increase safety in the mining industry
- Create a remote controlled mining vehicle

Constraints

- Remotely controlled (2m of cable)
- Descend 80 cm
- Navigate terrain and obstacles
- Retrieve payload
- Ascend 80 cm shaft
- Dimensions: 20 x 20 x 15 cm
- Cost under $10,000

Criteria

- Minimize cost
- Maximize automation
- Maneuverability
- Minimize environmental impact
- Overall safety

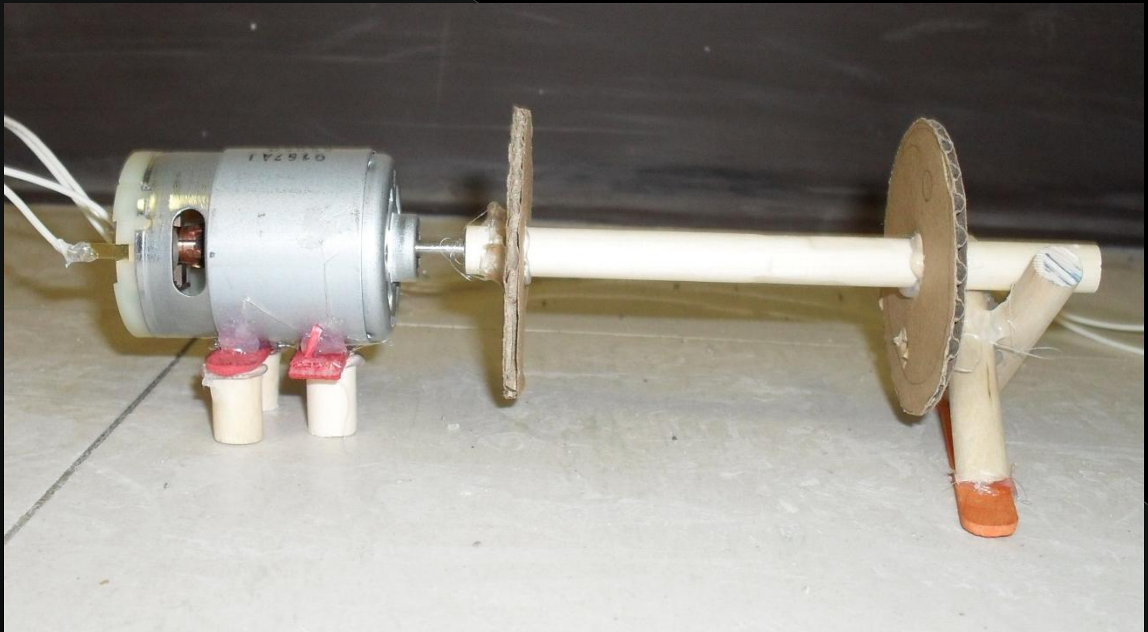
People, Planet, Profit

Design Process

- Thorough comprehension of needs
- Assessment of materials
- Individual brainstorming
- Group brainstorming
- Evaluation of ideas
- Identify optimal design
- Proceed to prototype generation & testing

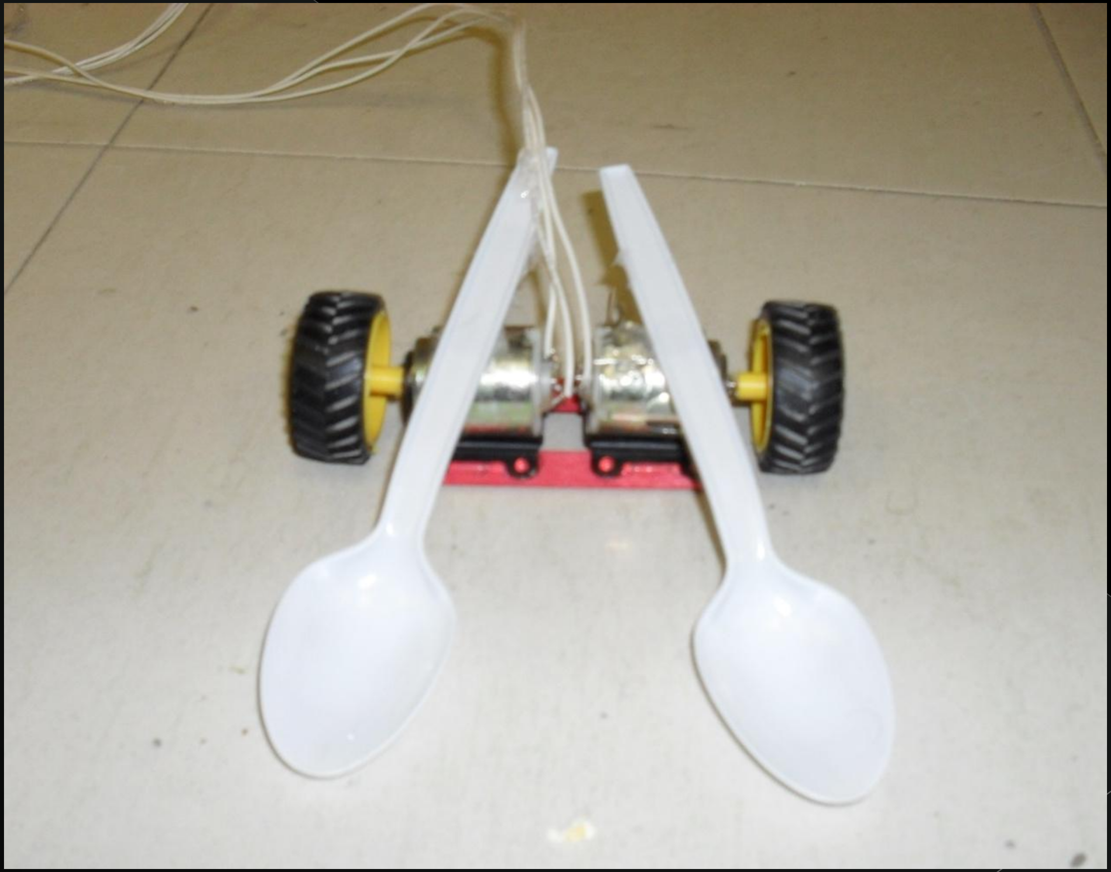
Design Principles

- Task Force 1: Descending and Ascending the Mine Shaft



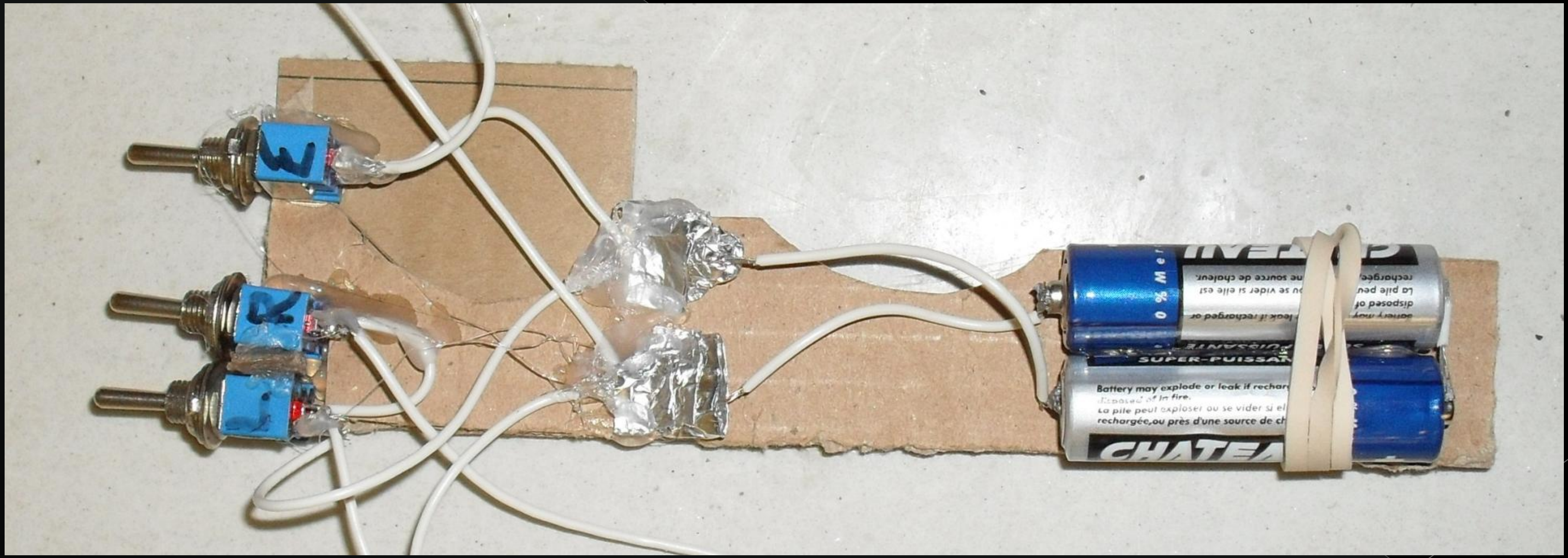
Design Principles

- Task Force 2: Retrieval of Payload



Design Principles

- Remote Control System



Benefits: People

- Reduced human risk
- Simple to operate
- Safe to operate
- Better working conditions

Benefits: Planet

- Minimal footprint
- Minimal fuel consumption
- Limited geological disruption required
- Potential for renewable energy
- Potential for sustainable material usage

Benefits: Profit

- Under Budget
- Total cost: $6,216
- Minimal labour costs
- Resourceful use of materials
- Creative switch design

Critique of Design

- Lift motor operation inefficient
- Unstable lift
- Imprecise control
- Scoop not always reliable

Originality and Innovation

- Remote control design – ergonomic, adaptable
- Four way vehicle control with two wheels
- Structural foundation
- Creative use of materials

Thank you!

Questions?