

Abstract

Us at team Epic have built Rachel, a robot with efficient, yet complicated design. Our robot is similar to the well known VEX Clawbot with some key differences. One example of such are the thick and sturdy wheels that along with the new, ingenious idea for the trapezoidal prism we use for our chassis, helps us surpass Mr. Barton Millar's custom 12 inch gap, a part of the grading scheme. Not only that, the trapezoidal prism design we used for the chassis allowed usage of a spool door powered by a motor, discharging sand onto a small, 'custom' fire because the door is placed diagonally on the front of the chassis. Our custom chassis also allows for the placement of a smartphone to capture visual information from inside the house (which is also a part of the custom challenge our instructor, Mr. Barton Millar) without having to send the "firefighter" using the robot into danger. This robot is meant to act as a prototype for one that could end up in the real world. Because of our 'remote' firefighter approach, many firefighters lives would be saved because of the minimised amount of them that have to actually show up at the scene. This is because our machine is controlled by a remote control with live camera feed.

Design Rationale

Our robot, Rachel was designed with features that are simple, yet effective. A few of the features include sturdy and fast wheels to cross gaps, as well as a claw used to pick up any stragglers, whether human or not, away from the fire. We also used a trapezoidal prism for our chassis for multiple reasons.

Firstly, the technology for the wheels needed to be fast, yet sturdy. This is why we used a four wheel drive system, with motors powering each individual wheels. The reason for this is that our robot had to cross a large, 12 inch gap with ramps on either side. Secondly, we used a trapezoidal prism for our chassis because of multiple reasons. To begin, we needed to efficiently discharge sand from a spool door to put out the fire, and the diagonal design of the side of our chassis allowed this. Next, it was also used to host flashlights that could shine at the floor while unobstructed when put into a dark place because of the shape of the chassis. Thirdly, we used a claw to save aforementioned people as well as animals from fire as opposed to a shovel or a needle because one; a needle would be very quick and efficient at picking up fire victims but would also poke a hole through them, and two; a shovel isn't very efficient in picking anything other than grainy substances up. A claw is a perfect middle ground between the two because it is effective in picking living things up, while also not killing them.

Safety features in Rachel include the mesh at the bottom of the storage system for the people and objects picked up by the claw. Landing on soft material instead of hard metal after the claw drops them in could save the people getting seriously injured in the process of being saved.



Typical House Fire
(Credit: moldychum.com)

Team EPIC

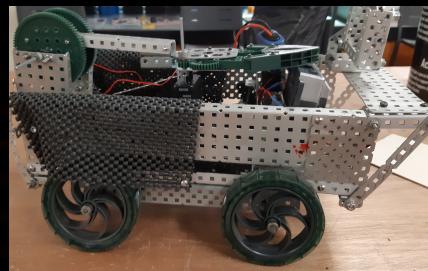
Singapore American School, Singapore, SG
"To make a great robot, it must have phenomenal design."

Theme

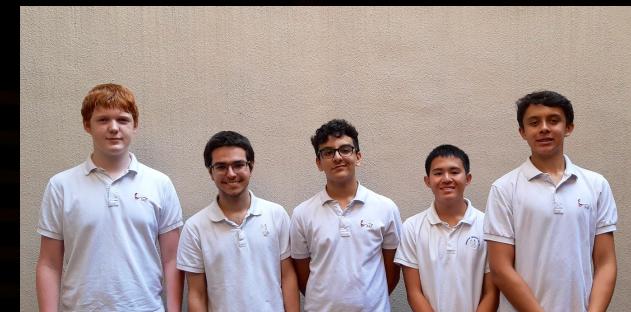
According to WebMD, Approximately 50–80% of deaths in fires are due to smoke inhalation. This is why we need to be sending less men into a fire to die while saving others. In the conditions of a fire, this robot could access the scene, helping injured as well as healthy people escape without putting others (firefighters) in danger. This means that in situations too dangerous for a firefighter to enter a given fire, they can simply deploy Rachel or one of her counterparts to save those the fire without putting themselves into danger. As the technology for automated firefighting continues to improve, firefighters can start to deploy these vehicles more often, putting themselves in less and less danger every day on the job. The only problem that might arise with this otherwise perfect approach would be the jobs that the firefighters would lose as a result of the robots taking over the field. In retrospect, though, losing a job is less severe than having the chance of losing your life while attempting to provide for your family.

Sources:

Administration, U.S. "U.S. Fire Statistics." U.S. Fire Administration. N. p., 2019. Web. 22 May 2019.
Cold, Flu & Cough, and Eye Health. "Smoke Inhalation." WebMD. N. p., 2019. Web. 22 May 2019.



Rachel's Final Form
(Credit: Lucca Browning)



- Erik Rolskov Rosenbalm
 - Programmer
 - 3D Modelling of Robot
 - Co-Engineer of Robot
- Has prior tinkering knowledge.

- Lucca Anthony Marcondes Browning
 - Poster Creator
 - Author of Technical Paper
 - Photographer
- Has prior knowledge in graphic design.

- Avya Suteku Kohli
 - Co-Engineer of Robot
 - Co-Designer of Robot
- Has Prior Coding knowledge.

- Christopher Masuda Lee
 - Co-Engineer of Robot
 - Main Designer of Robot
- Has prior team leading experience

- Devan Dooling
 - Co-Engineer of Robot
- Has prior workshop experience.

Team Evaluation

Overall, our team was pretty successful in our work but not perfect. For example some of the things we did right are as follows: We split up workflow somewhat evenly and were rather quick at getting most tasks done. Our robot was very unique and efficient in the way it was designed, with the trapezoidal chassis being a highlight of Rachel. An area seen by our group for improvement in the future is to have better communication between ourselves. We were consistently on the wrong page, and the only things holding us together and getting us to finish our project successfully was our aforementioned constant and split workflow. The most rewarding part of this experience was working in a team. There's nothing that quite beats turning in a project together with your team as it is a joint experience. Next time, we would stay more active in our group chat so we can more easily convey our ideas, concerns, and complaints to the

Acknowledgements

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Firefighter in Action.
(Credit: Lancashire Fire and Rescue Service)

