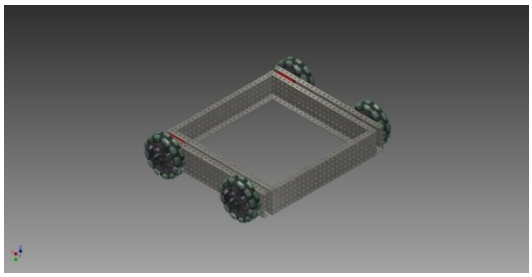
Last year's season, our team created a simple winch. It could only be used once, and was mechanically triggered on. This year, I decided to create a more advanced winch for the CAD Challenge. The Electrically Activated Winch (EAL) is a solution to all cases in which a winch would be used. There are many benefits of using the EAL, all of which have been thoroughly designed and tested. The EAL is a winch that is electrically turned on and off, allowing for multiple usages. It operates as a standard winch would, allow for a single direction of rotation when turned on, and bidirectional when turned off.

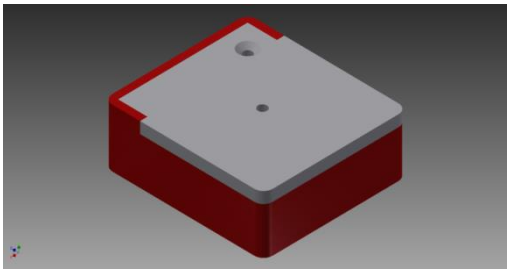
This piece was designed for VEX EDR as a supplementary tool for robots with specific designs. As there are many new drones and RC vehicles being created, students now have the ability to create various search and rescue robots using a winch, or robots that have improved driving abilities and new safety mechanisms. For example, the EAL can be integrated on a robot so that when driving up a hill, in the case of a motor malfunction, the EAL will stop the robot from sliding down the hill. The EAL can also be used as a standard winch for pulling or restraining a wire, possibly for pulling cargo, or hauling a stuck car up a hill. The varieties of uses of the EAL make it extremely versatile and useful in any VEX EDR classroom.

The design of the EAL integrated many different concerns and design elements. The basic design was constructed among many other designs for a part. The EAL was chosen due to its usability, realistic build ability, and high utility. Many designs were drawn out, the benefits and negatives debated, and a final part diagram was made. Some of the more realistic original designs were using a solenoid to limit the direction of the gear. This idea was not used because the force required to stop the gear required a solenoid much larger than that of one that could fit in the enclosure. The decision incorporated verbal discussion, calculations, and CAD diagrams proving or disproving elements of each design.

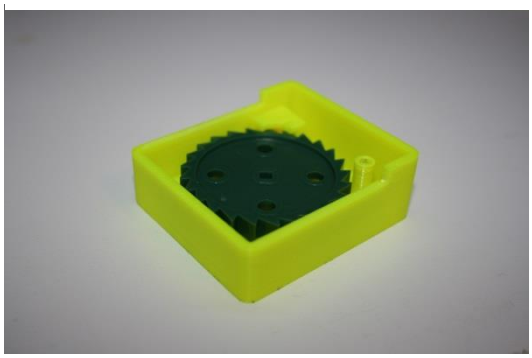
The final design of the part is very similar in size and shape to the existing optical encoder. It relies on a small servo to move a pin into the way of the moving gear. This restricts the motion of the gear in one direction, but the pin can be retracted to allow motion. Mounting to any VEX robot with a similar mounting system to the optical encoder allows for easy integration to new or existing robots. The reinforced plastic internal components and plastic gear allow for a stronger overall system. The easily opened casing allows for gear changes, replacements, and general maintenance. In conclusion, the EAL boasts many significant advantages and utility, clearly demonstrating its usefulness in any VEX EDR classroom.



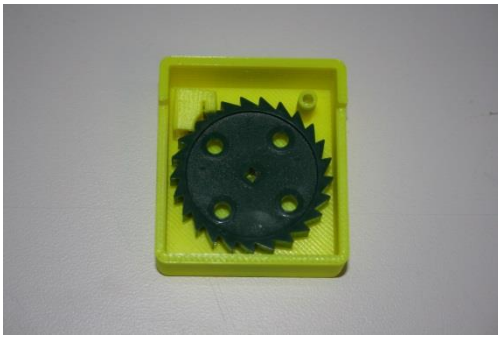
Robot with dual EAL installed



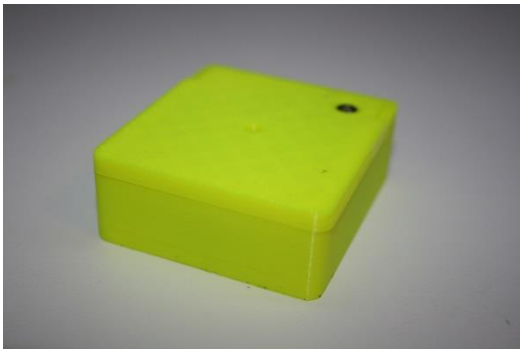
EAL Assembled



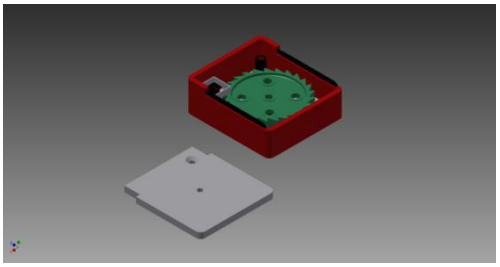
EAL Showing Components



Top view of EAL



EAL Assembled



Components of EAL