Intuitive Controller for an IED Interrogation Claw

Overview
The U.S. Army’s Buffalo MRAP vehicle has a robotic claw and arm that is used to interrogate improvised explosive devices in Iraq and Afghanistan. The current controller used is an off-the-shelf crane controller that requires rigorous training time to successfully operate the MRAP’s interrogation arm. It’s large, bulky design includes knobs and switches that don’t relate instinctively to the motions of the arm and claw. In order to reduce training time and improve the arm’s operation, a new intuitive controller has to be designed.

Objectives
The new design for the controller has to be simple and intuitive in nature so that anyone can look at it and have an idea of how it works. Also, the design needs to be ergonomic, have the ability to control all 14 movements of the claw and arm, and can be used by both left handed and right handed people.

Approach
- A list of assumptions was created for the problems that needed to be addressed.
- Brainstormed ideas for a controller that could be used with one hand.
- Built first design in Solid Works and had the sponsor rapid prototype it to test the return rate.
- Performed finite element analysis to test stress deformation and refine the design.
- Second concept was created and shown to our peers during the prototype showcase.
- Received feedback from the sponsor that two space balls could be used to separate motions.
- Brainstormed how these two space balls could improve upon original design.
- Modelled the third concept in Solid Works and had a focus group to test this new design.
- With feedback gained from focus group, improvements were made and another design created.
- A final, improved prototype was produced and shown to the public during the design showcase.

Outcomes
The feedback from our Sponsor was very positive:
- The controller that the Army uses now costs them $3,500 and our final design costs approximately $1,200.
- The final design proved to be intuitive when it was shown to the public.
- The controller is able to control all 14 movements of the claw and arm.
- With the emergency stop button placed in the middle of the controller, the final design can be used by both left and right handed people.