

# Remotely Operated Robotic Lineman System

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## Objective

Linemen have one of the top ten most dangerous jobs in America. This robotic system is designed to be controlled by a lineman and telecommunicate with an Oculus Rift virtual reality controls scheme to remotely carry out human movements and linemen tasks. For this prototype, SPARX is using the created system to mimic the removal and replacement of an insulator.

User interacts with virtual robot in VR

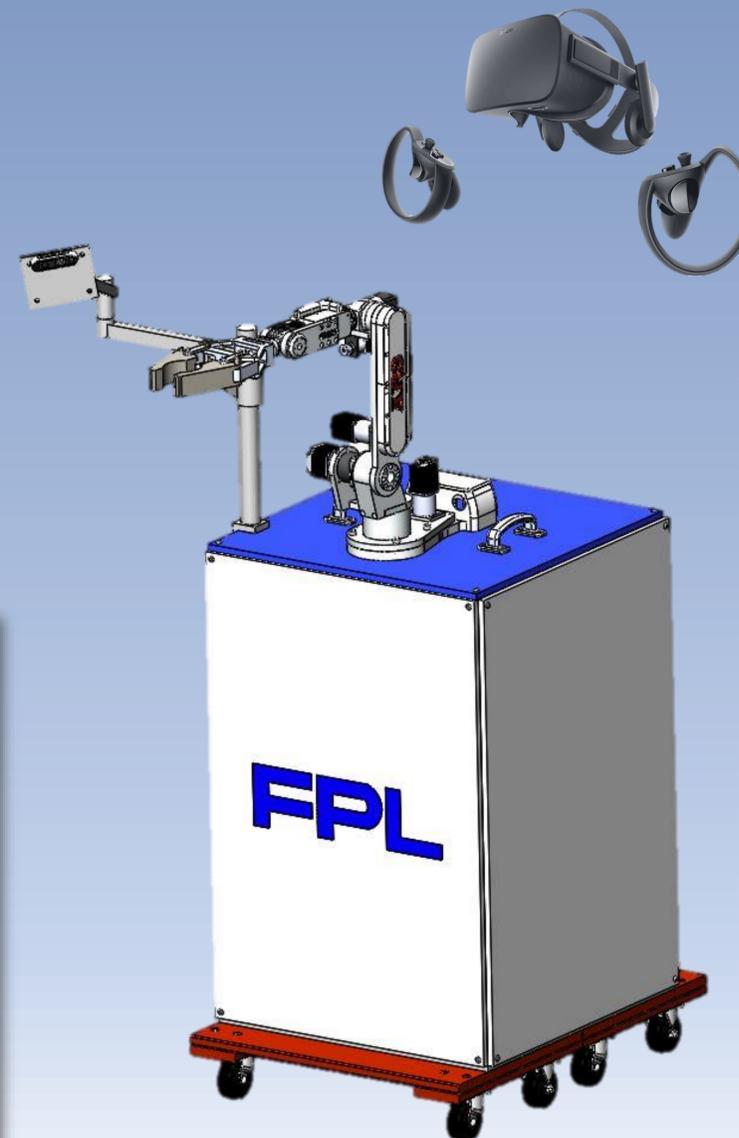
Unity uses PhysX to simulate movements made and solves for joint angles

Unity sends data to physical arm over serial communication

Teensy receives data and controls stepper motors and end effector

## Testing and Takeaways

- Camera capable of 70 FPS
- Arm can mirror user angles with precision of 1000<sup>th</sup> of a degree.
- Oculus Rift Resolution: 0.1 mm
- Prototype cost \$3,107.84, which only uses about 30% of \$10,000 budget given.
- Scaled up estimated cost: \$47,300



## Features

- Firmware developed to reduce joint stress and noise disturbances through acceleration control
- Optimal target achievement with few oscillations
- Ability to rapidly change directions
- Highly interactive user environment with intuitive control of the system.

## Projected Benefits

- Approximately \$2.5 million in savings a year based on deploying 30 units, with a net present value of \$4.8 million.
- Pay back period is  $\leq 5$  years.
- Increased efficiency
- Increased safety

