Robotic Pipe Welder

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Introduction

Problem statement:

The main objective of this project is to develop a robotic arm capable of remotely welding damaged pipes from the inside. Finding a safe and effective approach to repairing damaged pipes in inconvenient areas.

Constraints:

- Low latency from action to feedback $< 300\ ms$.
- Clear visual feedback camera $> 720p$ & $30\ fps$.
- Budget cost $< 6,000$ SAR.
- Pipe sizes for oil & gas bigger than 4 inch and lower than 48 inch
- Straight pipes are preferrable.

Target specification:

Technical Specifications

- Arm Movement: $1\ RPM$
- Camera Resolution: 720p & 30 fps
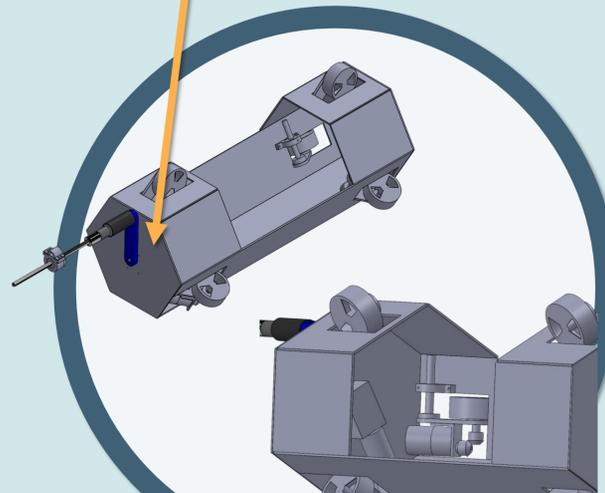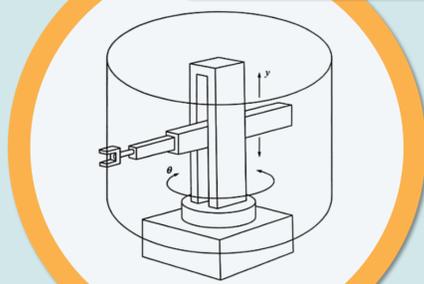- Weight: $14.9\ kg$
- Deployment Time: $5\ min$
- Responsivity: $130\ ms$
- Deployment Steps: Simple & clear

Workspace Type

x2 x1
x4 x1
x6 x1
x1 x2
x1 x2

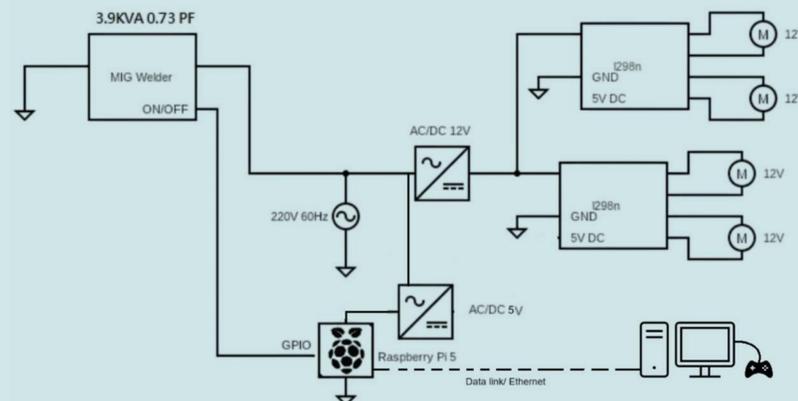## Prototype Design

Circuit Diagram

Testing / Validation

- Can fit inside pipes as tight as 12 inches in diameter.
- Accommodates a delta of 4.5 cm in diameter variation utilizing a specialized suspension system.
- Capable of HD Visual feedback.
- Intuitively Operated using an Xbox controller.
- Connected to & controlled by computer utilizing a graphical user interface.

Charts

Acceleration of Arm Speed Over Time

Acceleration Profiles for Arm Speed
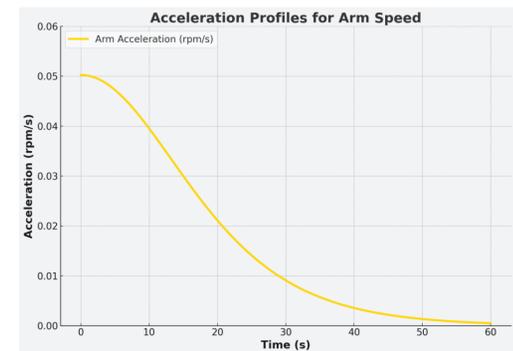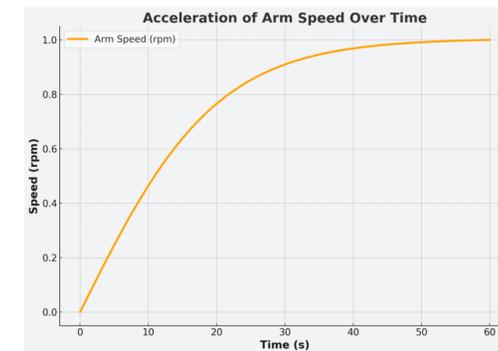
Conclusion

The robotic pipe welder project is a new area of focus for the efficient maintenance of oil and gas pipelines in a safe & economical manner. The use of automation, remote operation, and real-time inspection will minimize down time and greatly reduce risk for workers. By minimizing the environmental effect, boosting durability, & eliminating excavation, it helps the environment.

Project future impact:

1. Creating Job Opportunities.
2. Safety Standards Enhancement.
3. Environmental Sustainability.
4. Cost Saving for Businesses.

For More Information