

SELF RECONFIGURABLE MODULAR ROBOT

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PROJECT STATEMENT

The goal of this project was to design and build a self-reconfigurable modular robot. Each module was designed to move independently, identify and connect with other modules, and travel as a collective system.

APPLICATIONS

- Robust adaptive solution to unique and dynamic problems
- Search and rescue
- Space exploration
- Stabilized platform construction

SYSTEM DESIGN REQUIREMENTS

- Individually mobile (3DOF)
- Lightweight
- Able to lift at least two other modules
- Operate for at least 15 minutes
- Max size 4x4x8 inches

MODULE MODELING AND SIMULATION

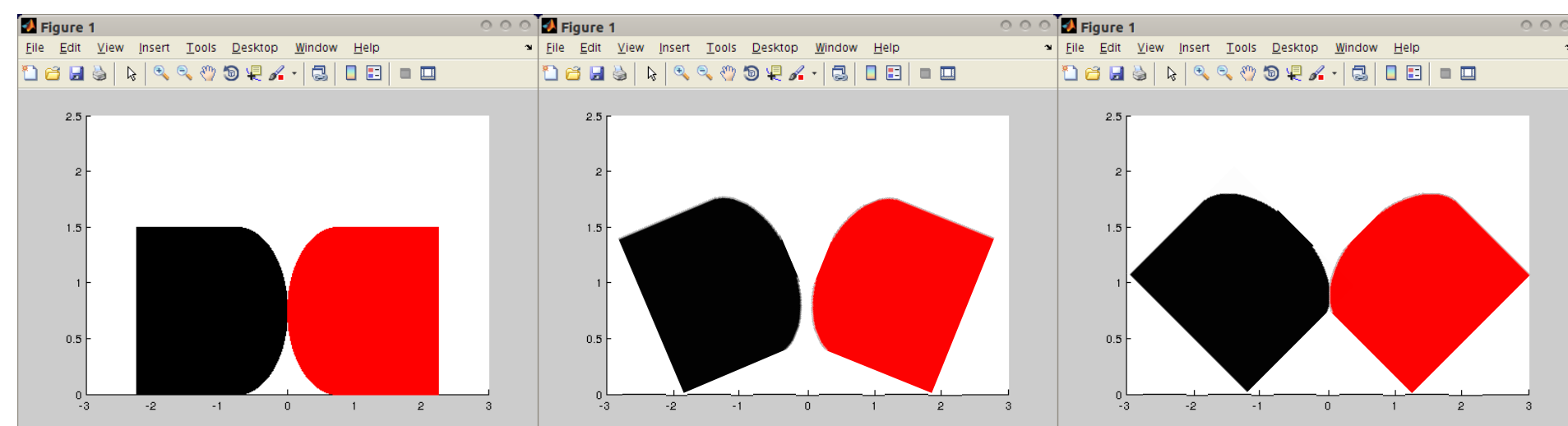


Figure 1: Single Module Gait Simulation

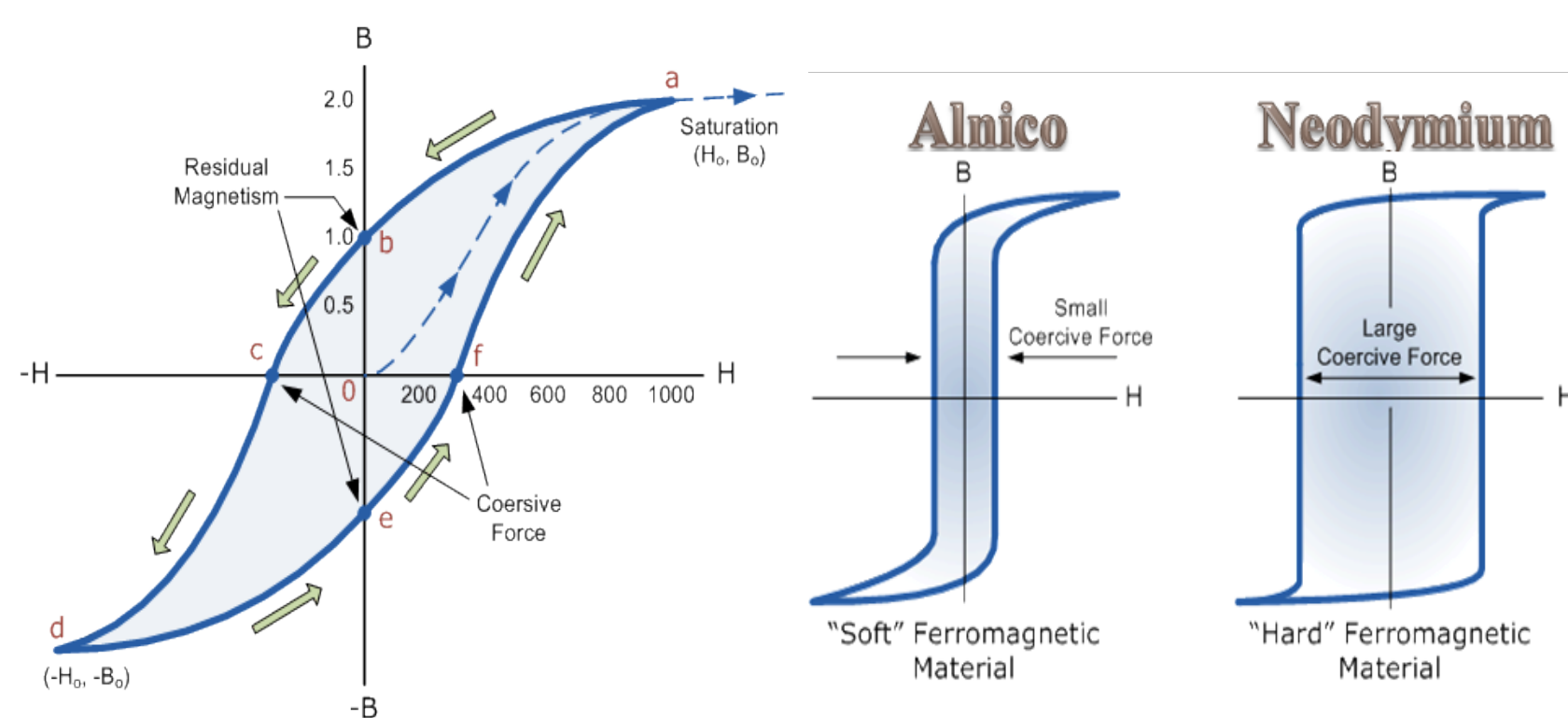


Figure 2: Electrical Switchable magnets

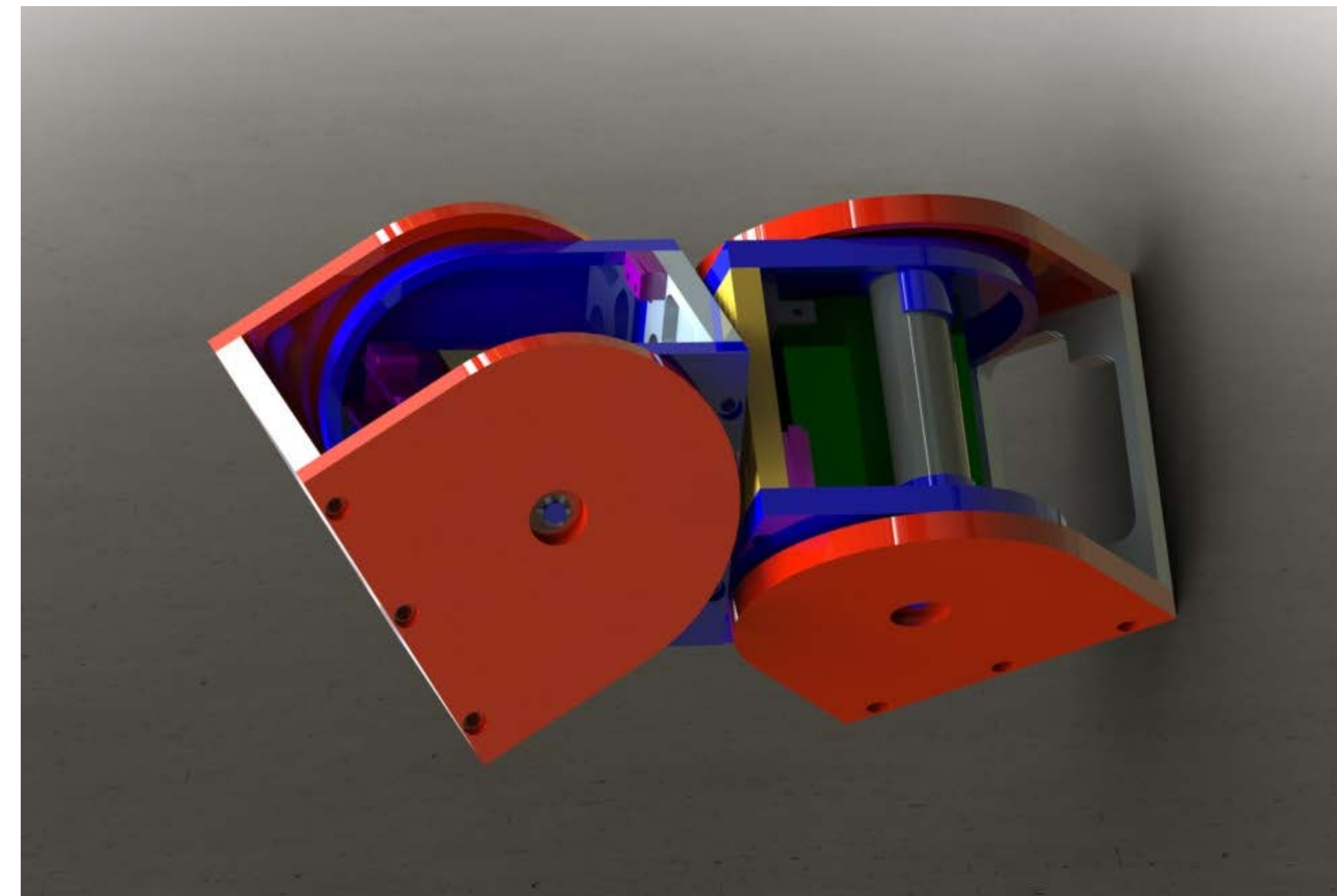


Figure 3: Design

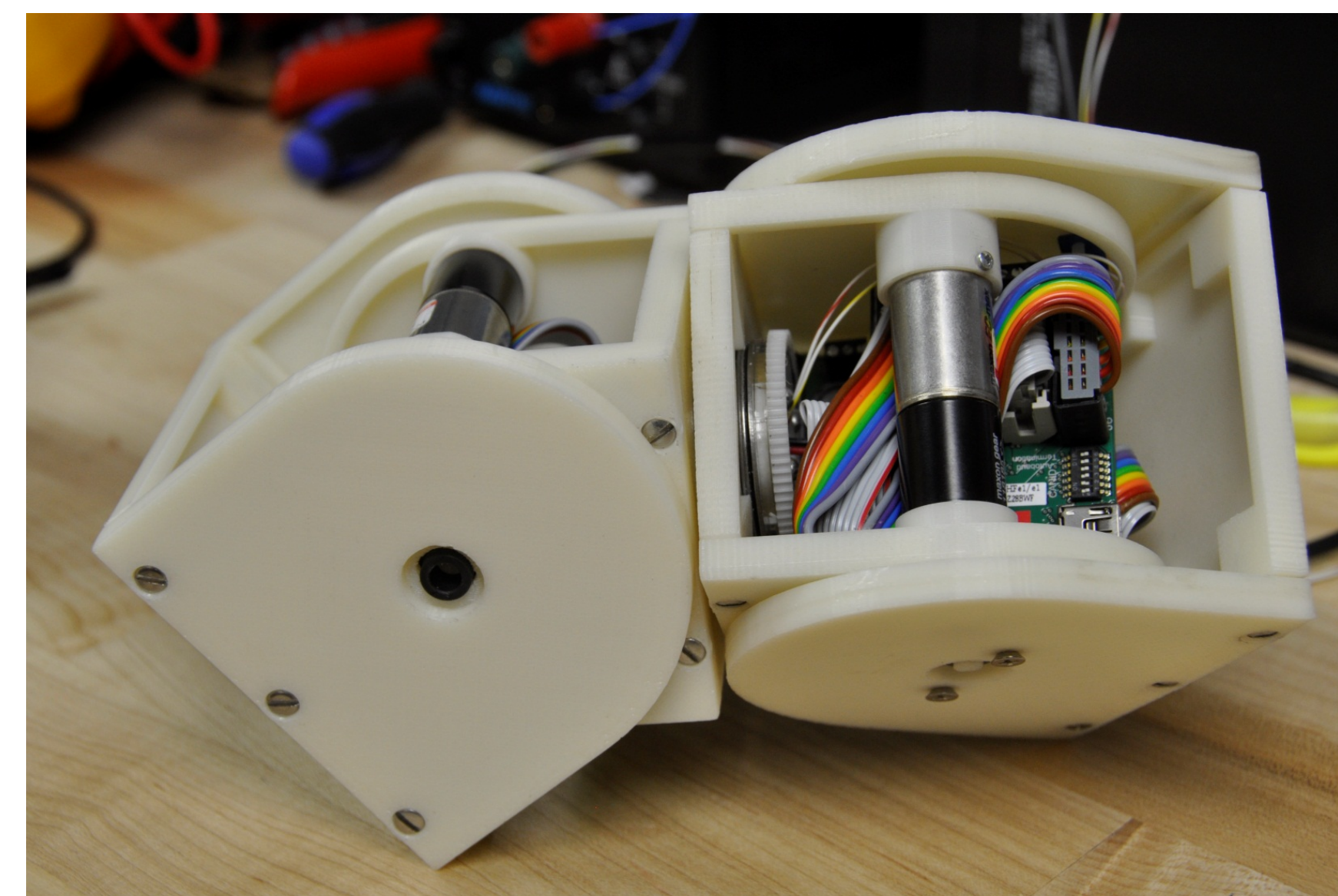


Figure 4: Prototype

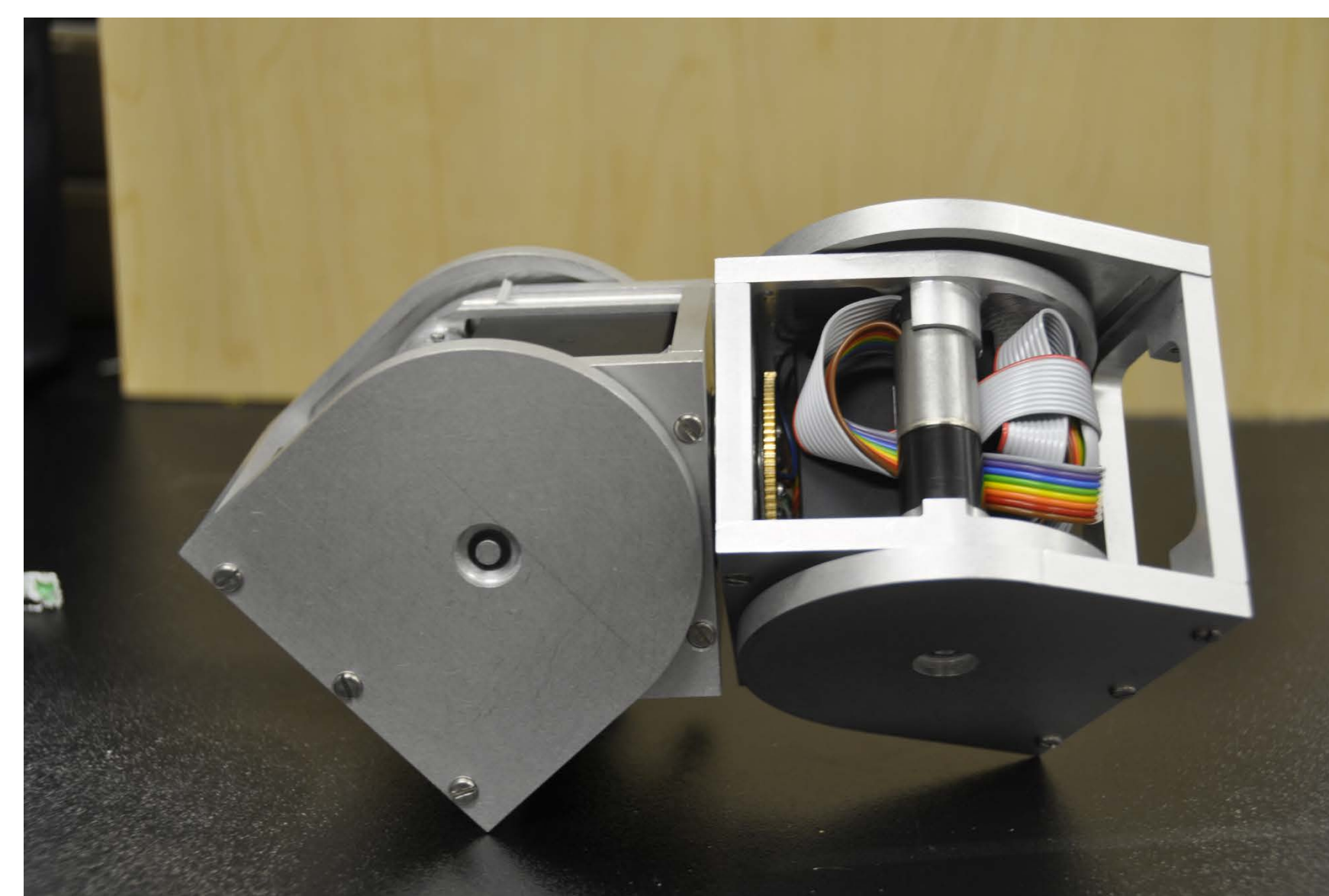


Figure 5: Final Product.

MODULE CONTROL STRATEGY

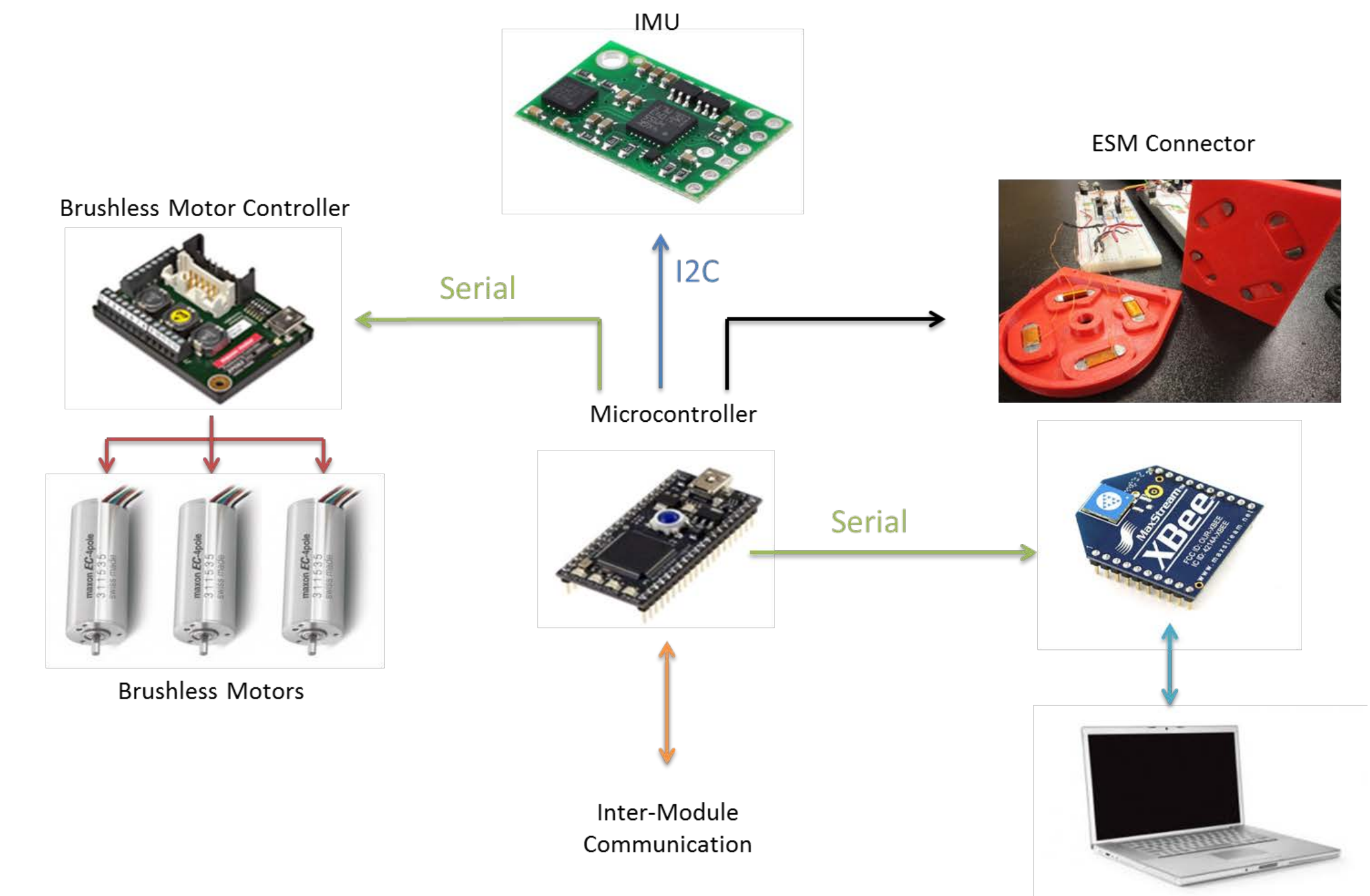


Figure 5: Control Diagram

PROJECT ACCOMPLISHMENTS

- Designed and fabricated self-reconfigurable modular robot.
- Finite element analysis of design
- Designed and implemented electrically switchable magnets
 - Reduced energy consumption
- Designed and implemented custom PCBs
 - breakout board
 - power management
- Developed gait generation simulator
- Implemented synchronized motor control
- Implemented extensible object oriented software design

FUTURE WORK

- Simulation with multiple robots
- System self reconfiguration
- Autonomous mobile system with multiple robots

SPONSORS

