Project Objectives

1. The cube must be able to function as a normal Rubik’s cube would, independent of the electronics inside of it.
2. The cube must be no larger than 150mm x 150mm x 150mm
3. The cube must be able to solve and scramble itself in under a minute.
Block Diagram

Battery Voltage (7.2v)
Regulated 3.3v

Microcontroller
I2C IO Expander

Two Way Switch
Motor Driver
Motor

Motor/Switch block replicated 6 times.
I2C lines are common between all units
Original Design Plan: Mechanical/Hardware

- DC Motors rotate faces
- Bi-directional switch detects rotations
- Software back tracing algorithm and pseudo random scrambling
- 3D printed cube to hold components in
Original Design Plan: Software

- Detect every 90 degree face rotation
- Randomize Rubik’s cube to 20 moves
- Self solve through optimized algorithms
- User trigger interactions
Project Results: Hardware

- **Results**
  - 90 degree motor control
  - Addressable through I2C bus
  - Functional through battery power at 7.4 V

- **Challenges**
  - PCB delays
  - Switch module PCB grounding issues
  - Center PCB
Project Results: Mechanical

● Results
  ○ 115mm side length
  ○ Motor rotation independent of electronics

● Challenges
  ○ 3D printing quality issues
  ○ Motor core design issues
  ○ Fragile wiring
Project Results: Software

● Results
  ○ Successful self scrambling and self solving
  ○ Working back tracing algorithm
  ○ Program can remember human scramble moves
  ○ Debouncing

● Challenges
  ○ Optimized solving algorithm
Conclusion

- Met most project goals despite setbacks
- Great work from everyone

Revisions and continued work:

- Beveled 3D prints with better supports in mind
- Changing PCB designs to prevent unintentional grounding
- Optimized solving algorithms
- Fully implemented control and power systems
Thank You