**Goals & Objectives**

- Design and develop a digitized chess board to help players with any skill to learn to play chess
- A physical 8 x 8 will be augmented with components such as Raspberry Pi 3, I2C Multiplexer and Reed Switches for digitizing player input

**Hardware Design**

- Raspberry Pi 3 is connected to the Arduino Teensy 2.0 via RS-232 serial connection
- All other components are interfacing with Inter-Integrated Circuit (I2C) Protocol, allows for multiple slave chips to link with a single master chip
- The N/O Reed Switches are connected to the Port Expander. With the presence of a magnetic field from the magnets, the reed switches snap closed, conducting current/signal to the Port Expander
- Port Expander communicates with LED Driver & microcontroller to implement algorithm

**Research & Design Challenges**

- Interfacing and interacting with Arduino (C code) communicating with Raspberry Pi 3 (Python Code) to create a digitized prototype of an 8 x 8 LED matrix
- Accounting for time delay of Read/Write Signals (especially with Reed Switches and LED Driver) due to serial connection

**Acknowledgement**

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**Schematic**

**Future Vision**

- **Short-Term**
  - Implement voice commands and mechanical conveyance to autonomously move pieces

- **Long-Term**
  - Re-target the technology to apply for other applications

**Results**

- **Initial Prototype:** 3 x 3 Led Matrix/Reed Switch grid to simulate a tic tac toe game for troubleshooting purposes
- **Large scale Design:** 64 Square Grid with LED Matrix/Reed Switches
  - 4 mini breadboards soldered to 4 separate port expanders, which grounds one end of each reed switch and the other end connects with pins of expander.
  - LED Driver Connection: Anode & Cathode of LED all connected within the grid; rows represent Anode (+) and Columns represent Cathode(-) and they are soldered to the pins of the HT16k33 Driver.
  - Arduino implements the python code and acts as data controller for other hardware by processing output signals from the Pi 3.
  - Terminal is used to track the current states of the chess pieces

**References**
