Electrical Engineering and Computer Science
EECS373 - Design of Microprocessor-Based Systems

Wizard's Chess

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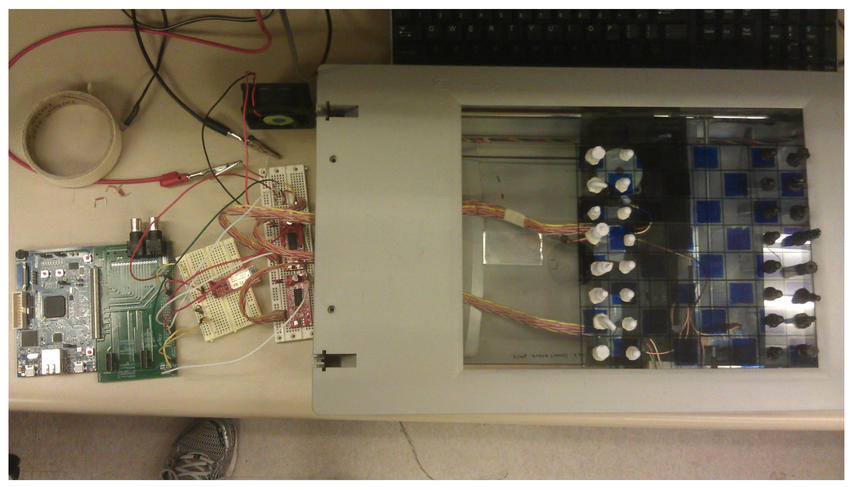
Introduction: Hand's Free Chess: The Idea and Basic Implementation

Idea:

- Bring to action a scaled down version of the chess played in 'Harry Potter and the Sorcerer's Stone'
- Try to make chess a hands-free endeavor

Implementation:

- Make an Android app to text which piece you would like to move and where, checks validity of submitted move
- Use magnets under the pieces and set in motion by stepper motors
- Use servo motor to magnetically glide pieces across board

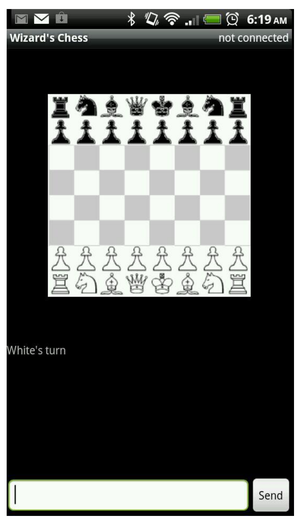


Problem Description: Putting an Interesting Spin on an Old Classic

- We wanted to put a fun spin on a classic board game by combining new and old technologies
- Use magnets and motors, along with an Android platform as part of an effort to mimic a "magic" effect

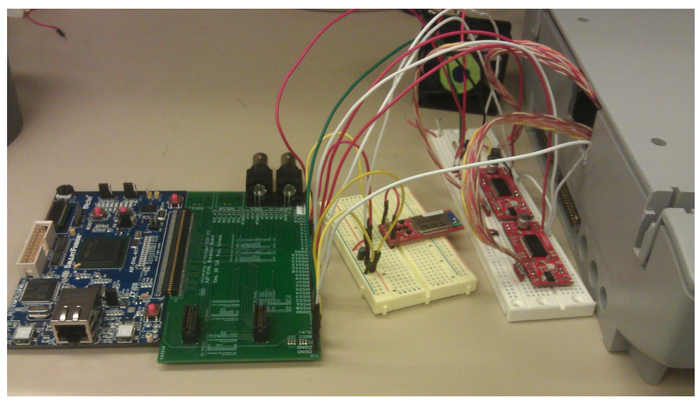
Solution:

Human Interface



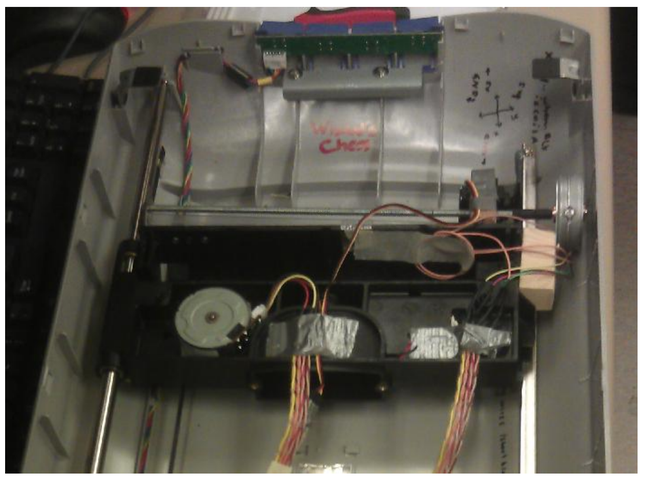
- **Serial Bluetooth Device**
  - Communicates with app running on Android
  - Sends and receives 'move' messages
- **The App**
  - Back End
    - Maintains state of game
    - Parses user input
    - Checks legality of moves
    - Communicates move to embedded system
  - Front End
    - Includes simple move history
    - Graphical representation of chess game

The Go-Between



- **ARM Cortex-M3**
  - Serial communication with BlueSmirf
  - Software PWM generated by timer interrupts for precise control of stepper motors
  - Hardware PWM to control servo motor angle
  - GPIO for motor direction control
- **EasyDriver Stepper Motor Controller**
  - One driver for each motor takes a PWM signal and 0-3.3V for motor direction
- **The X-Y Motion**
  - X-direction uses scanner bed stepper motor and gear system
  - Y-direction uses a standalone stepper motor and threaded rod to propel servo motor block

The Board and Pieces



- **The Chess Board**
  - Made from an old unused scanner
- **The Piece Selection**
  - Servo arm rotates by PWM ,uses attached magnet to engage/disengage chess pieces
- **The Pieces**
  - Inexpensive travel set pieces, cut down to fit board limitations
  - Underside has rare earth magnetic discs

Conclusion

By starting with serial communications from an Android App, we were able to accept messages from the device as fabric interrupts to the system. Then we used timers, along with pulse width modulated signals and manipulation of duty cycles to control servo and stepper motors which allow us complete control of XY movement and engagement of pieces when paired with magnets to implement our vision of 'Wizard's Chess'.