INNOVATION

Hockey Puck Tracking System

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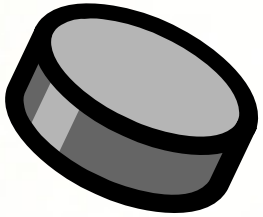

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Problem Formulation

- Problem Statement
  - Tracking a high speed moving hockey puck
- Background
  - A common complaint among American hockey fans is that the puck is difficult to follow on the ice when watching a game on TV.
  - Team HPT devised a means of tracking a hockey puck in specific areas to make the hockey puck more visible to the audience on television.

Difficulty viewing the puck?

Video courtesy of Michigan Technical University

Alternative Designs

- Ultrasonic Technology
- Visual object tracking algorithm
- Tracker with Single Board Computer Interface
- Transmitter & Receiver with Repeaters
- Magnetic Sensor with Grid

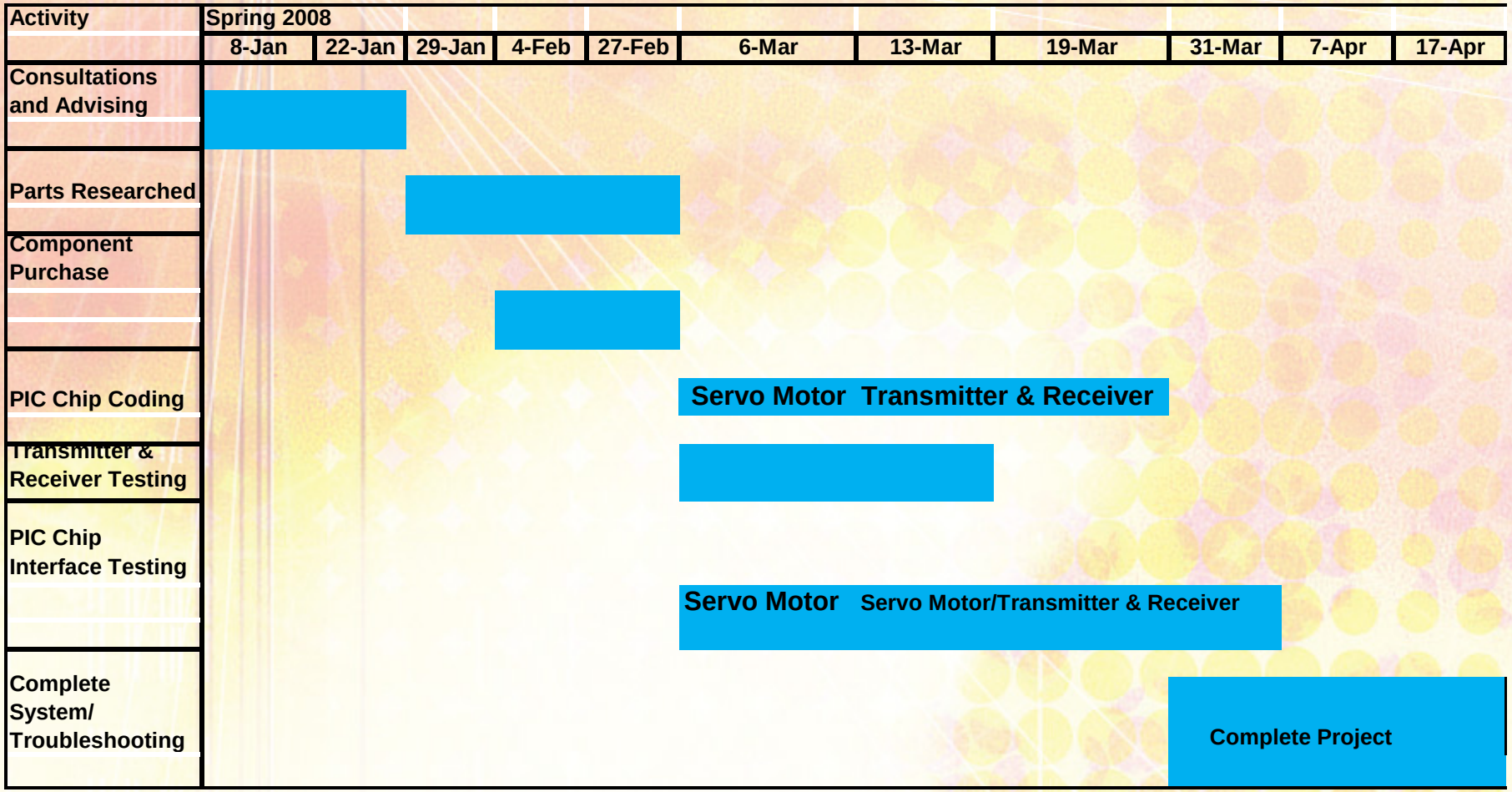
Final Design

- Use a transmitter and receiver to determine intensity level of signal transmission
- Use two receivers with various level ranges to determine positioning of the transmitter located inside the hockey puck
- When hockey puck location is identified, motor turns in direction of puck positioning

Implementation Plan

- Aspects of Implementation:
  - Transmitter and Receiver
  - Analog readings from receiver
  - PIC Coding
    - Voltage Identification
    - Motor Control
    - A/D Conversion
  - Soldering

Gantt Chart



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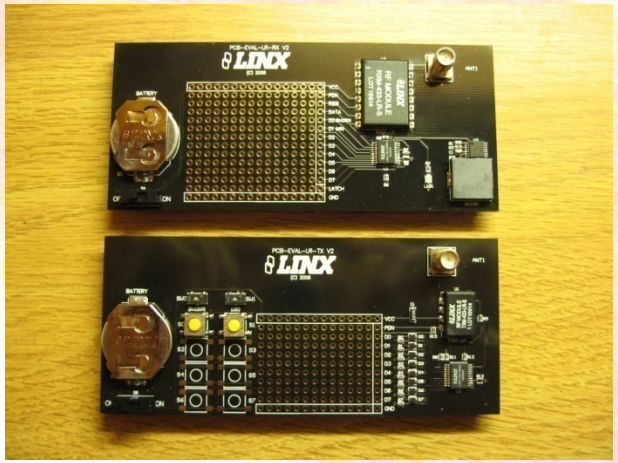
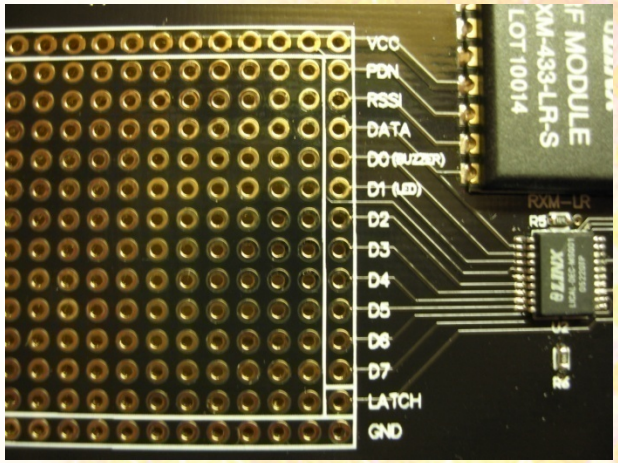
Transmitter & Receiver

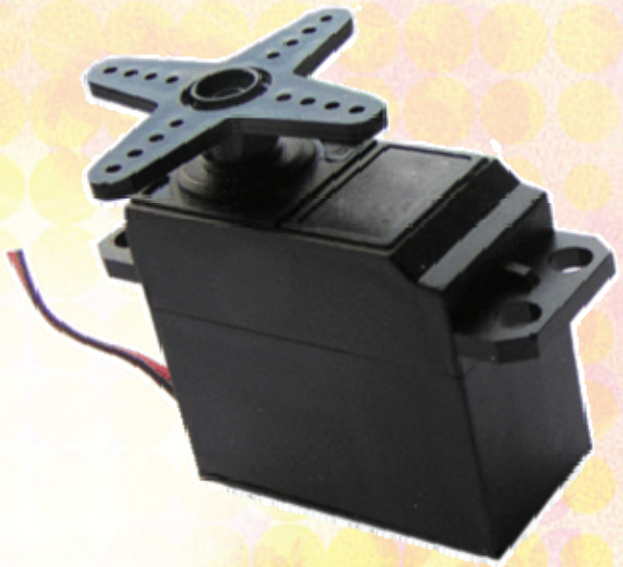
- 1 Transmitter & 2 Receivers
  - 433 MHz op. freq.
  - 3V power supply on eval. boards
  - 9V power supply on dev. board
- Receive voltage output reading at the RSSI pin
- Voltage output is proportional to the signal intensity.





Servo Motor

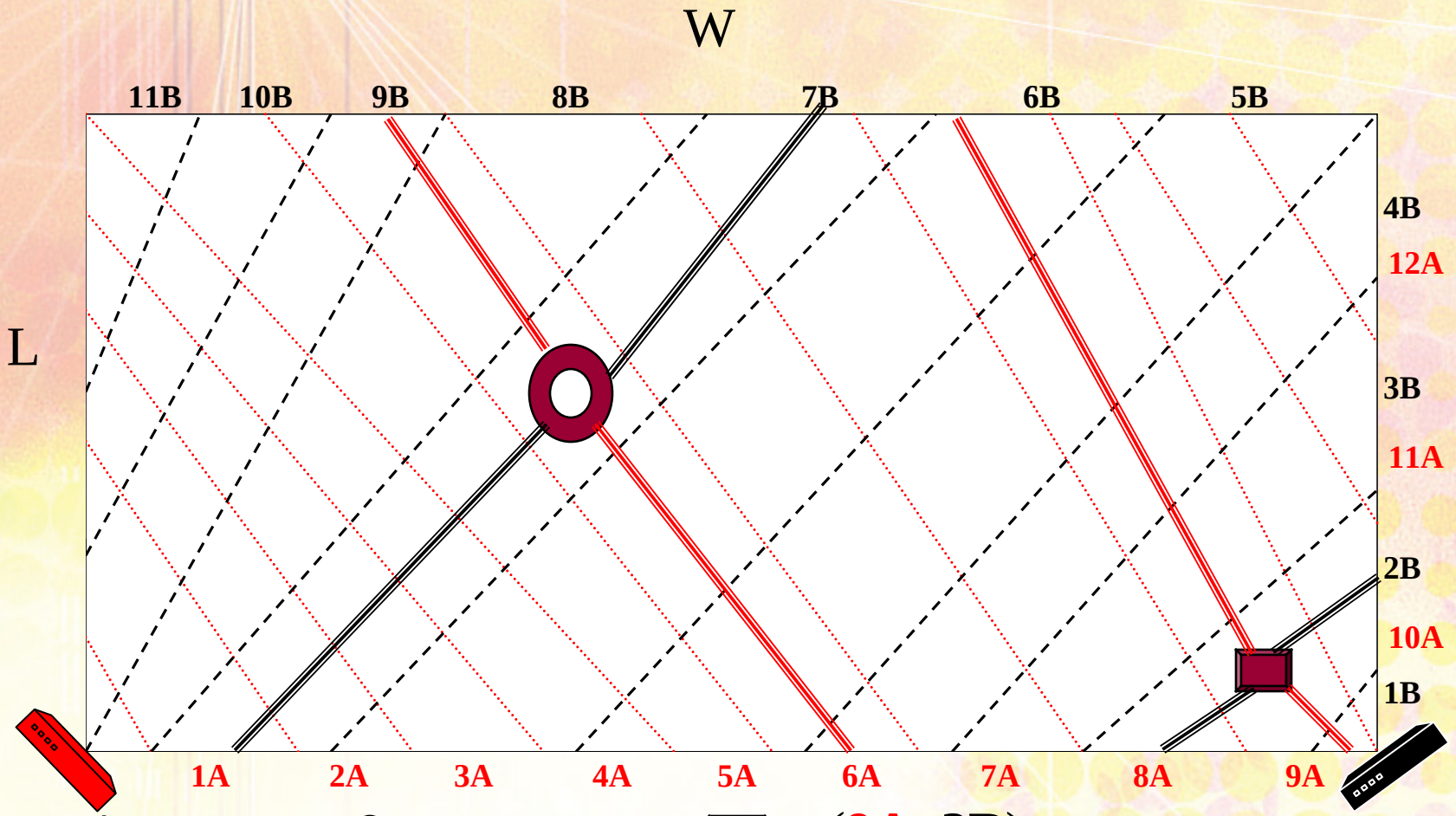
- 6 voltage max
- 0 to 180 degrees rotation
- 20ms Period
- Use timing delays to specify position of motor to desired degrees



Microcontroller - PIC16F877A

- 20 MHz clock input
- Read voltage from RSSI pin on receiver
- Used 10-bit analog-to-digital conversion to convert voltage from receiver to digital value
- Controls motor

Coordinate System



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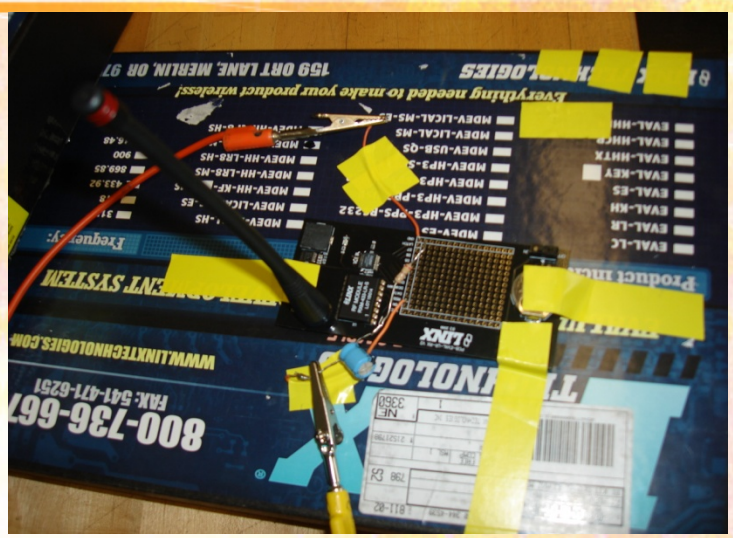
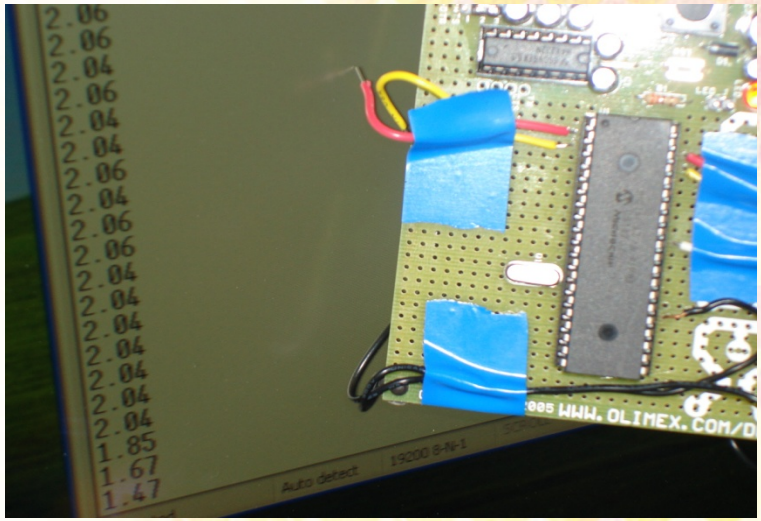
Implementation

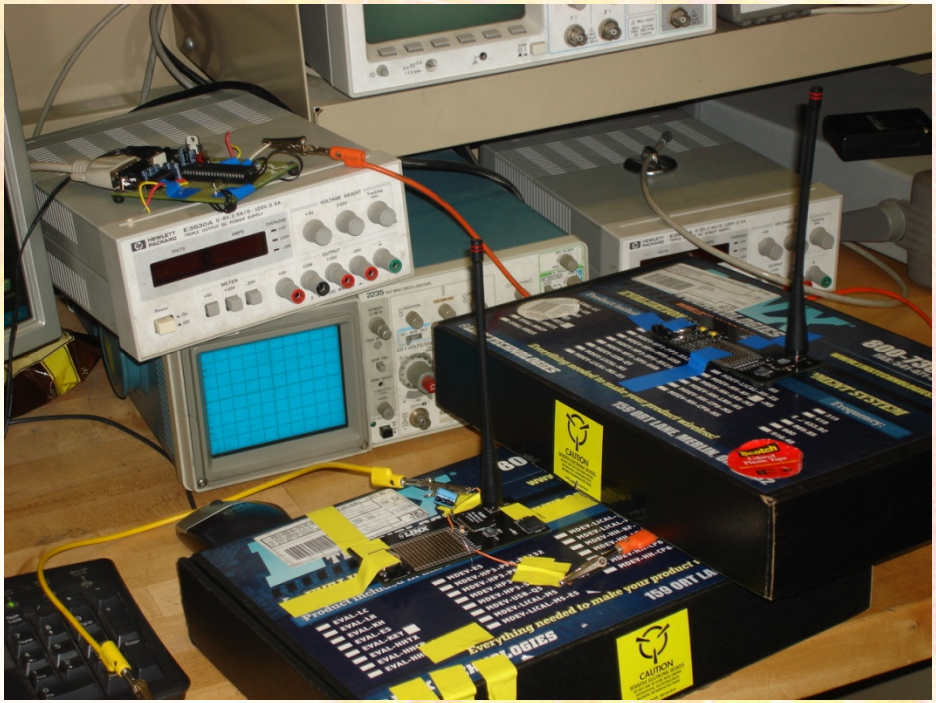
- Communication between transmitter and receiver
- Voltage is outputted from RSSI pin
- Voltage used as an input to the PIC
- A/D conversion performed input voltage





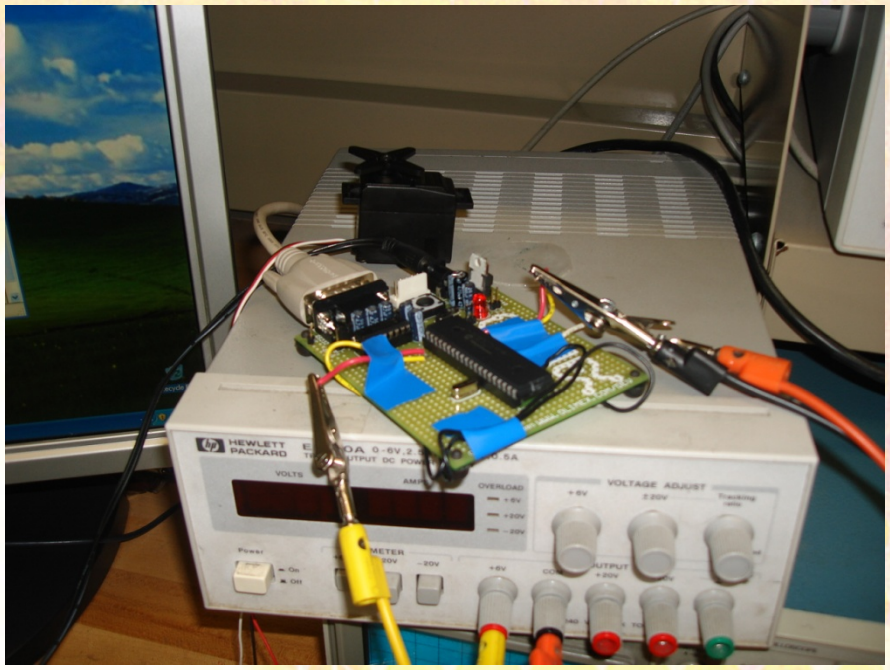
Implementation

- Digital voltage stored in memory
- Tested voltage valued stored in RAM
- Voltage read from the RSSI pin compared to tested voltage



Implementation

- If the compared voltages match the motor subroutines are then called to instruct the motor to move the motor
- Motor moved to specified position based off pre-determined coordinate system



Design Challenges

- Inaccurate voltage readings between receiver and microcontroller
- Delay time between components very slow
- Time constraint for entire design implementation
- Budget constraint for entire design implementation

Future Recommendations

- Recommend quality components for implementation
- Research time delay for each component and calculate total delay time for system vs. delay time needed to track a hockey puck

Special Thanks

- College of Engineering, Architecture, and Computer Science
- Hobby Works
- National Hockey League

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Thank you for your time

Questions or Comments?