

Capacitive Touch Controlled Vehicle

Final Presentation

ECE 511

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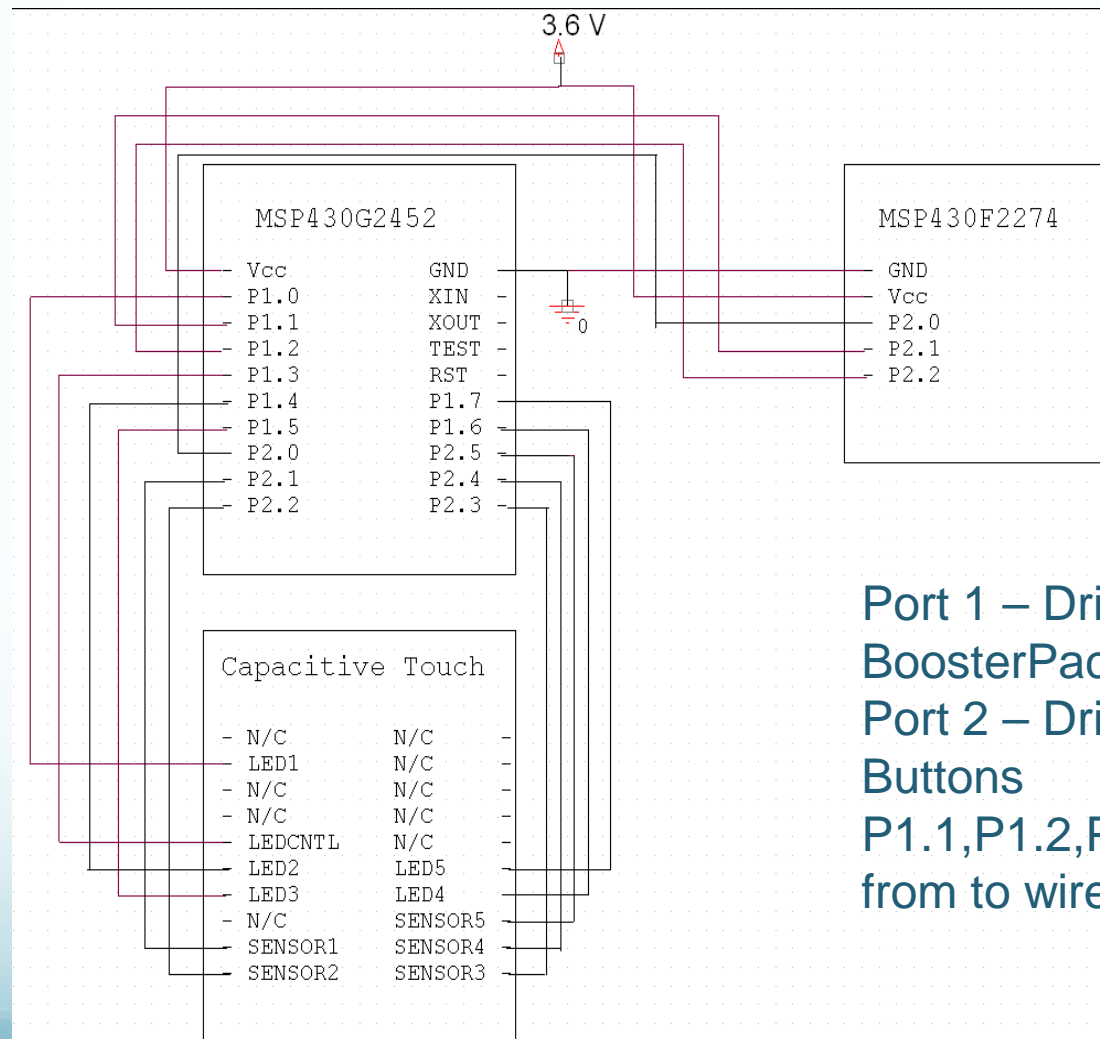
Jason Esquivel

12/6/11

Overview

- Capacitive Touch BoosterPack serves as a plug-in board for the MSP430 LaunchPad.
- Goal is to integrate the BoosterPack to wirelessly control the direction of a robotic car's servo and DC brushed motors over an RF interface.
- Two separate systems
 - 1) Connected to the capacitive touch
 - 2) Provides power and direction to the servo and DC motors on the robotic vehicle.
- The Capacitive scroll wheel will allow us to :
 - 1) Provide direction for the robotic vehicle
 - 2) Control the state of the robotic vehicle (on/off)

Control System Hardware

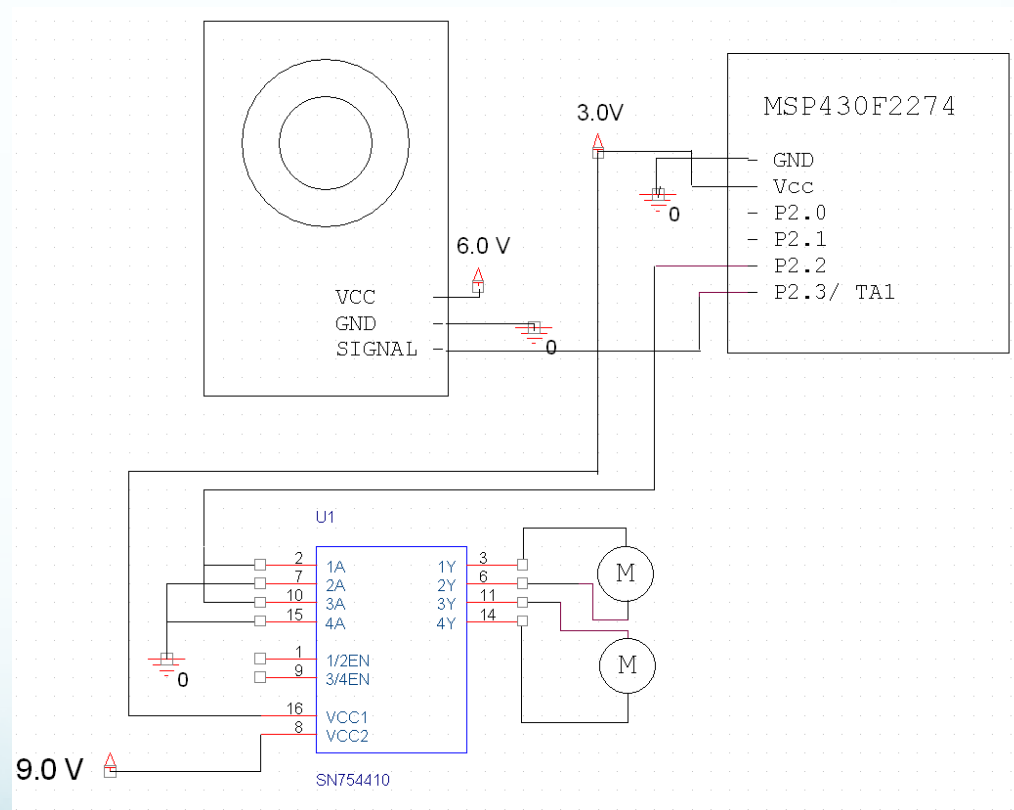


Port 1 – Drive the LED's on the BoosterPack

Port 2 – Drive the Wheel and Buttons

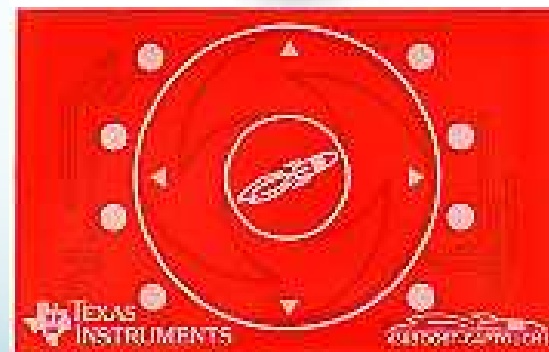
P1.1,P1.2,P2.0- control signal from to wireless module

Robot Car System Hardware

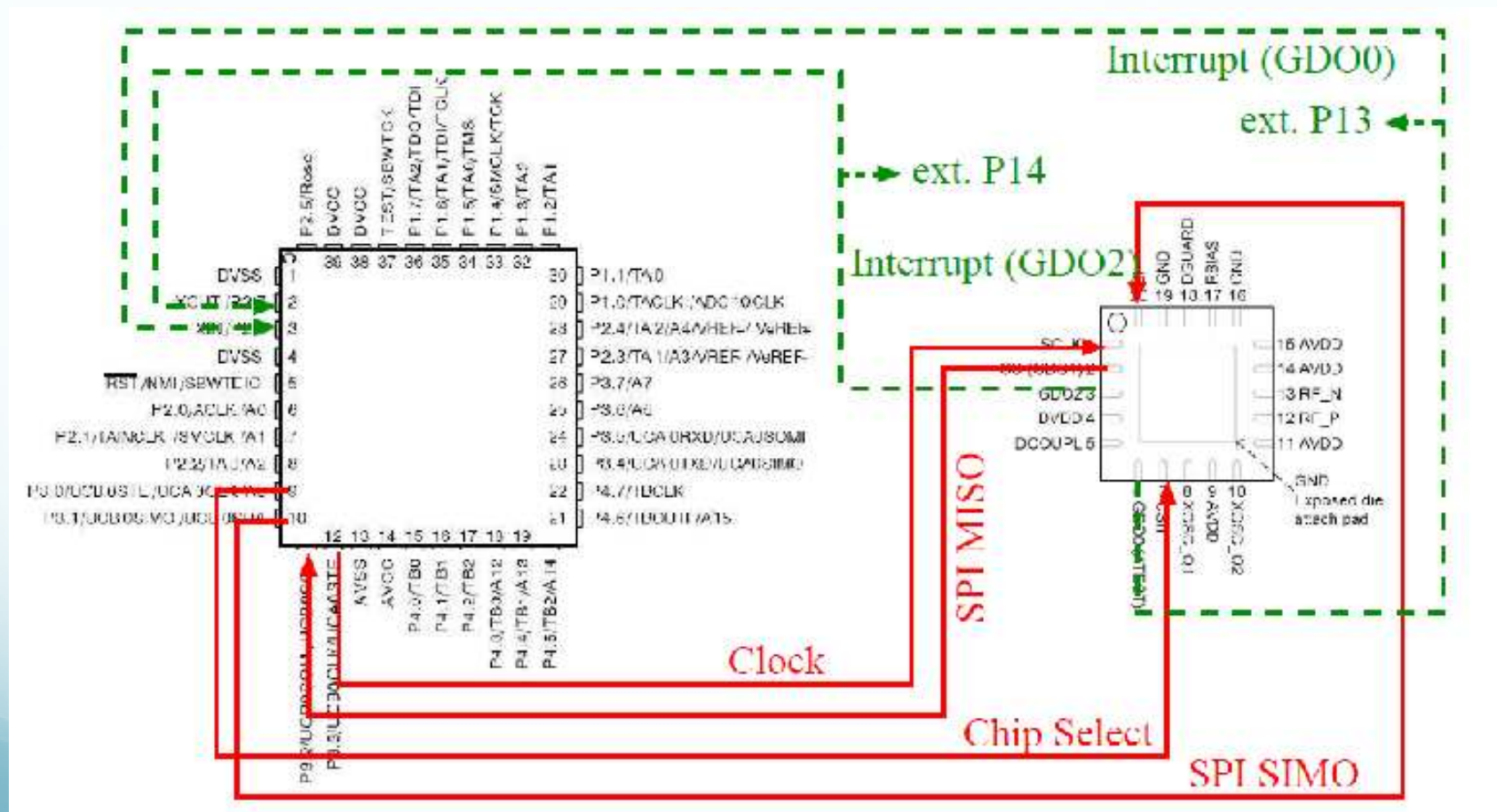


Capacitive Touch Software

- Watchdog Timer and Timer A0 used to determine the capacitance of each individual button.
- Correspond LED's turn on when capacitance of nearby button reaches threshold level
- When corresponding left/right button/center is pressed control signal will be sent to EZ430-RF2500 and send packet to receive EZ430-RF2500 on robot car.



EZ430-RF2500 Hardware



EZ430-RF2500 Software

- Packet Format:
 - Length (1 Byte)
 - Source (4 Bytes)
 - Destination (4 Bytes)
 - Payload (8 Bytes)
 - CRC (1 Byte)
- MSP430 initializes the SPI communication acting as the master and the RF-2500 as the slave.
- MSP430 configures the 47 registers of the CC2500. Some of these registers set:
 - Operating frequency(2400-2483 MHz)
 - Modulation scheme
 - Baud rate(1.2-500 kBaud)
 - Transmission power.

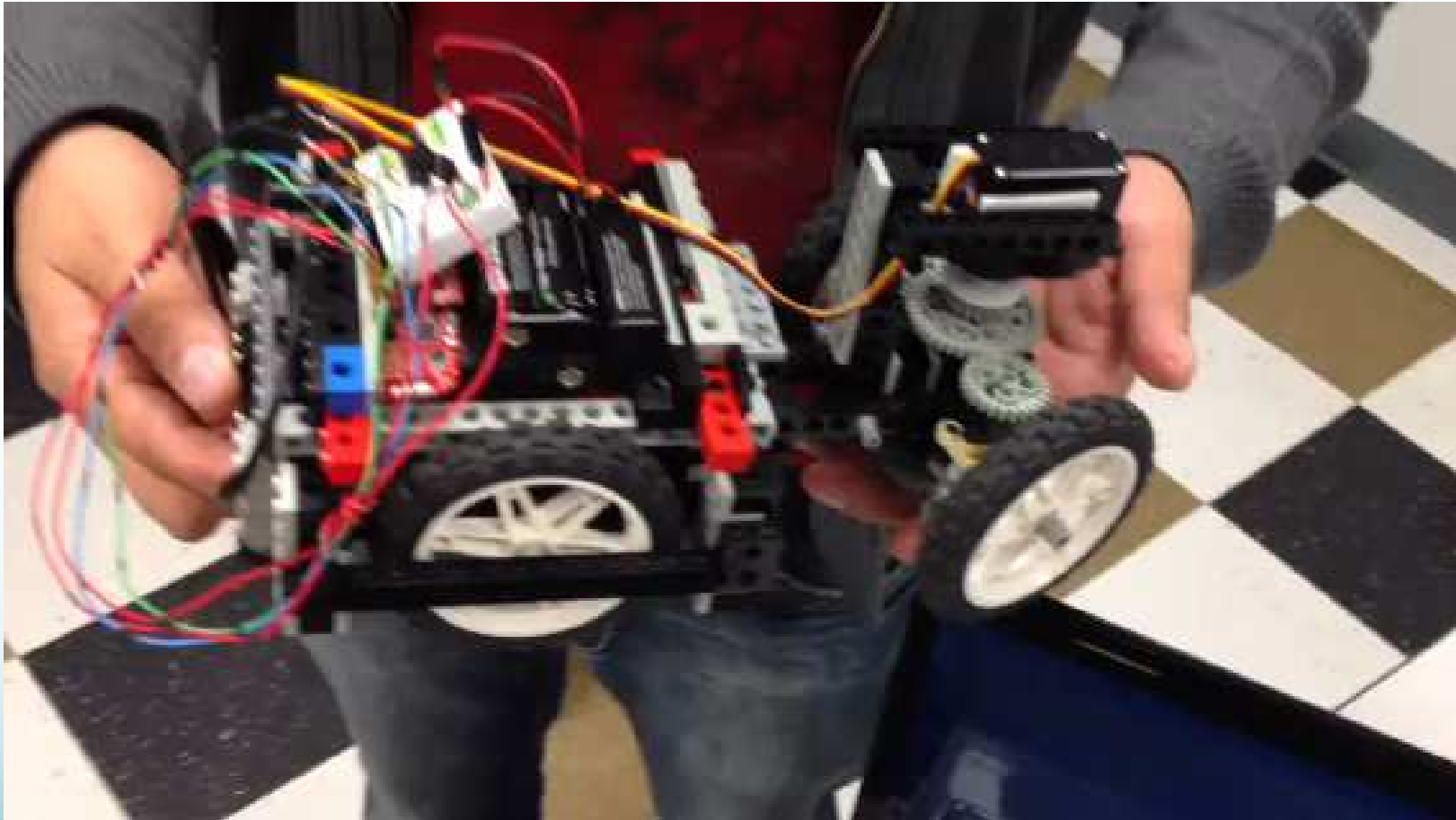


Motor Control Software

- The motors were controlled based off the instruction in the packet from the sender.
 - 0x01 Servo Right Shift
 - 0x02 Servo Left Shift
 - 0x04 DC Motor Toggle
- The servo motor is controlled using Timer A:
 - Setting the period to 20000 us, CCR0
 - Pulse width in a range from 600-2400 us, CCR1 When a right shift was sent the pulse was increased by 225 us, and a left shift would decrease it by 225 us.
 - Set TACTL to use the SMCLK (1 MHz) and a clock divider of 8, set the timer in upmode.
- The DC motor was used with a 50% duty cycle with a period of 40000 us. Would toggle at the same period as the servo if motor was set to on.



Demo



Obstacles/Resolutions

- Trouble getting Capacitive Touchpad to integrate with MSPF2274 on the ez430-RF2500
 - Setup a 3 wire communication between the MSP430 integrated with the Capacitive Touchpad and the ez430-rf2500 with MSPF2274.
- DC Motor circuit interfering with Servo circuit when using common ground.
 - Used independent circuits and power supplies for each motor.
- Lost teammate
 - Worked a lot more hours in a smaller time window.

Conclusion

- Successes:
 - Capacitive Touchpad on and working to send directional data.
 - RF Chip attached to capacitive touchpad's MSP430 sends packets of data to the RF chip attached to the motors.
 - Servo Motor able to rotate in a 180 degree scale.
 - DC Motor is able to cut on and off.
- Failures:
 - Integration of Capacitive Touchpad with MSPF2274
 - Smooth driving on the robot

Special Thanks –
Joel Chenette

Questions?