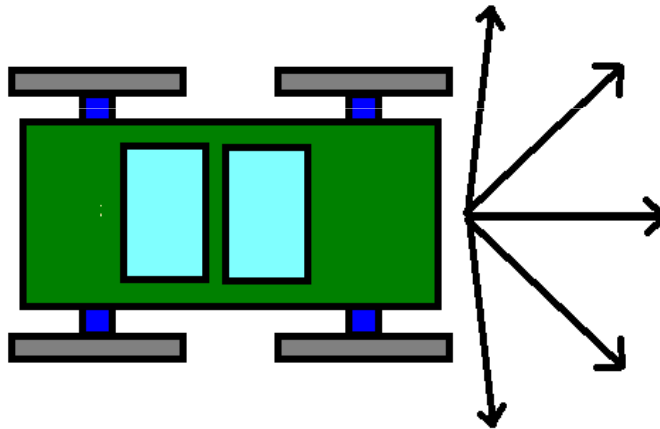


ECE 511: Obstacle Evading Ultrasonic Robot Project Report #2



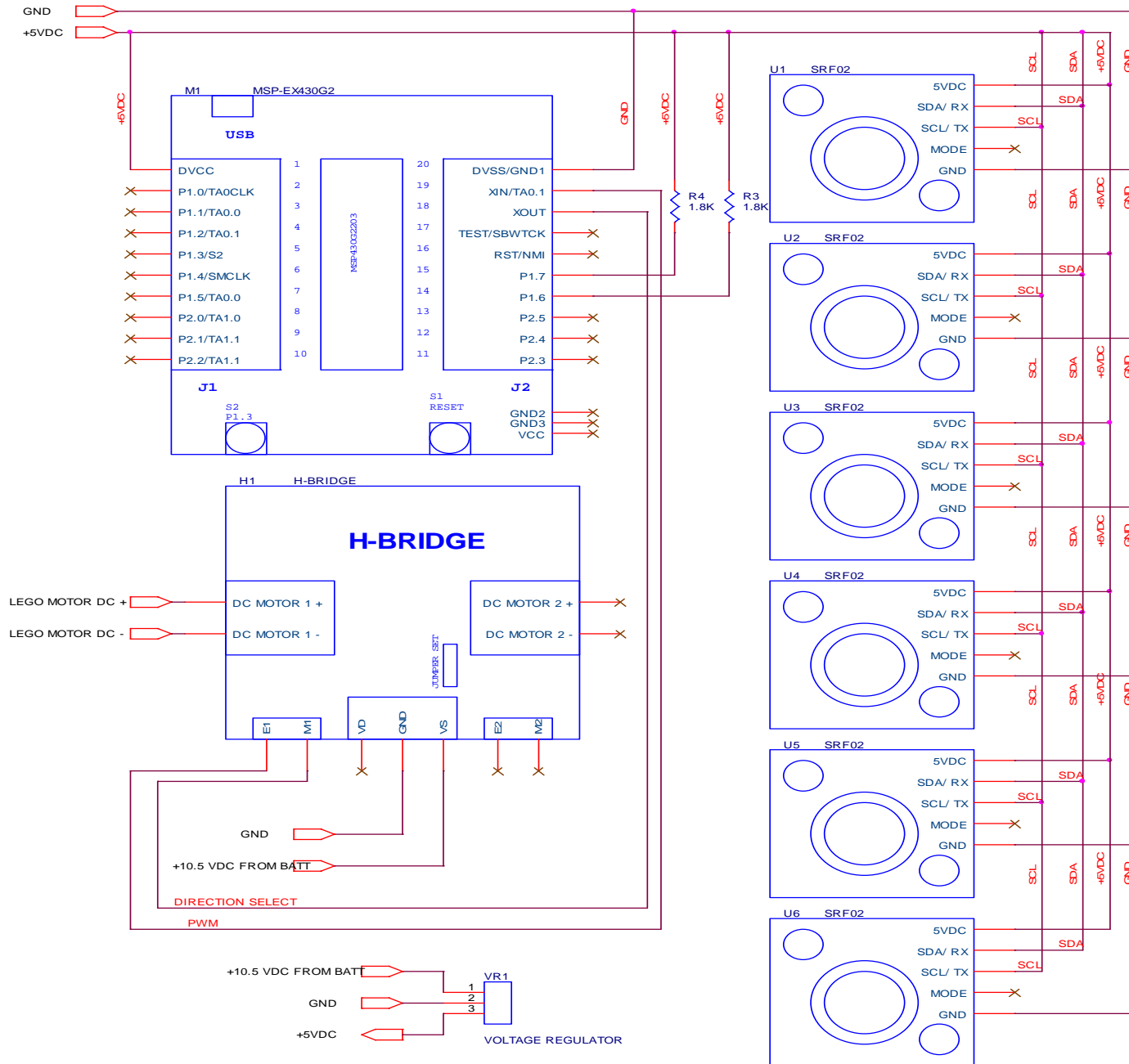
Team: Aaron Hunter, Eric Whitestone, Joel Chenette, Anne-Marie Cressin

Fall 2011, ECE Department, George Mason University

List of Components

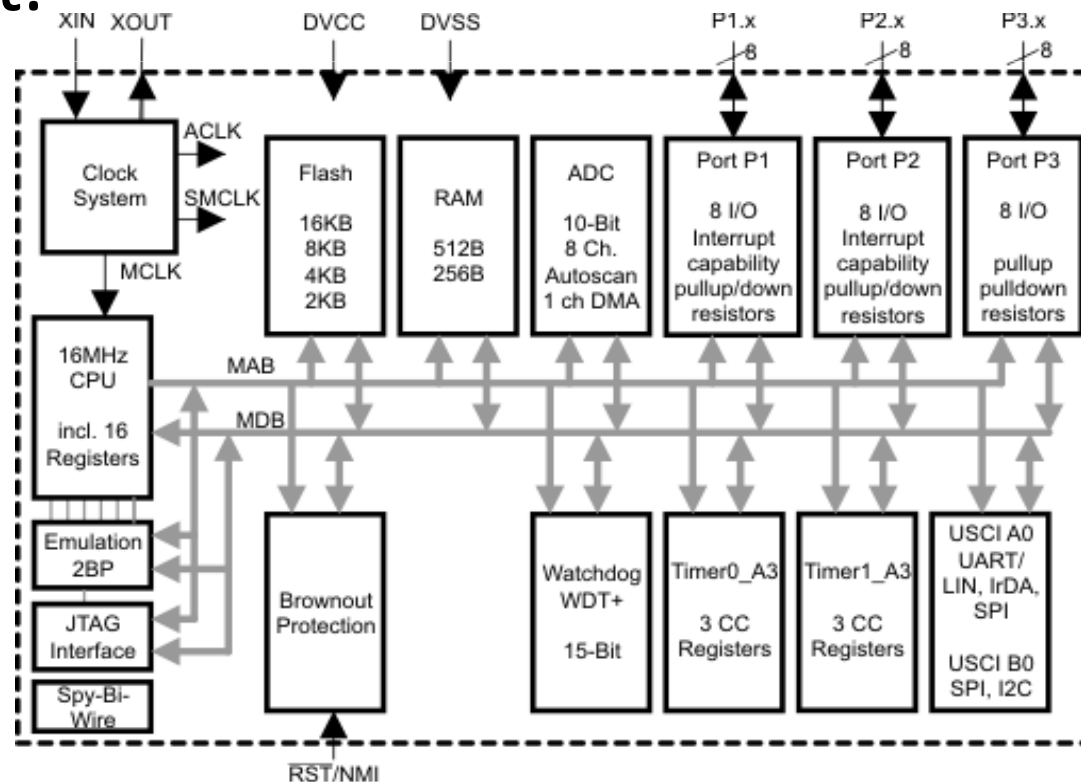
Description	Qty	Manufacturer	Manufacturer Part Number	Price per Unit	Total Price
Microcontroller	1	Texas Instruments	MSP430G2203	\$2	\$2
Ultrasonic Range Finder	6	Devantech LTD	SRF02	\$24.50	\$147
H-Bridge	1	DFRobot	DRI0002	\$22	\$22
Steering Servo	1	Hitec	HS-322HD	\$10	\$10
Voltage Regulator, 5VDC, 3A	1	Linear Technology	LT1085CT-5#PBF	\$5	\$5
Voltage Regulator Heatsink	1	CTS Thermal management	7-339-3PP-BA	\$9	\$9
Set of Batteries	1	n/a	n/a	n/a	n/a
Total Project Cost					\$195

Overall System Diagram



Component #1

- Instead of the MSP430G2231 provided in class, we purchased the MSP430G2203 as we needed 2 timers. It is a 20-pin chip, DIP format.



Component #2

- Ultrasonic Sensor – Detects objects
 - I2C interface
 - Interfaced with software using USCI_B0 hardware peripheral
 - Challenges: Confusion over what serial hardware peripheral the MSP430G2203 includes
 - Development still in progress

Component #3

- H-Bridge - Powers the wheel motors
 - One pin for direction, another pin for speed control
 - Direction pin uses a digital I/O pin
 - Speed pin is controlled by Timer hardware
 - Modifying CCR1 changes the PWM dutycycle
 - Tested OK, Software in development

Component #4

- Steering Servo – Turns the robot
 - 3 pin interface: Power, Gnd, PWM input
 - Pulse width from $\sim 1050\mu\text{s}$ to $\sim 1950\mu\text{s}$, frequency of 50 Hz
 - PWM pin is controlled by Timer hardware
 - Modifying CCR1 changes the PWM dutycycle
 - Challenges: Servo doesn't have full range of motion. Had to manually tweak the PWM timings
 - Tested OK, Software mostly developed

Component #5

- Set of Batteries – Powers robot
 - 2 Pin interface
 - 10.5 V supply voltage
 - No software interface
 - Testing in progress

Component #6

- Voltage Regulator – Adapts battery voltage for MSP and ultrasonic sensors
 - 3 Pin interface: V_{in} , Gnd, V_{out}
 - TO-220 package
 - Dropout voltage less than 1.5V
 - No software interface
 - Component has been purchased

Division of Tasks among members

- I2C Development: Eric Whitestone and Joel Chenette
- Hardware Integration and Documentation
Lead: Anne-Marie Cressin (System Diagram schematic, PCB layout, PCB stuffing & testing)
- Power and Steering Development: Aaron Hunter

Overall Progress

- Overall System Diagram done
- PCB Layout in Progress
- I2C interface with Ultrasonic sensors in Progress
- Overall Physical integration of components in the vehicle still not finalized

Plan B

We will attempt to achieve all the goals but we may drop priorities or modify them depending on their importance.

- Simpler, easier to interface sensors.
- Simpler steering algorithm
- Relaxed obstacle avoidance requirements