

## Homework 2: Design Project Proposal

Team Code Name: GRASP      Group No. 11

Team Members (#1 is Team Leader):

#1: Ryan Taylor      Areas of Expertise: Hardware, PCB Design

#2: Miles Whittaker      Areas of Expertise: Software, Algorithm Development

#3: Bryan McDonnell      Areas of Expertise: Software, Operating Systems

#4: Michael Mize      Areas of Expertise: Hardware, Filters

**Project Abstract:**

Our team is designing an autonomous robot used for surveillance purposes. The robot will navigate to a chosen location using GPS coordinates; along the path, the robot will use onboard sensors to detect obstacles, and with the help of a digital compass, navigate around them. At the chosen destination, the robot will begin recording audio data until a designated time limit is reached; after this time limit is reached, the robot will steer back to its original location where the user can download the audio that has been recorded.

**Design/Functionality Overview:**

The GPS-guided autonomous robot will be capable of following a set of user-determined waypoints until it has reached its destination. While traveling, the robot will detect obstacles using ultrasonic sensors and navigate around them. Three ultrasonic sensors will be placed on the outside (one on the front, left, and right of the vehicle), thus allowing object detection when the car is arranged in multiple orientations. When objects are detected, the robot will maneuver around them using a combination of GPS coordinate, sensing, and digital compass data. The robot will be used for surveillance purposes by implementing an onboard microphone to record an audio conversation at the destination location. Audio captured at this location will be encoded using a compression codec such as OGG; this information will then be encrypted using custom

designed cryptography set, where it can then be decrypted and heard once the robot has returned to its starting point. Information such as remaining battery life and distance to the final destination will be displayed using a character only (non graphical) LCD display. Final destination and waypoint information (in form of GPS coordinates), along with the encrypted audio conversation will be stored on a portable media device such as an SD memory card.

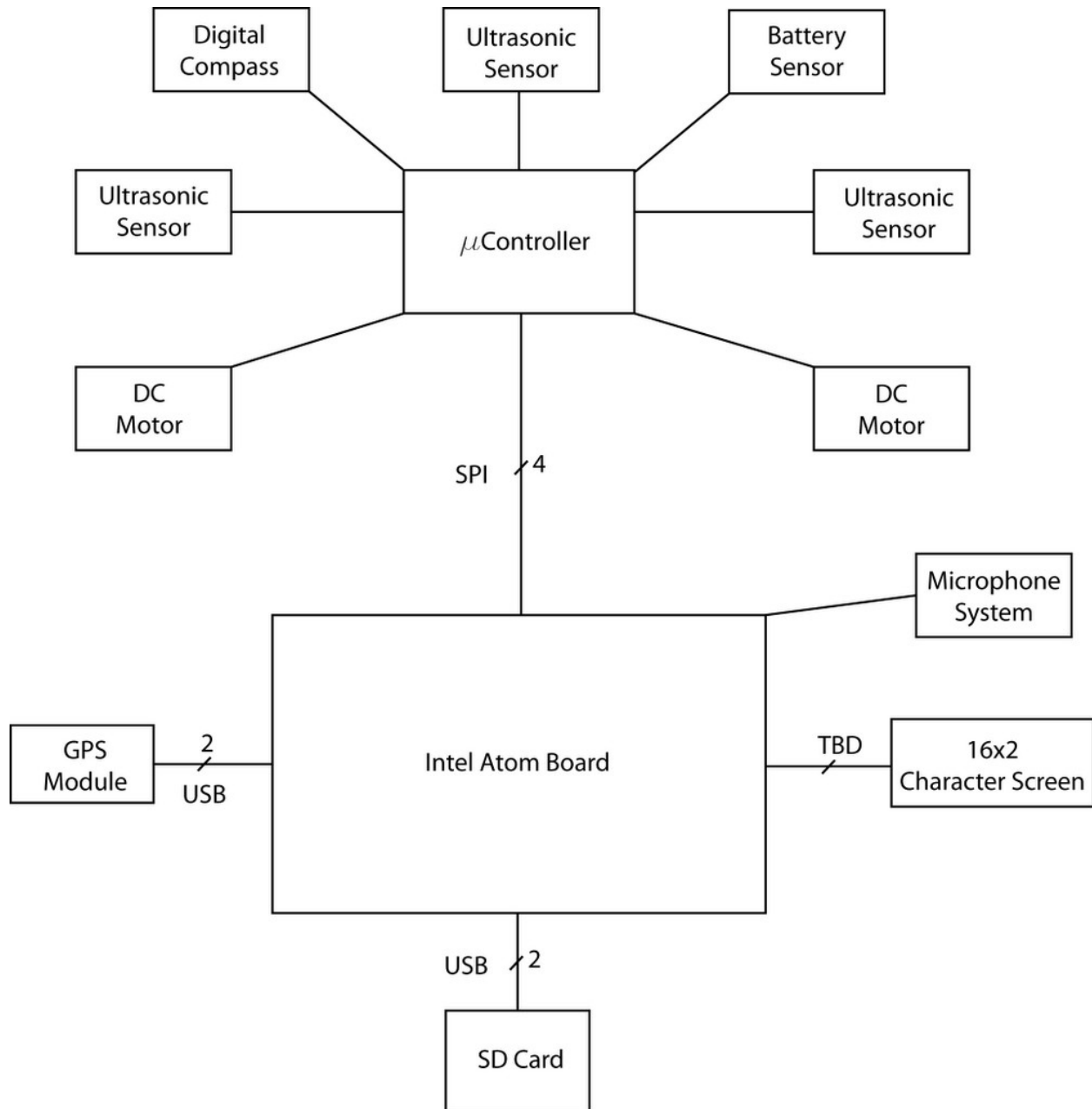
Estimated costs for this project range between 265 - 305 USD (between 66 - 76 USD per group member), after accounting for the components that have already been purchased or can be procured for no cost by the department.

Ryan and Michael will be expected to design and develop all hardware systems and interfaces (motor drive systems, sensor interface, and assorted mechanical tasks) and will be responsible for PCB layout. A R/C car will be used as a base; the insides of the car will be stripped out, thus allowing the placement of electrical components inside. Miles and Bryan will take charge of audio capture and encoding, along with cryptography algorithm development.

**Project-Specific Success Criteria:**

1. An ability to display the current status of the robot on a external display (e.g. battery life)
2. An ability to read and write data from a portable media device (e.g. SD Card)
3. An ability to make navigational decisions based on sensor, GPS, and digital compass data
4. An ability to move robot using steering and motor drive
5. An ability to record audio and encode it using a cryptographic system

**Block Diagram:**



**Division of Labor:**

<i>Design Component Homework</i>		<i>Professional Component Homework</i>	
4-Packaging Design and Specs	MW	3-Design Constraint Analysis/Parts List	BM
5-Hardware Narrative and Prelim Schematic	MM	10-Patent Liability Analysis	MW
6-PCB Narrative and Prelim Layout	RT	11-Reliability and Safety Analysis	MM
9-Software Design Narrative	BM	12-Social/Political/Environmental Analysis	RT