**Preliminary Design Questions**

1. What computational platform(s) do you plan to use (BBBw, Atmel, etc)? How many of each type do you plan to have in your system? Why did you choose this platform?

Our group plans to use one BBBw microcontroller for this project. The BBw was selected because of its proven I/O capabilities. It is also one of the more powerful embedded devices and we have some experience with it.

2. What sensors do you plan to use? Please be specific and include links to parts (when applicable).

Hall Effect sensor (2): (Waiting for Baja team to respond to where they got their sensor from)

LCD Screen (Waiting for Baja team to respond where they got the LCD from)

Accelerometer ADXL345 which will provide a +/- 16g measurement:

<https://www.amazon.com/WINGONEER-ADXL345-Digital-Acceleration-Gravity/dp/B06XHHT4T8/ref=sr_1_2?ie=UTF8&qid=1521676168&sr=8-2&keywords=adxl345>

GPS: Adafruit Ultimate GPS Breakout - 66 channel w/10 Hz updates

<https://www.amazon.com/gp/product/B00GLW4016/ref=as_at?imprToken=yBajkRBnZ1cb72O6L7y9RQ&slotNum=0&ie=UTF8&camp=1789&creativeASIN=B00GLW4016&linkCode=xm2&tag=sonofthesouth-20>

3. What outputs/actuators do you plan to use? Please be specific and include links to parts (when applicable).

Web Page (self-Developed using python or NodeJS, javascript, and HTML, but ThingSpeak if the project starts coming to a time crunch)

* GPS data on a google map
* Accelerometer data
* Speed Data
* RPM Data

LCD Screen with speed, RPM data, and Stopwatch

4. How do you plan to power each component? Please be specific and include links to parts (when applicable).

We will power the BBBw with a rechargeable battery (portable charger) that is capable of supplying enough current and voltage. The battery will be connected to the Beaglebone via a USB to Barrel Plug cable.

Battery pack:

<https://www.amazon.com/RAVPower-Portable-22000mAh-Li-polymer-Smartphone/dp/B01G1XH46M/ref=sr_1_1_sspa?ie=UTF8&qid=1518794450&sr=8-1-spons&keywords=usb+battery+pack&psc=1>

USB to Barrel Adapter

<https://www.amazon.com/CableDeconn-Volt-Barrel-Power-Cable/dp/B012VLKXKM/ref=sr_1_1_sspa?ie=UTF8&qid=1521687145&sr=8-1-spons&keywords=usb+to+barrel+jack&psc=1>

The components will be powered from the BBBw.

5. How do you plan to connect these components? This includes physical connection (Ethernet cable, Wifi, individual wires, etc), protocol (TWIM, SPI, TCP/IP, UDP, ADC, DAC, GPIO, etc), and interface (Web Sockets, ThingSpeak, TWIM interface described in sensor data sheet, etc).

We plan on using wires to connect all the components in our project. I2C will be used to receive accelerometer data. UART will be used to receive GPS Data. The beaglebone ADC/GPIO pins will be used for the hall effect sensors.

The data will be sent over a cell network to a database that the website will connect to. The cellular network uses either a 3G or 4G LTE connection, and the connection to the DB will be over TCP.

Cellular Modem and sim card costs:

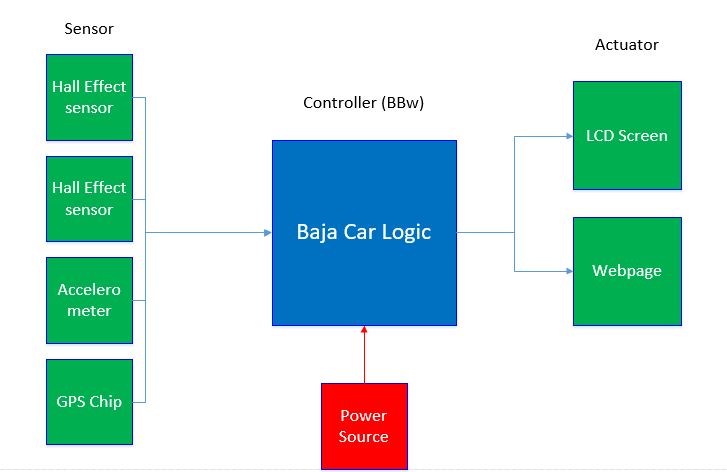
<https://hologram.io/store/nova-global-cellular-modem/36>

<https://hologram.io/store/global-iot-sim-card/>

6. How do you plan to package/encase your devices? Will devices need to be weatherproof? How do you mount or install your devices? Will you need to use a 3D printer?

We would like to 3D print cases for our devices. This will keep the components weatherproof when placed on the Baja Car, which will be important for the competition.

7. Draw a complete block diagram of your system. In addition to the standard components of block diagrams, show how each component will be powered. For each device that is connected, show the physical connection type, protocol, and interface definition on the lines that connect devices. In cases where you have multiple controllers (computational platforms), make sure to show how they are connected with each other and include all systems on a single diagram.



See question 5 for connection protocols.

8. What programming language(s) do you plan to use? What drivers or ASF modules will you need?

Languages: C, Node JS, and possibly python since there are a lot of modules available for use in python.

Modules: Stdio.h, iot.h, json parser, ThingSpeakC, BBBIOlib-master, more as needed.

9. If your project will utilize a web display, what software technologies will you use to accomplish this?

ThingSpeak or self-developed webpage. If the self-developed route is chosen, most likely the website configuration will be as follows:

* Database: PostgreSQL
* Backend: Flask (python) or NodeJS (Javascript)
* Frontend: HTML with JQuery.

10. Please list any other details or topics that are not covered by the questions above.

This project is for the Baylor Baja Team, so we hope to be able to test with the Baja Car. Also we may use a bike for demonstration of the embedded system if the car is not available.