# System Requirements Review

In the space below detail the requirements the proposed design meets. Then describe and defend the proposed design and finally compare any alternative designs.

| Initial Element Design |
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| Requirement:  The controller board shall have as many control ports as possible so that we can handle as many sensors and motor control boards on the same board instead of having to manage communication with multiple boards. |
| Design:  The CTRE HERO will be used initially as the main controller board for as many sensors and motor controllers that the board can fit, we can then use a second CTRE HERO or another appropriate microcontroller for any remaining sub systems. The use of the CTRE HERO and a possible second board will allow us to have direct input from and sensors to the CTRE HERO and any calculations or commands will be direct outputs from the CTRE HERO the motor controller or other controlled system. Programming the CTRE HERO can be done in java or C++ along with the WPLib Library, that will allow us to use all the tools that come with the WPILib library and will also allow us to follow the FRC documentation, flashing the CTRE HERO can be done with the through Visual Studio Code, and testing with the board can be done the autodesk synthesis simulation software and WPILib control dashboard software.  The CTRE HERO Specifications are:  Processor: 168 MHz, 256KB RAM & 2MB Storage  Ports: 1 Mini USB & 1 USB A  IO: 6 Analog In, 3 UART, 1 USART, 12-14 GPIO  Control Ports: 3 PWM, 3 Serial, 2 I2C, 1 Analog out, 3 UART, 1 USART, 1 CAN  Power: Requires 5.2 - 72 V & 48 - 72 mA or 0.24W - 2.0 W  Pros:  \* The CTRE HERO allows us to use most of the FRC documentation and also allows us to use the WPILib documentation.  \* The CTRE HERO has many communication protocols, although some can not be used at the same time.  \* The CTRE HERO is only $60 but does have additional costs like the “Gadgeteer Modules” for access to the pins.  Cons:  \* The CTRE HERO does not have wireless communication , but the manufacturer sells an ESP8266 module that would allow us to have WIFI and Bluetooth communication.  \*\*\* The CTRE HERO has much lower RAM & Processing power that may lead to possible problems that will be hard to solve down the line.  \*\* The CTRE HERO in some cases does not allow for multiple communication protocols to be used at the same time as they share some of the same pins.  \* The CTRE HERO’s documentation is in C#, but they supply documentation and a library for c++ and java  \* Strong possibility that we will need multiple boards communicating with each other to be able to fit all the sub systems.  \*\*\* The CTRE HERO is made with the intention of using proprietary CTR technology like their CTR motor controllers and the “Gadgeteer Modules”. |
| Alternatives:  The RoboRIO can be used and allows for a more straightforward approach to things. Though is comes with a higher cost of $1,142.00 |