Introduction
The purpose of the project is to create a wiring harness diagram for Hyperloop and physically construct the design. Many factors are considered in a wiring schematic because there are devices that must be in a specific location. Other factors are maintaining outside factors such as heat, weight, battery storage and voltage and current supply. The Hyperloop project is a new concept and form of a high-speed transportation pod. The pod is combined of microcontrollers, sensors, battery packs, mechanical parts, and a variety of wires. The wiring schematic plays a significant factor in the overall project of Hyperloop because it will be the basis of communication of all the components of the pod. It will also be used as the primary resource for the physical build.

Methodology
The initial steps to build the diagram is to list the devices that will be considered on the board, their position, current ratings, voltage ratings, temperature sensitivity, and communication to the master microcontroller unit (MCU).

The first step to designing the pod was to research wiring harness designs. In “Automatic Assembly Path Planning for Wiring Harness Installations” we are concerned about the position of battery packs as they are going to be placed in a condensed area. Furthermore, the article goes into great depth about creating virtual designs to start planning for the pod then moving onto physical design. Virtual designs can be made in various places; The assembly path for the wiring harness of Hyperloop was constructed using Altium Circuit Maker and draw.io.

For safety specification as the pod, it requires the use of thermistors for the BMS. It is shown in the original design, and assumed for the BMS in the new design. The placement for each sensor is critical because it must be balanced and accurate to send signals to the master MCU. Many of the sensors depend on a 3.3V rating which can be achieved through ports of the MCU as shown in Figure 7.

Factors required the batteries to be placed on the front and the back of the new design that attach to the BMS then provide voltage to the loads as seen in Figure 6, where the busbars are depicted.

Analysis and Results
The new design is shown below with the added optical sensors, battery and color code. It is important to note that the design could not yet be implemented. The wiring shows the sensors requiring 3.3V-5V and optical using digital then pressure using analog; this can be achieved using the I2C on the MCU.

The final design for the primary battery pack and secondary are shown in Figure 6 with connections to MCU as given by the Orion BMS Jr. The ESC currently used is the Sevcon5 that supplies to the motor.

Summary/Conclusions
Overall, the primary wiring harness differed in devices, the voltage settings remained consistent over small lengths. The wiring used will not required new purchases, the battery pack changed in internal and physical configuration to provide enough current for the motors. Connectivity tests need to be performed in the lab, and vacuum performance. The design needs to be updated as new devices are added.

Key References


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