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Erythraean Bot Spec

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**Customer Requirements:**

*The customer requirements are defined for an actual autonomous vehicle. The bot and swarmbot community simulate autonomous vehicles, so the functionalities implemented in this project can be applied to real-world autonomous vehicles.*

* Safety- The collision detection system will help the vehicle avoid accidents and allow for a higher level of safety than for a conventional vehicle.
* Traffic flow- By using sensors for the bot to follow a path, traffic flow should be improved when several bots are programmed to follow the path (there will be less delay between starting/stopping).
* Fuel economy- By controlling acceleration and deceleration rates, when this system is implemented in a real autonomous vehicle, fuel economy can be optimized.
* Human error- Since the bot will be able to make its own decisions, then humans are not in control of the decisions so human error will not come into play. The microcontroller will be used for decision making.

**Cost and Price:**

* The cost of the bot will be based on the cost of components used, and the people hours it took to design, build, and test it.
* As we build the bot, we will create a comprehensive components list which includes the cost of each component. For now, we will create a more specific spec which includes an estimated component list and cost projection.
* We will record how much time it takes to complete each phase in order to determine the people hours.
* To record costs, we will create an itemized parts list with parts cost and a time sheet of labor hours.
* The competitive cost for an engineer to build and test a swarmbot is $42.19 /  
  hour. The competitive cost for a manufacturing worker to assemble the swarmbot is  
  $26.31 / hour. Project manager competitive costs are approximately $66.11 / hour.
* The final sales price cannot exceed a 65% margin on the parts and labor. We will price our bot to achieve a 50% margin.

**Modules:**

* **Drive System**
  + **Inputs:** The inputs to the drive system come from the microcontroller. The microcontroller will decide whether the bot needs to move forward, backward, turn, or stop. It will provide this to the drive system as input.
  + **Outputs:** The output of the drive system is motion. Based on the inputs to the system, the drive system will produce the required motion - forward, reverse, turns, or stopping.
  + **Function:** The drive system uses the input from the microcontroller and the power supply to produce the correct motion in the required direction.
* **Communications**
  + **Inputs:** The inputs to the communications system come from the microcontroller and from sound signals (a microphone)
  + **Outputs:** The communications system produces sound signals to communicate with the TCC and other bots and electrical signals to transmit information to the microcontroller. The communications system will also be responsible for lighting up LEDs to communicate information to humans.
  + **Function:** The communications system allows the bot to receive and send information to and from the TCC and other bots as well as conveying information to humans that are around the bot.
* **Sensors**
  + **Inputs:** The inputs to the sensors system are light signals and magnetic field readings. These simulate the paths for the bots and the pedestrians that may be in the way.
  + **Outputs:** The outputs of the sensors system are electrical signals to the microcontroller to inform it of any dangers or paths that need to be accounted for.
  + **Function:** The sensors system allows the bot to follow predefined paths and avoid dangers like pedestrians (modeled with magnets)
* **Microcontroller**
  + **Inputs:** The inputs to the microcontroller are electrical signals from the other subsystems that convey information about the bot’s surroundings
  + **Outputs:** The outputs of the microcontroller are electrical signals to the other subsystems that dictate the response of the bot to different inputs.
  + **Function:** The function of the microcontroller is to make decisions based on the inputs from the other subsystems and then use those subsystems to make the bot respond accordingly. These decisions are programmed into the bot’s microcontroller.
* **Power**
  + **Inputs: N/A**
  + **Outputs:** Power
  + **Function:** The power subsystem supplies power to the various subsystems and allows them to function.

**Schedule:**

The schedule below will be used as a guideline for completing design phases. The highlighted rows have already been completed.

