Final Project Proposal

Year: 2022 Semester: Spring Team: 08 Project: Gimbal Vehicle

Creation Date: 1/13 Last Modified: 1/13

Team Members (#1 is Team Leader):

Member 1: Zeren Li Email: li3103@purdue.edu

Member 2: Bohang Ni Email: ni67@purdue.edu

Member 3: Deyuan Sun Email: sun829@purdue.edu

Member 4: Haiwen Zhang Email: zhan3237@purdue.edu

1.0 Project Description:

We will design a Gimbal Vehicle infrastructure. This vehicle is capable of omnidirectional moving by using omni wheels (mecanum or other wheel can achieve the function). This vehicle’s gimbal is capable to maintain a horizontal and vertical stable regardless of the status of chassis. We can manually set the direction that the gimbal is facing or let it faces to a default direction. Also, users can monitor IMU parameters of the vehicle in real time from the LCD screen on the controller. Other users are capable to add more functionality to our infrastructure. I.e., adding water gun to become a fire extinguisher, adding a camera to become a video recorder.

2.0 Roles and Responsibilities:

Zeren Li (Team leader) – Maintains communication among team members and instructors. (System engineer) – Responsible for designing the interfaces between the wireless vehicle controller, the motor, and the gimbal.

(Software engineer) –Constructing the program for the communication between wireless module’s receiver and transmitter

Bohang Ni: (Hardware engineer) ­– Responsible for design of the circuit board, electrical schematic, and layout. Also, in charge of construction and assembly of the circuit board.

(System engineer) – Responsible for high level functional overview of the system, including the theory of operation, block diagram, and component selection. Ensures components and systems on project work together coherently

Deyuan Sun: (System engineer) – jointly responsible for designing the interfaces between the wireless vehicle controller, motors, and the gimbal.

(Software engineer) – Implementing the LCD display for real time information, control wheel motors and gimbal servo.

Haiwen Zhang (Software engineer) - Write a program to read data from IMU to STM32 microcontroller using I2C communication protocol, then display data on LCD display using SPI.

2.1 Homework Assignment Responsibilities

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| --- | --- | --- | --- |
| *Design Component Homework* | | *Professional Component Homework* | |
| 3-Software Overview | ZL | 9-Legal Analysis | HZ |
| 5-Electrical Overview | BN | 10-Reliability and Safety Analysis | ZL |
| 7-Mechanical Overview | HZ | 11-Ethical/Environmental Analysis | BN |
| 8-Software Formalization | DS | 12-User Manual | DS |

3.0 Estimated Budget

|  |  |
| --- | --- |
| Mechanical | Estimated Cost |
| wheels (×4) | $50.00 |
| Laser Cutting | $100.00 |
| Packaging material | $50.00 |
| Electrical |  |
| Wireless transceiver (×2) | $20.00 |
| Joysticks (×2) | $2.00 |
| SPDT switch (×2) | $2.00 |
| BLDC with Hall sensor encoder attached (×4) | $200.00 |
| Servo (×2) | $20.00 |
| OLED Screen (×1) | $5.00 |
| 9V Alkaline battery clip (×1) | $1.00 |
| Microcontroller (×2) | $100.00 |
| Voltage regulators (×3) | $5.00 |
| IMU (×1) | $3.00 |
| Motor Drivers (×2) | $5.00 |
| Rechargeable Batteries (×2) | $20.00 |
| Other Electronic components | $40.00 |
| Printed circuit Board | $30.00 |
| Total | $653.00 |

4.0 Project Specific Success Criteria

1. PSSC #1: An ability to manually change the direction that the gimbal is facing (Hardware)
2. PSSC #2: An ability to design an algorithm to implement the feature of omnidirectional move. (Software)
3. PSSC #3: An ability to stabilize the gimble while chassis is moving. (Software)
4. PSSC #4: An ability to display real time vehicle information on LCD. (Hardware)
5. PSSC #5: An ability to read hall sensor encoder data (Hardware)

5.0 Sources Cited:

N/A