Final Project Proposal

Year: 2022 Semester: Fall Team: 5 Project: Metaporter

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Team Members (#1 is Team Leader):

Member 1: Jehan Shah Email: [shah435@purdue.edu](mailto:shah435@purdue.edu)

Member 2: Manav Bhasin Email: [mbhasin@purdue.edu](mailto:mbhasin@purdue.edu)

Member 3: Kris Kunovski Email: [kkunovsk@purdue.edu](mailto:kkunovsk@purdue.edu)

Member 4: Sen Wang Email: [wang3989@purdue.edu](mailto:wang3989@purdue.edu)

1.0 Project Description:

Metaporter is a plug-in device that scans human faces by rotating the device on a circular track and creates 3D reconstructed mesh. The device has two main components: sensor hub and computing unit. A user button input will trigger the sensor hub to start the scanning process and collect sensory data with timestamps. The computing unit will be an off-the-shelf Nvidia Jetson Nano that receives the sensory data and constructs a 3D mesh. Additionally, the device may feature LEDs and LCD display for a simple user interface.

*During the initial project proposal you identified a problem and developed a proposed solution to that problem. On this section of the report, state formally the project you intend to undertake, particularly any changes to the project since it was initially proposed. This should be a relatively short description. (Exception: If it is a big change in project scope or implementation plan, do include a longer description. Include a justification/rationale for the change.)*

2.0 Roles and Responsibilities:

*In this section, devote 1 paragraph (possibly a short paragraph) to each member of the team and his/her area(s) of expertise. Then describe the roles to be taken on by each team member. Traditional roles include:*

1. *Team leader – Maintains communication among team members, ensures team is progressing and assists fellow team members in addressing significant issues*
2. *Systems 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*
3. *Hardware engineer – Responsible for design of printed circuit board electrical schematics and layouts, often in charge of circuit board construction and packaging assembly*
4. *Software engineer – Responsible for design and implementation of source code. Undertakes functional prototyping efforts early in the semester to mitigate risk in the later stages of the design process*

*Depending on the nature of your project, multiple students may need to undertake a given role, or students may need to take on multiple roles (the team leader may also need to be a systems engineer, for example, or a team may require multiple software engineers for embedded/desktop/mobile/FPGA work).*

Jehan Shah has experience leading software teams for robotics competitions at Purdue and has also participated in robotics research and internships. He is also pursuing a master's focusing on computer vision and will be the team lead. He will be the Scrum Master and help organize the team’s weekly sprints and help facilitate communication. On the technical side he will focus on the sensor fusion algorithm and programming for 3D reconstruction.

Kris Kunovski has had extensive experience working on software development teams and as an undergraduate TA for a software engineering tools class at Purdue University. He has a suitable understanding of low-level programming languages and embedded systems from Purdue courses. As a result, Kris will use his knowledge to aid in integrating project components, and he will also help his team with any hardware or software tasks when needed.

Sen Wang has had considerable experience working with embedded software and software development during his internships. Therefore, he will be assisting in the development of embedded components, including but not limited to code implementation, functional prototyping, test integration, as well as PCB layouts and hardware designs. Even though Sen has no prior experience in hardware or PCB design, he will do his best in accordance with the team to fulfill his duty. Additionally, Sen will also help with any team inquiries as they arise.

Manav Bhasin has substantial experience working on software engineering teams as an intern as well as teams at Purdue University. He will function as the software engineer for this project and will contribute to the development of any interface that requires higher level software. Some of these interfaces include may include transferring data to a web UI as well as communication with athe additional computing unit.

2.1 Homework Assignment Responsibilities

*ECE477 requires students to undertake one design component homework and one professional component homework. In this section, each team member is expected to select ONE design component homework and ONE professional homework that they are responsible to complete. Denote your commitment to those assignments by initialing the associated box. Please note that these assignments are expected to be followed: students are accountable for the assignments they select; if the assignments students must complete is to be changed, please contact course staff.*

|  |  |  |  |
| --- | --- | --- | --- |
| *Design Component Homework* | | *Professional Component Homework* | |
| 3-Software Overview | KK | 9-Legal Analysis | MB |
| 5-Electrical Overview | SW | 10-Reliability and Safety Analysis | SW |
| 7-Mechanical Overview | MB | 11-Ethical/Environmental Analysis | KK |
| 8-Software Formalization | JS | 12-User Manual | JS |

3.0 Estimated Budget

*In this section, develop a first-cut estimation of the budget of your project, separated into categories. For each category, include a description of the category as well as a conservative estimated cost. Include a total estimated cost at the end of the estimated budget. See the example Final Project Proposal for more details.*

An estimated budget for project Metaporter is as follows:

|  |  |
| --- | --- |
| Item | Estimated Cost |
| Electronics |  |
| MCU | $60.00 |
| CAM | $60.00 |
| LiDAR | $160.00 |
| IMU | $30.00 |
| Power Management | $25.00 |
| PCB | $50.00 |
| Mechanical |  |
| Product Shell | $40.00 |
| Total Budget | $425.00 |

Note that all expenses include shipping & logistics.

4.0 Project Specific Success Criteria

1. An ability to configure and receive data from the IMU to the microcontroller via I2C. (Hardware)

2. An ability to send and receive sensor (LiDAR and IMU) data from the microcontroller to the compute unit via UART. (Hardware)

3. An ability to send and receive data from the LiDAR to the microcontroller via I2C.

4. An ability to display status on the LCD display via SPI. (Hardware)

5. An ability to fuse sensor data from camera, IMU and LiDAR for 3D reconstruction using. (Software)

*ECE477 requires teams to develop a set of 5 project-specific success criteria (PSSCs). Overall success or failure of the senior design final project shall be largely based on the extent to which these criteria are satisfied. Develop 5 PSSCs to gauge the success of your ECE477 senior design project. Please note that there are specific course policies that must be observed when selecting project specific success criteria. More information on these course policies can be found in the “PSSC Policy” document, available on the ECE477 course website.*

5.0 Sources Cited:

(No sources cited, remember to get rid of this section)

*Throughout this and other papers, use of the IEEE citation style should be used. Use of embedded hyperlinks for all web-based sources is required. A reference to the IEEE citation style format is provided* [*here*](http://www.ieee.org/documents/ieeecitationref.pdf)*.*