ECE 4970 - Student Team Contract Template

Dr. Liesl Klein

August 2022

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1 Contact Information

1.1 Team Names and Contact information

Sean Meals smeals@villanova.edu 484 222 9144
Timothy Hoo thoo01@villanova.edu 650 815 8331
Alex Rhodes arhode03@villanova.edu 724 674 4234
Rafael Guerrero rguerrer@villanova.edu 323 387 4280

1.2 Adviser Information

Sarvesh Kulkarni sarvesh.kulkarni@villanova.edu 610 519 6533
Joe Zebrowski jaz@zintegrium.com 272 209 612

1.3 Meeting Information

Meetings will be recurring and conducted on Tuesday and Thursday at 1:00 pm in Toletine 215, room subject to change with prior notice. Accommodations can be arranged to host meetings virtually via Microsoft Teams if any member is unable to be physically present.

2 Project Summary

2.1 Problem Statement

Our problem consists of incorporating the known behavior of materials with real-time data acquisition to determine the success rate of a weld. This will not only increase efficiency but will also decrease time and material loss. From the information provided, we know that there are currently ways to determine the quality of a weld however, no technology exists to provide this information to the welder in real-time. Our team is tasked with finding a solution to this problem. Our user consists of skilled trade personnel with a need for real-time data acquisition relating to the task at hand. All group members are aware that our problem space may change moving forward as we learn more information and conduct our research.

2.2 Brainstorming/Ideation Summary

There was an idea to implement current detection on existing welding machines, allowing the use of the direction of the current to determine the direction of the magnetic field. A multi-meter sensor would have then been placed over the wire to determine the current. Another idea was to figure out different ways ot demonstrate the result of the weld through sensory feedback. The ideas were, putting light indicators to tell if the weld is going as planned or not, earbuds to give feedback using different tones or spatial sounds, and a vibration device which could be on like the welder's leg having different speeds to portray different information. Our last idea was to implement a gyroscope on the clamps to display the angle of the weld being done on a monitor in the front of the machine. A microchip needs to be placed on and calibrated from a created origin to provide accurate data. All these brainstormed ideas came from speaking to welders and our advisor who informed us of problems they have dealt with.

2.3 Solution Summary

Our solution includes a measuring device that detects the magnetic field strength. This would allow us to detect voltage and current on any type of welding machine regardless of manufacturer. Since this type of detection is noninvasive it can be easy to use for anyone. This solution does not affect the welder since there are no extra steps that would make the process complex. Using magnetic field strength to detect current is widely used in industry and provides accurate results within a certain range. Welders' skills will improve since the real-time data provided can allow them to adjust and correct errors as they happen. All the examples and descriptions provided allowed us to decide that this would be the best solution. Based upon our results from the decision matrix, this solution ranked the highest compared to our hard-wired solution and creating a whole new wiring harness.

3 Team Guidelines

The following contains the list of guidelines in which all team members shall adhere to throughout the project.

1. Meeting attendance is mandatory for all group members. If a member is unable to attend, physically or virtually, they shall communicate this to

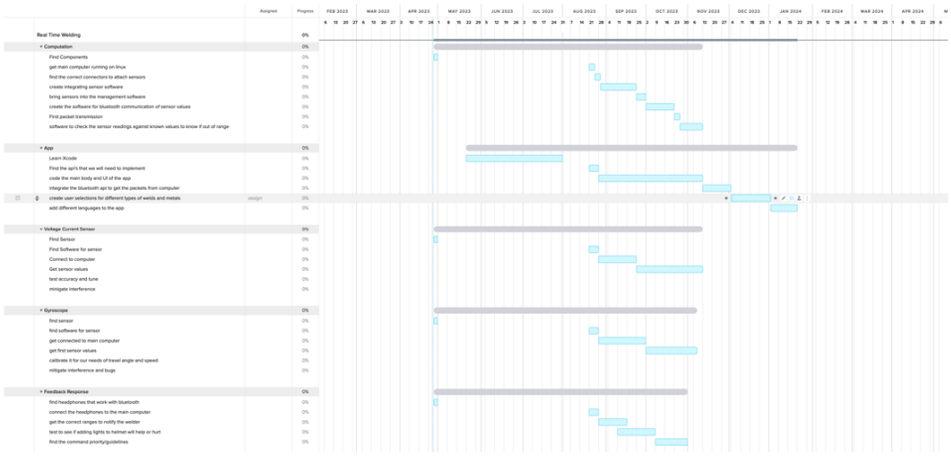
the group within reason.
2. Microsoft Teams shall be utilized for communication. It is expected that each member can respond within a 24-hour window. If urgent, instead of double texting," at" the team member(s).
3. In lieu of absence from the meeting, the absent member shall submit a summary of information to the team to be recorded in the meeting minutes.
4. All work done outside of regularly scheduled meeting times shall be ac-accomplished by each member at their own pace. No time requirement is set for each week, but each member is required to work on their portion of the project for time they deem necessary.
5. If a conflict arises it must be first mitigated between group members. If the conflict persists, a meeting time with the instructor will be arranged for further discussion.
6. Sean Meals is designated as team secretary and will record meeting minutes. All work performed by each group member for the week is to be disclosed on Fridays during the meeting.
7. Official meeting minutes will be recorded every week and published to Microsoft Teams for record keeping. Meeting minutes will consist of the project title, date, meeting place, and time in which the meeting was called to order. A list of attendees will be recorded followed by a reading of the secretary's minutes and treasury report. A Project Status section will consist of each member's name, the total hours worked for that week, and a description of the work completed. This will be followed by an Old Business section which will address concerns from the previous meeting. Next will be a New Business section that will address concerns going forward. Finally, an Objectives section will demonstrate our goals for the following week and the meeting adjournment time will be recorded.

4 Deliverables

By the end of the semester, we will have built a functioning prototype. We will start by finding a sensor and software for sensors. We will then connect to the computer (Arduino) to obtain sensor values. The next accomplishment will be to get the main computer running on Linux and find the correct connectors to attach to sensors. Creating an integrating sensor software will follow and we will then bring the sensors into the management software. Creating the software for Bluetooth communication will be required at this point to obtain sensor values. We will then check the sensor readings against known values to see if they are out of range. Find the api's that we need to implement will follow and we will need to code the main body of the app. We then need to integrate Bluetooth api to get the packets from the computer and create user selections for different types of welds and metals. Eventually, if time permits, we would like to add different languages to the app. We then would need to calibrate it for our needs for travel angle and mitigate interference and bugs. Next will be finding headphones that work with Bluetooth and connecting the headphones to the main computer. We then need to get the correct ranges to notify the welder of what to correct. Testing will follow to see if adding lights to the helmet will help or hurt. Lastly, we will need to find the command priority and guidelines and test for accuracy and tune.

After completing all of these steps, we will have a high-functioning prototype. For each segment to be functional we will need to individually work on our specific points in the project and integrate them together to create our prototype. All the requirements listed above need to be successful for our project to function correct

4.1 Deadlines



5 Team Responsibilities

Joe Zebrowski- Industry Advisor, Helping on the Welding and technical side.

Dr. Sarvesh Kulkarni- Faculty Advisor, Helping with the coding and engineering side.

Alex Rhodes – Team Lead, Focusing on management of schedules and assignments. On the technical side he will be focusing on the IOS application and the Bluetooth capability

Rafael Guerrero- Supply Manager, Focusing more on the hardware side of the project. Specifically on the gyroscope and headphones

Timmy Hoo- Programmer, Focusing more on the programming of the Arduino board and interfacing with the other sensors.

Sean Meals- Minute taker, Will be the primary hardware engineer. Focusing on getting the voltage reading from the welder

6 Bibliography

IEEE format or APA format

References

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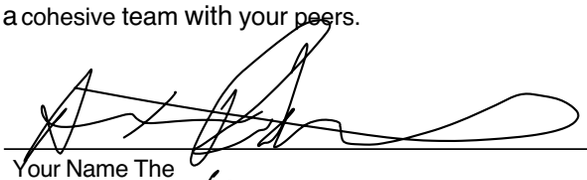
7 Signatures

By signing this contract, you are agreeing to the conditions listed in the above sections. You will put forth your best effort to achieve the goals of your

design project and work as a cohesive team with your peers.

Approved: 
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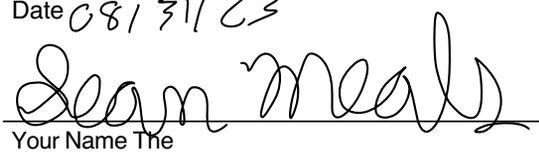
Approved: 
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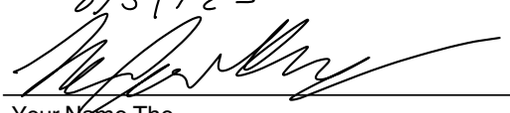
Approved: 
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