CS 307: Project Charter

By Team #24:

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Problem Statement

First Robotics Competition (FRC) Robotics teams often face challenges in diagnosing performance issues and optimizing their robots due to a lack of comprehensive data logging and visualization tools. Existing solutions fail to capture critical metrics such as motor activity, sensor feedback, and control system operations, making it difficult to troubleshoot issues or improve robot performance during competitions. Additionally, teams need a way to visualize their robot's movement during matches to analyze strategy and external factors. Without real-time data and actionable insights, teams struggle to make informed decisions quickly. Currently, there is not an accessible solution for this lack of data collection. Some teams may choose to spend their time writing their own, but that is time taken away from being able to work on the robot and the task at hand. This project aims to develop a software solution that logs, visualizes, and analyzes robot data to help teams identify issues, improve troubleshooting, and enhance performance based on data-driven decisions.

Project Objectives

- Develop a robust and intuitive data collection framework and desktop application in windows for FRC participants.
- Build a system to collect data when running the robots, then to send that data to display in a human readable format on the application.
- Create a user-friendly application that allows users to easily analyze the data they have collected.
- Implement a variety of data visualization formats, such as graphs and tables, within the application as well as data/file exports.

Stakeholders

- Users:
  - **FRC Robotics Teams**: Primary users who will utilize the software for robot performance analysis and troubleshooting.

    - ➢ **FRC Coaches and Mentors**: Secondary stakeholders who will use the software to guide their teams.
    - ➢ **Developers and Technicians**: Those involved in developing and testing the software, as well as those who might extend its features in the future.
- ❖ Developers: Jenna Rigdon, HyunShu Kim, James Gilliam, Roger Braun
- ❖ Project Coordinator: Bishal Basak Papan
- ❖ Project Owners: Jenna Rigdon, HyunShu Kim, James Gilliam, Roger Braun

Project Deliverables

- **Logging System**: A fully functional system that records control system activity, motor data, and sensor readings during matches.
- **Visualization Tools**: Customizable graphs and charts that display the logged data for analysis.
- **Data Export Functionality**: Options to export logged data in formats like CSV and JSON.
- **Robot Path Mapping**: A map feature that shows the robot's movements throughout a match. This will require another framework, such as Leaflet.js, OpenCV.
- **Troubleshooting Suggestions**: A tool recommending solutions for issues based on data trends or anomalies.

Possible Frameworks

- **Front End (Desktop Windows Application):** WPF (C#), WinUI(C#), Electron(JavaScript, HTML, CSS)
- **Back End (Data Logging & Processing):** Node.js, Django / Flask, ASP.NET Core
- **Data Storage:** SQLite, PostgreSQL / MySQL, JSON / CSV Files
- **User End:** Data collection from the RoboRIO (FRC Control System), Windows application on user laptops