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SAVI Software Platform

Project plan

Contents

1 Introduction

1.1 Project statement

This project is to develop a server and client interface for autonomously operating a tractor robot. The server will store data on the farmer's fields and robots. It will collect live data and video from all the robots. The server will use a map of the field to help calculate the most efficient path through the field while still gaining optimal coverage. The user interface will be available on android and pc. The interface will provide an easy way for farmers to upload feed maps, look at different possible paths the tractor could take through the field. It will also provide live monitoring of all tractors. Giving live video, GPS locations, gauge, and instrument readouts. There will be secure access between all clients, servers and robots.

1.2 purpose

As the need for more and more food is constantly on the rise. Farmers need to be able to produce more food, which means to either increase yields or increase the amount of land being farmed. More farm land means more time needing to be spent in the field. But with the new robot and software we are developing farmers will be able to remotely control their tractors. This will open up the possibility for farmers to have multiple tractors in multiple feeds reducing the time the farmer needs to spend in each field.

1.3 Goals

Establish a server and database to collect and store data.

Implement a path planning algorithm.

Make a basic gui that provides the robot with basic movement.

Add more functionality to the gui such as, live monitoring, uploading fields, running path planning algorithms, and the ability to assign versus robots to versus fields simultaneously.

2 Deliverables

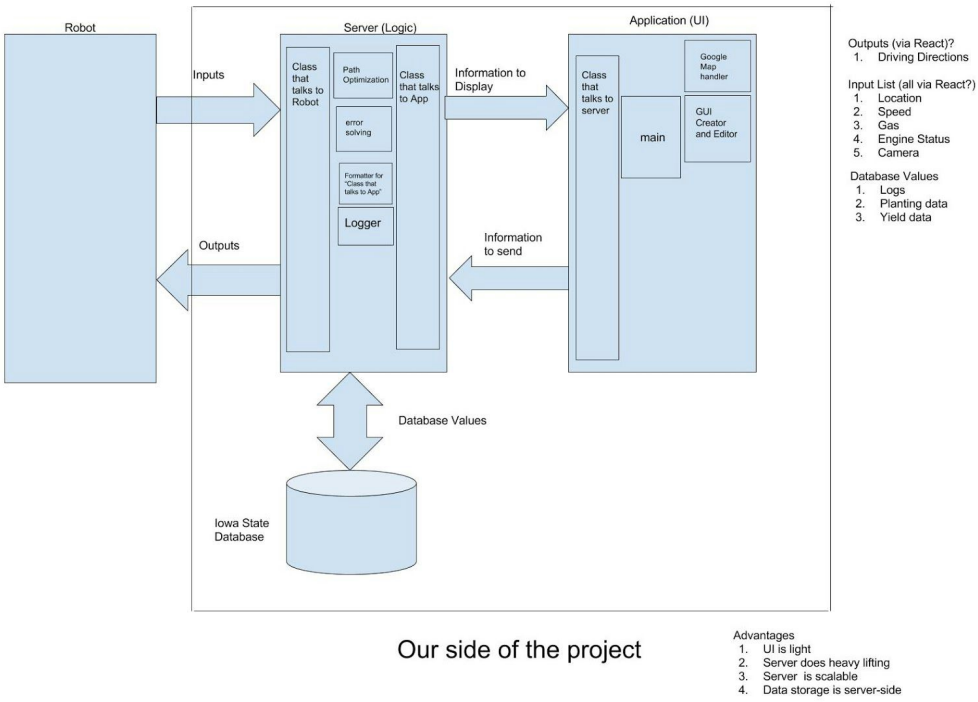
- To meet the goals outlined in the introduction we will need the following deliverables:
- A functioning UI the farmer can use to monitor the status of all robots out in the field, as well as stop and start robots out on the field.
- A working framework of controls for the robot. This includes movement, ability to accept different routes, send and receive information for the robot, and use all components on the robot.
- Store information about the robot for immediate use, or for analysis after the season is over

3 Design

3.1 Previous work/literature

Research was conducted about all forms of software architect. Advantages and disadvantages from various software designs were weighed. Some research included research about client server networking (Client Server Networking), and research about Multitier architecture (Multitier Architecture). Countless other uncertainties and confusions were also cleared up through research.

3.2 Proposed System Block diagram



3.3 Assessment of Proposed methods

Provide a short discussion about the different approaches available and the approach you want to follow in your work.

We decided to have a server that talks to the robot, the database, and the user application. All logic would take place on the server and the application would serve mostly only as a GUI for the user. The database would be used to store all data relevant to the robot and software logs. We chose this design because we wanted all the heavy lifting to be done on the client side because it will increase performance and is scalable. This model also creates a light application that is essentially just the view.

Other options that were considered was having the UI talking to the database instead of the server. This idea was not chosen in order to reduce the load on the database and avoid problems of stale data as well as to keep data storage information on the server side.

Another option was combining the server and application into one. This was not chosen because we wanted to separate the view from controller as much as possible.

3.4 Validation

How will you confirm that your solutions work?

We can test if our solutions works if we accomplish all project requirements and specifications laid out in the “Project Requirements/Specifications” section of this

document. As of right now, there is no reason to believe that these requirements are not achievable with our current design.

4 Project Requirements/Specifications

4.1 FUNCTIONAL

1. Load in existing field maps with common file formats
2. Execute basic back and forth paths through the field, define distance to maintain from boundaries
3. Knowledge of what has been covered(Swath COntrol) to allow for directional “fill in” along boundaries
4. Create a simple coverage map
5. Create new planting maps with open file format
6. Auto raise and lower for turns
7. Remote control take over and kill switches for safety
8. Real-Time monitoring of machines

4.2 NON-FUNCTIONAL

1. Simple, easy to use GUI
2. Be hosted on cloud
3. Software should be easily compatible with multiple machine brands
4. Everything should be secure and encrypted
5. Cross Platform compatible (Windows, OS, Android)
6. Data portability for easy integration with precision ag data

5 Challenges

How to handle losing connection with the robot.

Learning how path planning algorithms work and implementing a functioning one.

Learning React and being able to efficiently implement it.

6 Timeline

Our project is still in its planning phase, and there are several elements that make it very hard to make a concrete timeline. We do have a basic plan of what we wish to accomplish by the end of our first semester, and the end of the second semester.

Our project revolves around receiving a product from an outside company (Evatech), so until we physically receive the robot, and begin working on it, we are unsure how difficult things will be, or how long it will take for us to get certain parts of the project done. With this in mind, we are budgeting discretionary time within our timeline, and making it as modular as possible.

6.1 First Semester

Our plan for the first semester is to fully research and get a full scope of our project, work on most of the front end software as we wait for the robot to be complete.

We received our project specs. on January 21st. For the month of January, we accomplished all of the administrative work. As a team we set up meetings times with our client, our advisor, as well as team meeting times.

For the months of February and March, we plan on focusing on planning, research, and basic development of code. Our client has a good idea of what he wants for this project, but there are parts of the project that are subject to change. He also wishes us to use a language we have not had much exposure to, and we will not have the physical product to work with, so we will do as much preparation as possible.

During this time, the entire team will be doing research into react, a javascript framework that helps in creating HTML/UI pages for the application. Chandler and Alex Peck will be working on getting the backend and database setup, while Alex Clark and Kurry Watson start setting up the front end of the application.

We are expecting to receive the robot April 1st, and as soon as we receive the robot we will drop current tasks and begin working with it. The entire team will be working on it, and it will include communication with the robot, basic autonomous control, and sending and receiving commands. We expect to work with the robot for the rest of the semester.

Our goals for the first semester are as follows,

- Understanding of Javascript and React
- Basic UI
- Database setup
- Basic functionality with robot including have the robot move, getting sensor information, and tracking location

6.2 Second Semester

Depending on how far we get with robot controls in semester one, will dictate our second semester.

For the month of august, we hope to refresh ourselves with the project. We plan on rescheduling all of our meetings, and continuing robot controls.

For September and October, we plan on working on the robot, getting full controls, communication, and monitoring location and status of robot. During these times, we also plan on making everything we do with the robot also integrated within our UI, Database, and Server.

For November and December, we are planning on putting the finishing touches on all deliverables required of us, and wrap up all loose ends. We hope to go into the month of November with only a handful of requirements left.

7 Conclusions

Sum up your project plan. Briefly re-iterate your goals for the project and the plan your team has put in place to achieve these goals.

The plan is to have a fully functioning GUI that the user can interact with in order to control a robot in a field. The user will be able to see all knowledge about the robot and will be able to run the robot remotely. The current plan is to have a server that talks to the robot, application, and database. All design plans will be flushed out and coding will begin by February 20th. The goal for the first semester is to have the server, database, and application up and running and be able to talk to the robot.

8 References

1. Project proposal: https://drive.google.com/open?id=0B5SAoPDouSRRTWo1U3BRUUtuQ00
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