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Prof. Sabal

Final Project Journal

12/15/2020

Ideas/Plans

Gps Navigation system for crop field farming

Needs

-controller(computer)

-navigation system

-speedometer

-autosteer

-wifi signal

-sonar(for hit collision detection)

First hour Thursday Dec. 3rd

* Looking for different ways to implement all needs
* Controller will be the computer running the program/Arduino
  + There is no other realistic way to control the program without using extensive amounts of hardware and software that I do not have access to.
  + Computer will the easiest to input information

Second and Third hour Thursday Dec. 3rd

* Looking for a pathfinding algorithm to steer/navigate
  + Found an Ai pathfinding algorithm that utilizes matrix mapping
    - <https://forum.arduino.cc/index.php?topic=435203.0>
    - <https://www.geeksforgeeks.org/a-search-algorithm/>
    - Using this program may prove difficult on larger farms
    - Wouldn't be very precise
    - Manual input of data for autosteer
  + This algorithm wouldn't work very well because you would have to input every aspect of the field because it can not utilize sonar to give it input.
  + Also couldn't connect a speedometer to track speed

Fourth Hour Saturday Dec. 5th

* Found a new GPS algorithm that utilizes arduino library
  + <https://www.arrow.com/en/research-and-events/articles/hands-on-with-arduino-gps-usage>
  + Uses external software called u-blox software
  + More precise than the previous algorithm
* Coding parts to make use of the algorithm
* Can be accurate up to a few inches

Fifth Hour Saturday Dec. 5th

* Looking for new algorithm to implement speedometer
  + Found a bike speedometer to try and rearrange to fit my code
    - <https://www.instructables.com/Arduino-Bike-Speedometer/>
  + This code is perfect to implement because tractors/ harvesters go at slow speeds and can be utilized with the previous GPS algorithm
* <https://roboticlegends.org/buildingtips/drivesystems/how-to-calculate-speed-based-on-wheel-speed-tire-diameter/>
* This is an algorithm that takes the size of the tire and calculates the speed
  + Using another component attached to the tire, and a few inputs by the user can accurately show the speed of the vehicle

Sixth and Seventh Hour Tuesday Dec. 8th

* Finding code for WIFI card implementation
  + Wanted to make a simple connection to make sure that all parts of the project could talk to each other
    - <https://create.arduino.cc/projecthub/Niv_the_anonymous/esp8266-beginner-tutorial-project-6414c8>
      * Simple code for WIFI card
      * I was unable to figure out how to implement the other parts of the project to this code, but left it in as it could prove useful to someone who could

Eighth and Ninth Hour thursday Dec. 10th

* Re-use the LCD screen code from earlier in the year to display the MPH and possibly show objects that are in the way of the sonar
  + Didn't have enough time to properly implement this into the project as i needed to start finishing up the last parts of the code
* Implement a hit detection system using a sonar system
  + I've messed with this module for an hour or two earlier in the year and found out how measure the distance between the sonar and the object in the way and implemented that into my project

Tenth and Eleventh hour Saturday Dec.12th

* I spent most of the time in these hours making the hardware version of this project. I did not have all of the parts that I needed to make this project complete, but would have liked to if I had the time too. I didn't have an actual GPS module but added in a component that would represent it on the hardware. Most of the components for display are on the breadboard, but can be separated on the actual vehicle. But I did not have the ability to do so on this project so it looks a little cramped.

Summary

This project was aimed to mimic a GPS navigator system for a tractor or harvester to be mounted onto. I have found that making this type of technology is no easy task. Obviously there are many companies that can do this much smaller and easier than I have been able to do, but the research that I have done looking for algorithms and other techniques on how to properly implement some concepts within my project. I have found lots of different AI algorithms that could potentially work when combining all of the components that I have set up, and all of them would work to some degree. I have also found that there are so many different designs of AI or algorithms that are overwhelming but many of them could work if you tweaked them a little bit. For me this was the easiest part of the project, and was the most interesting because I was able to see the design concepts of other people who have done similar things in the past. In my design concept I only had a limited amount of pins that I could work with and was able to do it. I also re-used some of the concepts that we had learned about earlier in the year with the LCD screen and incorporated it within my project to display all of the information that I plan on showing the user for convenience. I had to change a few of the inputs to match what I had put together, I also played with the sonar device that the ELEGOO kit comes with and added that to the project as the hit detection that would be incorporated with the AI pathfinding. The GPS module I was unable to get my hands on, so I improvised and used a different module just to represent the hardware. The wifi card I did not get to use much, but would have been used to remotely control all of the components so that the program could be used with a mobile device or app for easy use.

Citations

*A\* Pathfinding in the Arduino*, forum.arduino.cc/index.php?topic=435203.0.

*A\* Search Algorithm*. 7 Sept. 2018, www.geeksforgeeks.org/a-search-algorithm/.

Amandaghassaei, and Instructables. “Arduino Bike Speedometer.” *Instructables*, Instructables, 28 Oct. 2017, www.instructables.com/Arduino-Bike-Speedometer/.

“ESP8266 - Beginner Tutorial + Project.” *Arduino Project Hub*, create.arduino.cc/projecthub/Niv\_the\_anonymous/esp8266-beginner-tutorial-project-6414c8.

Jeremy S Cook Jeremy S. Cook has a BSME from Clemson University, et al. “Arduino GPS Tutorial: How to Use a GPS Module with Arduino: Arrow.com.” *Arrow.com*, 21 Oct. 2019, www.arrow.com/en/research-and-events/articles/hands-on-with-arduino-gps-usage.

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