Agricultural Drone

Olabode Ajayi, Emmanuel Alase, Sudeysi Ansha

Faculty Mentor: Dr. Puteri Megat Hamari

ECET Department, Minnesota State University, Mankato

BACKGROUND

This project is tilted towards helping out in a particular sector in the Agricultural world. It is an essential project in the sense that it helps farmers look over their crops/farmland more easily, and stress-free. In a world where everything is getting advanced and really expensive, most farmers find it hard to look over their farmlands with the current technologies available. This project is a cheaper solution to these challenges they face. It is significant for a successful and great harvest year. Farmers have difficulty in seeing the top view of their farmlands (mostly the maze fields), to see if there is any worrying issue. For example, farmers cannot really know the growth of the crops, how to verify if the fertilizer has been sprayed evenly and equally over the farmland, how to know if there are any area of their farmlands filled with stunted crops. Most times, some farmers either buy an expensive drone to solve these problems of looking over their farmland or pay someone to fly a plane over their farmland. Both of the solutions mentioned above are really expensive. Our group has made it a point to help out with the manufacturing of cheaper and more functional drones, that assists the farmers in completing this normally stressful, expensive and time-consuming task.

PROPOSED SOLUTION

The drone is made up of different functional parts that are lethal in completing any particular task. The most functional components include 4 brushless motors, 4 brushless motor electric speed controllers, a gyroscope, an accelerometer, an ultra-sonic distance sensor, an Arduino MEGA, a camera, an 14.8V LiPo battery, a transmitter and receiver, and a GPS module. We program the camera in python language, and make it able to differentiate colors associated with crops. The GPS module works hand-in-hand with the camera and Arduino MEGA microcontroller. When the camera clicks a picture, the GPS helps in providing the location coordinates of that particular area where the affected/stunted plants are located. This location coordinate really helps in the sense that it shows the farmer where any worrying issue is located, and also helps in directing the farmer to the affected location. All three components work together hand-in-hand to provide both the pictures and location coordinates of the affected area.

SYSTEM DESIGN

Power Supply

We decided to go with a 14.8V 65C 4S LiPo battery as the drone power supply. LiPo batteries are mainly used in wearable devices, medical devices, radio-controlled equipment, personal electronics, and so on.

Brushless Motors

They are powered by DC electric source via integrated inverter, which produces AC electric signal. The propellers are connected to this motors, which then enables the propellers to spin around and generate thrust to make the drone fly.

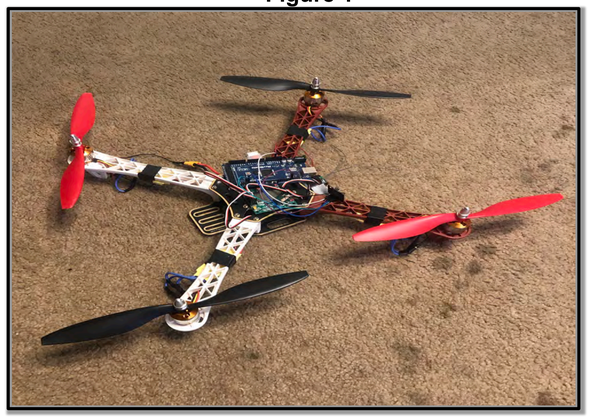
ESC

The Electronic Speed Controller is an electronic circuit that controls and regulates the speed of the brushless motors

Flight Controller

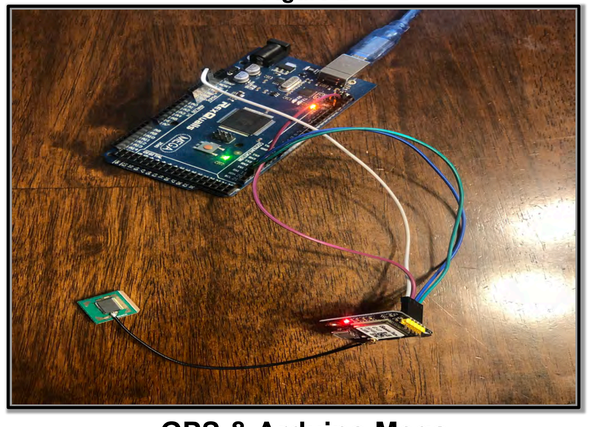
The flight controller is a circuit board of varying complexity. It's function is to direct the RPM of each motor in response to an input. It has an accelerometer and a gyroscope integrated in it.

Figure 1



Coupled Drone

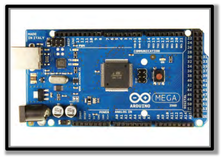
Figure 2



GPS & Arduino Mega

Arduino Processor

The Arduino MEGA is an open-source microcontroller board based on the Microchip ATmega2560 and developed by Arduino. In this project, the job of the Arduino is to interact with the GPS and the camera to get the necessary data.



GPS Module

GPS receivers use a constellation of satellites and ground stations to compute position and time almost anywhere on earth. If the GPS receiver's antenna can see at least 4 satellites, it can accurately calculate it's position and time. This module is connected to the Arduino.

Camera

The OpenMV Cam can be used for frame differencing, color tracking, marker tracking and so on. The OpenMV Cam H7 is a small, low power, microcontroller board which allows one to easily implement applications using machine vision in the real-world. It is programmed in high level python scripts. It also has a SD card where the pictures taken are stored on.

Transmitter & Receiver

The transmitter is an electronic device that uses radio signals to transmit commands wirelessly via a set of radio frequency over to the radio receiver, which is connected to the drone.

FUTURE DIRECTION

- Explore better, smaller and more flexible drone frame.
- Create a better schematic with more voltage regulator.
- Develop a way to integrate the gyroscope & accelerometer into the Arduino MEGA, so as to ditch the current flight controller being used.
- Create an efficient way for the users to get the location data from the GPS.
- Utilize a variety of OpenMV H7 Cam lenses for more involved processes.

REFERENCES

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[3] Microelectronic circuits. New York: Oxford University Press, 2015.

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CONTACT INFORMATION

Feel free to contact us at emmanuel.alase@mnsu.edu, sudeysi.ansha@mnsu.edu, and olabode.ajayi@mnsu.edu with any questions or comments.