OPTIC EYE IN SKY UNMANNED AIRCRAFT FOR IDENTIFY BLEMISH AND CONSERVING CROPS IN CULTIVATED AGRICULTURAL LANDS

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ABSTRACT:

In emerging era there is lot of innovation are made in agriculture field to enrich the production and maintenance of crops with reduced area and labor. We planned to introduce an optic in sky unmanned aircraft to fertilize, surveillance, nebulizer [1], growth monitoring and Yield analyzing purpose. This paper helps for crop feeding and treats pests. The OUA [2] has a special sprayer that can spread the minimum level of drugs over crops for the purpose of pest control during mid or late stages of development, food it in proper timing. In which used 64 channel GPS [3] for autonomous Driving by using Latitude, Longitude, Altitude and Speed it act as an tracker of OUA. The controllers are done in remote location using laptops/android devices when it is in autonomous mode. 2.4 GHz zigbee transceiver act as a communication channel between OUA and laptop/android devices .Pest identification is done by means of capturing the image of the crops using HD wireless camera if there is any variation in crop color then the spray pump will spray fertilizer or organic pesticides. The amount of pesticides sparing is determined by the infection rate of the crops, infection range is calculated through digital image processing by comparing and analyzing pixels of the crop image. Digital compass provides driving direction for OUA. Ultrasonic transducer determines the height of the optic unmanned aircraft. DSP processor is used for image processing in OUA. Growth of the crop keyed by changes in crop color and yield analyzing is done by capturing RGB of the crop means of continuous surveillance .It operates on solar power. The plane can prevent crop damage caused by traditional mechanical work and increase economic returns.

Keyword: *[1] Nebulizer- A dispenser that turns a liquid into a fine mist. [2] OUA-Optic Unmanned Aircraft. [3] GPS-* Global Positioning System

INTRODUCTION

Agricultural field there are lot of robotics are invented for seeding, picking the grown vegetables, harvesting and driverless tractors. But it is very difficult to maintain the crop in unstructured land surfaces, the operation of the robot in mud area is not that much easy to operate. There are more issues in handling the autonomous robots in this field. So we are migrating from the robotic technology to the unmanned aircraft. It is used to identify whether the crop is affected by any diseases or not. By means of comparing the color of unaffected leafs with the affected leafs. The picture of the crop is taken; using the pixel of the image the color variations are spotted. If there is any color variation in the pixel comparison then the ratio of the color variation is calculated, accordingly the pesticides are sprayed using the sprayer pump. May the crop is in under grown stage then the fertilizer is thrown using our OUA. We have operated the OUA using solar power. It can travels around 1Km range and fly at the height of 3m.By using this OUA we can easily traveled through the entire field without any difficulties. it is the fastest way to feed and surveillance

MATERIALS AND METHODS

A) HARDWARE ARCHITECTURE

Optic eye in sky unmanned aircraft uses 64 channel GPS for autonomous Driving by using Latitude, Longitude, Altitude and Speed it act as an tracker of OUA. The controllers are done in remote location using laptops/android devices when it is in autonomous mode. 2.4 GHz zigbee transceiver act as a communication channel between OUA and laptop/android devices .Pest identification is done by means of capturing the image of the crops using HD wireless camera if there is any variation in crop color then the spray pump will spray fertilizer or organic pesticides.

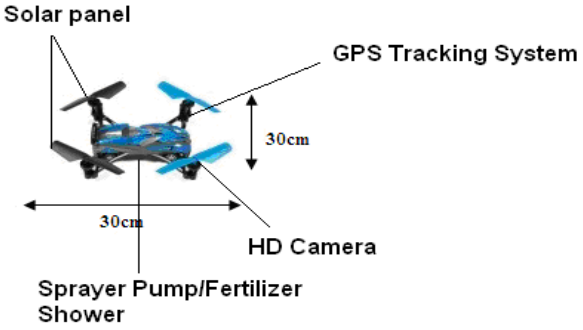

Fig:1 OUA Representation

Fig:2 Topview of the field from OUA

I) Directional controller:

GPS-634R" is a highly integrated smart GPS module with a ceramic GPS patch antenna. The antenna is connected to the module via an LNA. The module is with 51 channel acquisition engine and 14 channel track engine, which be Capable of receiving signals from up to 65 GPS satellites and transferring them into the precise position and timing information that can be read over either UART port or RS232 serial port. Small size and high-end GPS functionality are at low power consumption, Both of the LVTTL-level and RS232 signal interface are provided on the interface connector, supply voltage of 3.6V~6.0V is supported. The smart GPS antenna module is available as an off-the-shelf component, 100% tested. The smart GPS antenna module can be offered for OEM applications with the versatile adaptation in form and connection. Additionally, the antenna can be tuned to the final systems' circumstances. OUA direction is controlled by means of magnetic compass which is made up of high-resolution magneto-resistive sensors plus an ASIC containing amplification, automatic degaussing strap drivers, offset cancellation, and a 12-bit ADC that enables 1° to 2° compass heading accuracy. The I^2C serial bus allows for easy interface. These anisotropic, directional sensors feature precision in-axis sensitivity and linearity. These resistive elements are aligned together to have a common sensitive axis that will provide positive voltage change with magnetic fields increasing in the sensitive direction. Because the output is only proportional to the magnetic field component along its axis, additional sensor bridges are placed at orthogonal directions to permit accurate measurement of magnetic field in any orientation. The device continuously makes measurements, at user selectable rate, and places measured data in data output registers. Data can be re-read from the data output registers if necessary; however, if the master does not ensure that the data register is accessed before the completion of the next measurement, the data output registers are updated with the new measurement. To conserve current between measurements, the device is placed in a state similar to idle mode, but the Mode Register is not changed to Idle Mode. That is, MD[n] bits are unchanged. Settings in the Configuration Register an affect the data output rate (bits DO[n]), the measurement configuration (bits MS[n]), when in continuous-measurement mode.

II) Frame with 4 BLDC Motor

Quadcopter Frame with 4 BLDC Motor is used to carry the cameras and sprayer pump, fertilizer to the sky. It flies at the height of 3m range the height of the quadcopter is maintained by the ultrasonic transducer.It works on the principle of Using IO trigger for at least 10us high level signal, (2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. (3) IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.Test distance = (high level time×velocity of sound (340M/S) / 2. Easy to Interface conversion boads avilable now (PWM TO UART , OBSTACLE) - based on PIC microcontroller.

III) HD Wireless Camera

Pest identification is done by means of capturing the image of the crops using HD wireless camera if there is any variation in crop color then the spray pump will spray fertilizer or organic pesticides. The amount of pesticides sparing is determined by the infection rate of the crops, infection range is calculated through digital image processing by comparing and analyzing pixels of the crop image. The camera is operated in 5Mhz frequency.

Fig:3 HD Camera Captured Image

Fig 5: Low Mineral Estimated area

Fig: 4 Pest Affected leafs

IV) DSP Microcontroller

DSP microcontroller will act as the heart of this system. Here we used 32bit dsp microcontroller .Through which we can access entire OUA system .According the interrupt given it will operates the task. The software codlings are done using embedded C using real time operating system. When the system gets started the GPS receiver receives the signal from the satellite via GPS antenna it drives the OUA in proper direction. Compass sensor which is used to show the direction to the aircraft if it is running in a semi autonomous mode. According the data from the compass the processor determines in which direction the aircraft will get rotates. Ultrasonic transducer is used to maintain the height of the aircraft, digital signal processor will continuously got the response signal from the transducer if the transducer signal is not arrived to processor then try to land the OVA in safe place. Four BLDC motors are used in the propeller mechanism this motors are controlled and actuated through the DSP processor. Zigbee transceiver is used to transmit the data to the aircraft about the crop affection rates in digital format. When the defect of the crop is identified then the sprayer is get started by sprayer pump which is actuated by the dsp processor .This operation is done by means of comparing the leaf pixels with the earlier well grow crop pattern. HD camera is used for video images it consist of the optical RGB sensor. The image capturing is monitor in the background of the dsp program. The above mentioned events are scheduled properly in dsp controller. Accordingly to the priority of the task to be executed first and which task is executed in the last. The propeller motor is also controlled by the dsp microcontroller. The motors are actuated by means of h-bridge and relays to start the motors. The rotation of the aircraft is 360 degree. This feature is used for surveillance the agricultural field.

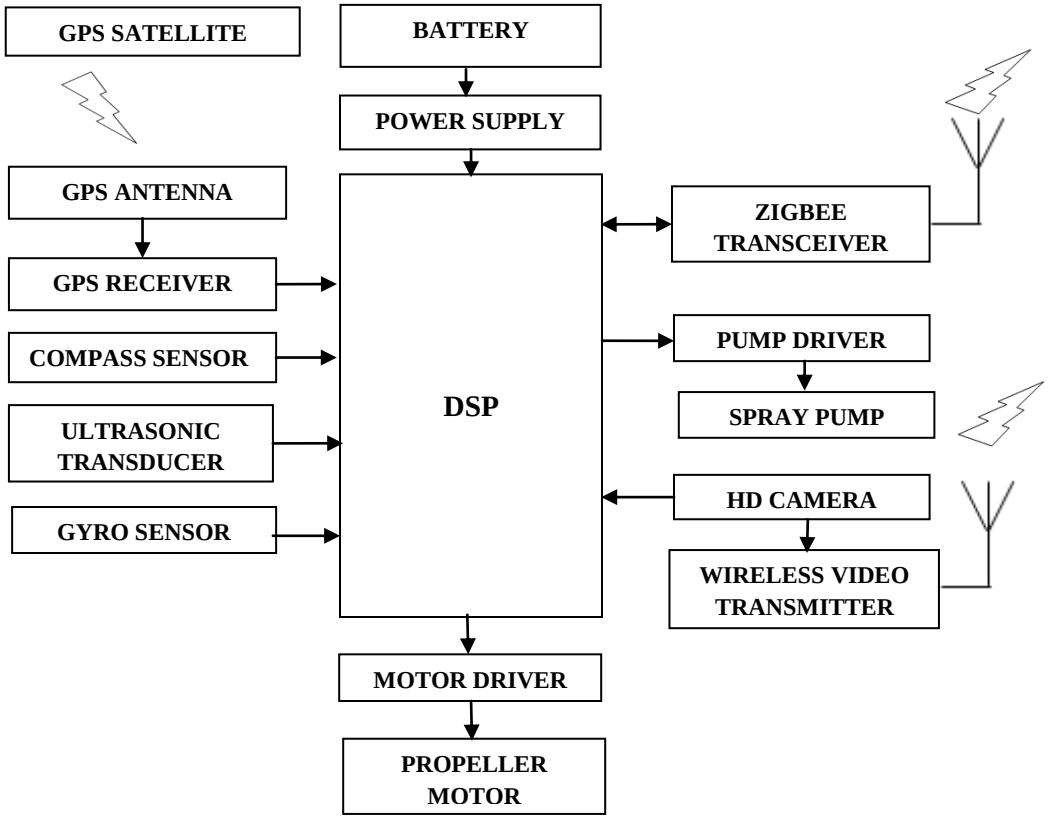

Fig 6: DSP Interfacing

B) Wireless communication

Zigbee/IEEE 802.15.4 is used for low data transfer to long distance. In this project it is used to transfer the image pixels to the laptop/android device for high end digital processing. HD camera is use to view the crop status. After completing of the digital signal processing the data is send to the OUV via The sender Module (fig 3).

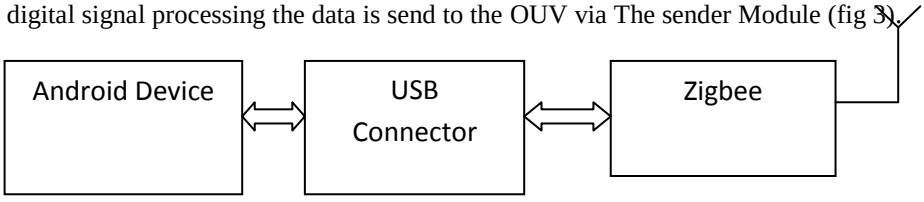

Fig 7: Semiautonomous mode sender side module.

C) Experimental Setup

By capturing the image we can identify the crop status. According to that the pesticides are sprayed using the sprayer pump

Fig 8: High ended image processing in Laptop/android devices

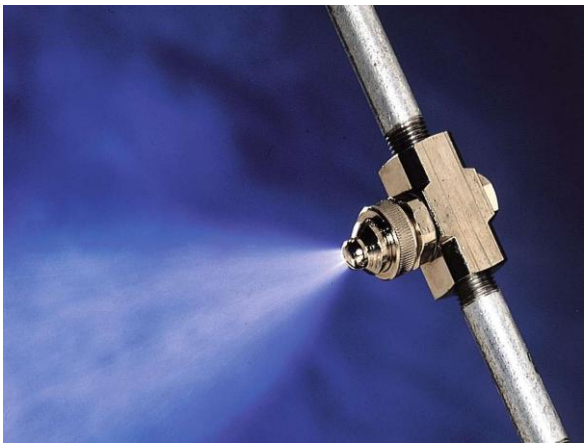

Fig 9: Sprayer pump in OVA

CONCLUSION

Optic eye in sky unmanned aircraft was developed to execute the identification of the diseases in crop, grown stages of crops and feeding it in right time. The control algorithm in its entirety will be implemented and tested on the Quad copter platform. A navigation algorithm has been developed and will be added to the control algorithm. The sprayer pump sprays accordance with the intensity of the infection in the crops. The precision of spaying is maintained at the proper altitude. Spraying is more accurate in noisy or cloudy fields. Delay for the transmission of data from sender side to the receiver side is 10ms.The conical angle of the sprayer is maintained so that it will not affect the other leafs. It is a solution to operated in the slope and unstructured fields. It also made the surveillance for entire day. By this project we can reduces the side effects to the human mankind during the fertilizer feeding and sparing the pesticides. This was experimentally tested in our field and tuned to the maximum accuracy result.

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