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UNMANNED AERIAL VEHICLE FOR AGRICULTURE AND DISASTER MANAGEMENT

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ABSTRACT*— This paper represents the model of design, production and validation of a portable sensory program for crop management by sprinkling watering and disaster fields. The objective of this scheme includes an exceptional amount of toxic gas leakage detection and fire detection using sensors. Agriculture is essential in life and one of the diminishing fields. The farmers cannot stand in front of the huge markets. The cost of yield is increased while the ROI is more insufficient for the farmers. There are significant technologies have been developed to automate cultivation to reduce the production cost and to improve profits of the farmers. The study reveals that the importance of drone and the obligation to do more R&D of drone in crop growing . The sensors have been selected by taking into account of weather and plant development representation and the requirements for their business on board the quad rotor. The prime support of this term paper are the support of the quad rotor as a raised area for measuring ecological versatile and the resolving of the best possible locality of sensors on a* ***quad*** *rotor. And here we present the same quad rotor for the disaster field managing by using gas sensor for monitoring the poisonous gas was leaking or not and flame detection.*

Keywords— *Future Agriculture, Drone, Micro-Controller, relay, Water Tank, Dc Pump Motor, Camera,* ***gas*** *sensor, flame detector Neurons.*

I. INTRODUCTION

The advancement of drone technology has seen many emerging use cases in agriculture and also in disaster organization. Drones are no longer simply toys for kids. Professional specialist look forward to farming utilization toaugment 70% by 2050, so enormous development system is desirable. The main purpose for which the drones could be effectively used in agriculture is Crop Dusting or Crop Spraying as stated in [1] and [2]. The use of drone for these purposes has proven an advantage over the conventional process. Industrial disasters are not simply safety problems that need to be resolved. Most of the disaster occur in industries due to gas leakage, fires etc., This

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unmanned aerial vehicle paved a better way for us to provide safety and proper alert or notification incaseofanyuncertainevents.

II. MOTIVATION

Agriculture as a back bone for Indian economy also consider as a "way of life" among Indian masses because more than 50% of the Indian People's livelihood directly depend on it. However, from previous few years, it is on verge of declining in its growth. Similarly much disaster events took place over the past years due to unnoticed gas leakage in industries. This unmanned aerial vehicle makes it possible by providing solutions to all the difficulties we have faced above.

This project works on four major motivations

- To increase the efficiency and profit for farmers.
- To reduce the use of water resources in agricultural fields.
- To detect the fire and spray water
- To identify dangerous gas leakages in industries and notify them.

III. SYSTEM DESCRIPTION

1. Quad copter Sizing

Each UAVrequired a casing to accommodate all the modules. It was selected depending on the basis of mass, dimension and resources .At this juncture an X-shaped casing is utilized to take the FSB, ESC, Motor, Propellers and Receivers. The following are the components for building the frame of the quad copter.

The electronic speed controllers (ESCs) wiring is also done in the bottom board and it will be as follows. This is to supply power to all the ESCs and to get supply from battery. After the ESC wiring and power pads connection is soldered in the board the quad copter frame is built by connecting screws and nuts.

TABLE 1: components of the quad copter

S.NO	SPECIFICATION	NAME
1.	450FBT	Top Board
2.	450FBB	Bottom Board
3.	450FAC	Frame Arms
4.	450FAW	Frame Arms
5.	10*4.5 Inch	Push Propellers
6.	10*4.5 Inch	Normal Propellers
7.	As Required	Screws And Nuts

2. Central Hump

The Central Hump houses all the electronic parts is decided to be in a special shape particular for current prototype. The shape is designed from preliminary design and case study to get a separate identity and good aerodynamic characteristics.

3. Components

4. Motor

Main category of DC motors specifically are used in the aircraft engineering production are Brushless DC Motors (BLDC). BLDC is also acknowledged as thyristor based commutated motors are a.cmotors power-driven by DC voltage by an button controller that give off an AC source to constrainevery period of the motor into blocked sphereregulator. The device which monitor and control during the process period of commutation to produce the current waveform.

TABLE2: Motorspecifications

S.NO	DIMENSIONS	SPECIFICATION
1.	1.2” (42mm)	Length
2.	1.18” (30mm)	Diameter
3.	0.11” (3mm)	Shaft Diameter
4.	3.8” (38mm)	Shaft Length
5.	3.03oz (86gm)	Weight
6.	326	No Of Cell Inputs
7.	1100kv	Rpm/Voltage
8.	9.9a	Max Current
9.	20a	Ese

5. Propeller:

A propeller is a kind of a device with many flat metal blades that turn around very quickly to make out electric source by changing revolving movement into force. The stress inconsistency is formed among the front and back surface of the air screw-shaped cutting side, A liquid like air or water improves the momentum at the back of the cutting edge. Propellers dynamics**,**similar to those aircraft arms, could be shaped by Bernoulli’s principle and Newton’s third law of motion. Propellers for RC aeroplanes are nothing more than vertically attached pivoting wings. Their job is to transform the engine power into momentum, to push the plane through the air. Thrust is produced in exactly the same way as the lift is produced by the wing, and that’s why propellers have a profile airfoil section. The propeller in this case a slow-fly type propeller to compensate for the high speed used. These types of propellers produce more thrust with less speed. Hence more stability and load bearing capability is produced.

TABLE 3: Propeller specifications

S.NO	TYPE/DIMENSION	SPECIFICATION
1.	Nylon mixed with carbon	Material
2.	9*4.5	Dimension
3.	Slow-fly	Type

6. Elcetronic Speed Controller:

Electronic speed controller is associate device that is employed to manage and regulate the speed of electrical mechanism valve or motor. It is chosen here since it's of low price and promptly out there motor controllers that may drive brushed or Brushless DC motors. At present it's unremarkably found it's application within the field of DIY, AI and Radio management (RC) applications..This ESC uses standard RC PWM signals as input .When the facility is given to ESC, it'll anticipate an occasional PWM signal to arm itself. While not being armed, it will not reply to signals. The ESC's minimum and most pulse Width Modulation(PWM) values will typically be graduated.

7. Lipo Battery:

The lithium polymer battery called as lithium-ion polymer battery is a rechargeable device of lithium-ion technology electrolyte instead of normal liquid electrolyte. Semi-solid polymers of high conductivity form the electrolyte for Li-Po cells, which are used in tablet computers and many types of telephone handsets. Similar to other lithium-ion cells, Li-Po's worksbased on the principle of intercalation/de-intercalation of lithium ions formed from a positive electrode substances as well as negative electrode substance, with the liquid electrolyte providing a conductive medium. To prevent the electrodes from touching each other, a micro-porous separator is placed in between the electrodes which allow only the ions to transfer from one side to the other. The potential of a Li-Po cell depends on its chemistry which varies from 2.7 to 3.0 V (discharged) to about 4.20V (fully charged), for battery based on lithium – oxides and in the range 1.8 to 2.0V discharged to 3.6 to 3.8V charged for those on lithium-iron-phosphate. For Li-Po battery sets with cells connected in series, a special charger may monitor the charge on per-cell basis so that all cells are moved to the same state of charge (SOC).

TABLE 4*:* Battery specifications

S.NO	SPECIFICATION	NAME
1.	2200 mah	Capacity
2.	7.4 V	Voltage
3.	25 C	Continuous discharge rate
4.	Recommended (Input 1A)	Charger time
5.	Length - 11.2 cm Breadth -3.9 cm Height -1.9 cm Weight -163 gms	Dimensions

8. Flight Stabilization Board

Flight stabilizer is the brain of the aircraft which is an aerodynamic surface consisting of one or more movable control surfaces to provide a longitudinal and directional stability and control. Flight stabilizer is a circuit board weighs about 5 grams with sensors to detect orientation changes of the drone. It also receives user commands, and controls the motors in order to keep the quadcopter in the desired position. The power required to operate is DC in

the range of 4 to 6 V. The PPM PCM 2.4 G are used as an compatible transmitters. Temperature ranges from -20 degree centigrade to 65 degree centigrade is appreciable and compatible. A supplementary polarity sheltered header has been put into practice for voltage detection, so not requirdfor on-board fusing. The KK2.1.5 multi-controller is a flight control board for multi-rotor aircraft (tri-copters, quad-copters, etc).

9..Radio Transmitter-Receiver

Before making the quad-copter, radio transmitter (TX) should be one of the first few items to look at. A radio transmitter is a tool which permit the pilots to run the aircraft wirelessly; the instructions are obtained by a radio receiver (RX) that is attached to a flight controller. The standard frequencies used in RC radio are 2.4GHz, 433MHz, 72MHz, ,1.3GHz, 900MHz and. 27MHz

10. Channels:

The no. of channels determines how much individual action on the aircraft can be controlled. Six channel high frequency remote is used.

TABLE 5: Channel allotment

S.NO	CONTROL	CHANNEL
1.	Aileron	Channel-I
2.	Elevator wing	Channel-II
3.	Throttle valve	Channel-III
4.	Rudder	Channel-IV
5.	Manual switch	Channel-V
6.	-	Channel-VI

Channel-I: Aileron- Roll or leaning left and right.
Channel-II: elevator- Pitch or lean forward or backward.
Channel-III: Throttle- Upward and downward motion.
Channel-IV: Yaw- Rotating left or right.

11. Microcontroller Board - Arduino Uno

The Arduino Uno is a sort of single board ASCII text file microcontroller supported the semiconductor ATmega328P.

The process unit in arduinouno is AN eight bit AVR small chip, SRAM is employed as a memory And uses flash andEEPROM as an storage part. Ab initio the inputs for a small controller are given to analog and digital input pins. Then preprogrammed microcontroller takes AN corrective actions as per laptop through the communication port and software system programming. TheArduino software system (IDE) includes a serial monitor that permits easy matter knowledge to be sent to and from the board. The communication port in uno act as AN virtual port to the software system on the PC.Finally in accordance with the program the mechanism gets motivated with the assistance of input feeds.It has multiple pins particularly in semiconductor diode,

5V,3.3V,Gnd,IOREF and Reset pins. It additionally has some specialised pins namely Serial / UART,Externalinterrupts,PWM(pulse-width Modulation),SPI (Serial Peripheral Interface),TWI (two-wire interface) / I²C,AREF (analog reference).

IV. SENSORS

GAS Detector or Gas Sensor (MQ5) module, shown in fig4.1, is helpful for gas leakage discovery.. It is suitable for identifying H2, LPG, CH4, CO, Alcohol, as stated in [3] and [4]. Due to its high sensitivityand responsiveness, measures can be taken as soon aspossible.

Fig 4.1: Gas Sensor - MQ5

Flame Detection Sensor module, shown in fig 4.2, is sensitive to the flame. It identifieswhether it is a flame or a light of wavelength in the range of 750nm-1200 nm.

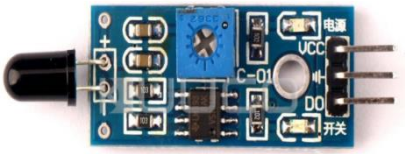

Fig 4.2: Flame Detection Sensor

V. SOFTWARE

Embedded C is an expansion to the C programming language that gives assistance for developing efficient applications for embedded devices.

VI. DESIGN AND IMPLEMENTATION

MAKING OF DRONE

Drone's frame (X-Frame) out of light metal like aluminum with dimensions 450mm*2.5mm (length*thickness) for a payload of 250-300 grams which varies according to the type of applications used. Brushless dc motors with power rating and speed (rpm) 1100KV is then fixed. Electronic Speed Controller is connected to the BLDC motor and propellers (10*4.5 inch) are fixed with the motors for controlling the speed of the drone. The Flight Stabilization Board (FSB), KK2.1.5 is fitted with the frame to give control commands to the ESC, which in-turn controls the speed of the drone and gives forward, backward and other direction movements. Lithium Polymer (LIPO) Battery with current rating 2200 mAh.Receiver senses the signals from the Transmitter which is mounted is mounted on the drone. Six channel Remote Control Joystick is used to control the movements of the drone.

VII. INPUT AND OUTPUT MODULES

Arduino board is mounted to the drone which is programmed for the control of input and output modules. Sensors such as fire sensor- MQ5, gas sensor- MQ9 are fitted. Spraying Tank is fixed to the drone for spraying water through the Nozzle which is controlled by the Relay.

VIII. PROGRAMMING

Coding for Arduino is done in Embedded C language for processing the sensed signals from the sensors and to respond to the received signals.

IX. FINAL PILOTING

The drone is made to fly with all the components fixed which are about 300 grams of total payload.

X. CONCLUSION

In this paper, gas leakage in industries is detected using UAV as mobile carrier. Further if the flame is detected, UAV automatically sprays water and extinguishes it. In order to increase the production of crops in agriculture, crop spraying technique is use which had paved a better way for the farmers to yield high efficiency with less amount of time.

REFERENCES

1. Yallappa D, M. Veerangouda, DevanandMaskiVijayakumar Palled and M.Bheemanna(2017),Development And Evaluation Of Drone Mounted Sprayer For Pesticide Applications To Crops, IEEE Global Humanitarian Tech. Conf. (GHTC).
2. Spoorthi.S, Dr.B.Shadaksharapp, Suraj.S and V.K.Manasa, Pesticide/fertilizers spraying drone – an agricultural approach, IEEE Global Humanitarian Tech. Conf.
3. Maurizio Rossi and d Davide Brunelli, 'Autonomous Gas Detection and Mapping With Unmanned Aerial Vehicles' Int.conf.on Instrumentation and Measurement, Dec 2015
4. V. Gallego, M. Rossi, and D. Brunelli, "Unmanned aerial gas leakage localization and mapping using microdrones," in Proc. IEEE Sensors Appl. Symp. (SAS), Apr. 2015.
5. M. Rossi, D. Brunelli, A. Adami, L. Lorenzelli, F. Menna, and F. Remondino, "Gas-drone: Portable gas sensing system on UAVs for gas leakage localization," in Proc. IEEE SENSORS, Nov. 2014.
6. Ackeman, Evan(2011), "Japan earthquake :Global Hawk UAV May be able to Peek inside damaged reactors".
7. Pratt, K., R. R. Murphy, et al. (2006). Requirements for Semi-Autonomous Flight in Miniature UAVs for Structural Inspection. . AUVSI's Unmanned Systems North America. Orlando, Florida, Association for Unmanned Vehicle Systems International.
8. Huber, M. (2010). "Evergreen supports UAV team mapping Haitian Relief." Aviation Int. News. March 2010.

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