

Multi-Purpose Drone Using IoT

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Abstract—Drone being a future technology marks its importance in industries, defence and various other fields. Due to its remarkable wide application the usage of drones is exponentially increasing. The goal of this project is to build a quadcopter and develop a customized remote using which drone and its features are controlled, drone is installed with temperature, humidity and pressure sensor to sense the drone's surrounding environment, on-drone camera is used to monitor the live video footage from drone which can be accessed online via IoT technology implementation. Drone is also equipped with fire extinguisher unit, pick and place unit which can be controlled by customized remote via wireless technology. Drone is also programmed with automatic patrolling system which is used to patrol the predefined path continuously for surveillance purpose.

Key words-*Automatic patrolling system, Quadcopter, Unmanned Aerial Vehicle, Wireless technology.*

1. Introduction

An unmanned aerial vehicle (UAV), commonly known as a drone is an aircraft without a human pilot aboard. UAVs are a component of an unmanned aircraft system (UAS) which include a UAV, a ground based controller, and a system of communications between the two. The flight of UAVs may operate with various degrees of autonomy either under remote control by human operator, or fully or intermittently autonomously by on-board computers. With the advent of aerial robotics technology, UAVs became more sophisticated and led to the development of quadcopter which gained the popularity as mini helicopters.

Drones are now a days are widely used around the world for a variety of purpose including aerial videography, photography, surveillance etc. In this study we propose a system of customized remote to control the drones we investigate the use of computer vision method to develop an institute way of agent less communication between a drone and its operator computer vision based methods relay on the ability of drones camera to capture live video footage as well as live video. Surveillance of large geographical area at short period of time and monitoring various factors such as temperature, pressure, humidity etc. at any random place can be recorded on-spot.

To satisfy the above requirements we need a device which is dynamic and can be made anywhere anytime and offer a service on spot where humans cannot reach on such solution is unwanted aerial vehicle (UAV) which is the efficient solution to reach any place any time. Virtually using which surveillance and many other surrounding data monitoring activities can be achieved in on time also fire accidents occurring at remote areas are forests can be controlled via Drone fire extinguisher. Automatic patrolling system which is used to patrol the

predefined path continuously for surveillance purpose can be achieved. Pick and place unit is installed on-drone so that necessary package can be delivered to the location where human reach is not possible like flood areas and many other situation. Metal detection unit is placed so that detection of bombs can be done which contains metal elements inside it.

2. General Structure

Our key contribution to this project include

- (1) On drone live video footage and streaming.
- (2) On drone fire extinguisher.
- (3) Automatic Patrolling system.

3. Methodology

1. The Drone Unit

Quad copter is built by assembling necessary components such as drone frame/chassis, motors, motor drivers, propellers, battery etc. and the main control of the drone is performed via drone control board where the motors are connected to it via motor driver boards. A wireless module is connected to the drone control board which is used to receive the data which is being transmitted from the remote control unit. On-drone temperature, humidity and pressure sensor is installed to monitor the drone's surrounding environment status and those parameters are sent to cloud via IOT implementation and it can be accessed on LCD screen installed on remote control unit. Drone is also equipped with Pick and Place unit which can be used to pick necessary objects and objects can be placed in the destination location. The controlling of pick and place unit is done via customized remote unit using wireless technology. On-Drone metal detector unit is placed where drone can monitor the presence of metal components in places where bombs and landmines are placed which uses metal parts inside it, hence an alert is provided to the LCD display on remote unit when metal is detected. Automatic patrolling system is a feature which can be used via customized remote unit where drone starts to patrol in the pre-defined path where continuous surveillance is necessary and flying the drone manually daily for surveillance is hectic job, so automatic patrol feature will run the drone automatically in pre-defined path to achieve continuous surveillance in a region. The Figure 1 below shows The Drone Control Unit.

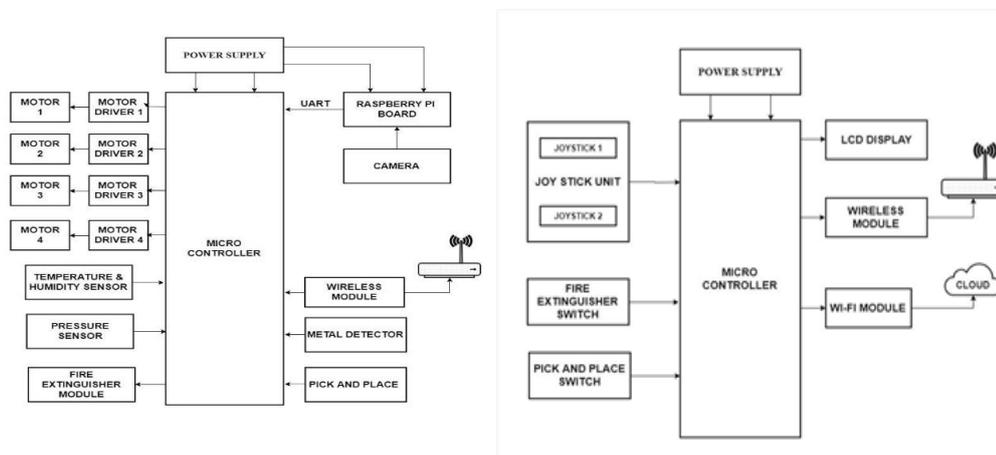


Fig.1 Drone Unit Fig.2 Remote Control Unit

2. The Remote Control Unit

The customized remote consists of Joystick unit, Wireless module, LCD screen, Fire extinguisher button, Pick and Place control, Automatic patrolling System button. Wireless module is installed on the remote unit to transmit the data which is used to control the drone and its functionality, those transmitted data is received by drone sided wireless module. LCD screen is placed on remote control unit which will display the current direction of drone and also temperature, Humidity and Pressure parameters Fire extinguisher button is provided on remote to control the on-drone fire extinguisher module when required. Pick and Place unit control is provided on remote unit where control data is transmitted to drone unit via wireless technology. Automatic patrolling system is used by triggering the button provided on the remote unit, when it is pressed the control signal is transmitted to the drone unit and patrolling in pre-defined path is automatically started by the flying drone. Figure 2 shows the Remote Control Unit.

4. Material Properties And Design Specification

4.1 ATmega328

The ATmega328P is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, we used ATmega328P in our project to achieve throughputs approaching 1 MIPS per MHz allowing the system designer to optimize power consumption versus processing speed.

4.2 Arduino Mega 2560



The Arduino Mega 2560 is an microcontroller board based on the AT Mega 2560. It has 54 digital input/output pins, a 16MHz crystal oscillator, a USB connection, a Power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect to battery to get started. The Mega is compatible with most shields designed for the Duemilanove/Diecimila.

4.3 nRF51822



The nRF51822 is an ultra-lower power 2.4 GHz wireless system on chip integrating the nRF51 series 2.4 GHz transceiver, a 32 bit ARM Cortex –M0 CPU, flash memory and analog and digital peripherals. We have used nRF51822 in our project because, it can support Bluetooth low energy and a range of proprietary 2.4 GHz protocols, such as Gazell from Nordic semiconductor.

4.4 Wi-Fi-module



Espressif's ESP8266EX is used as a Wi-Fi-module. It is a highly integrated Wi-Fi SoC solution to meet user's continuous demands for efficient power usage, compact design and reliable performance. We used in our project to make communication link between drone unit and remote control unit.

4.5 Temperature sensor



DHT22 is the temperature sensors we used in our project. DHT22 utilizes exclusive digital-signal-collecting and humidity sensing technology, assuring its reliability and stability. Every sensor of this model is temperature compensated and calibrated in accurate calibration chamber and the calibration-coefficient is saved in type of program in OTP memory. Small size and low consumption and long transmission distance enable DHT22 to be suited in all kinds of harsh application occasion.

4.6 Metal sensors

Inductive proximity sensors enable the detection, without contact, of metal objects at distances up to 60mm. Their range of applications is very extensive and includes the monitoring of machine parts, monitoring the flow of metal parts, counting, etc.

4.7 Motor drivers



L293 and L293D are the motor drivers we used are quadruple high-current half-H drivers. These devices are designed to drive wide array of inductive loads such as relays, DC and bipolar stepping motors, as well as other high-current and high-voltage loads.

4.8 Raspberry Pi camera Module

The Raspberry Pi Camera Module v2 is a high quality 8 megapixel Sony IMX219 image sensor custom designed add-on board for Raspberry Pi, featuring a fixed focus lens. It's capable of 3280 x 2464 pixels static images, and support 1080p30, 720p60 and 640x480p60/90 video.

5. Conclusion

It is obvious that drone technology is an important part of the future of warfare and is set to become a big commercial industry. Multipurpose drone using IOT is capable of doing multiple tasks at a time with less power consumption and with low cost. The materials and parts selection have been considered based on detailed evaluation of drones available in the market along with the considerable mass of payload to be carried.

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