DRONE BASED MEDICAL FACILITY

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ABSTRACT

Drone (UAV-unmanned aerial vehicle) can be used for the service based delivery purpose such as medicine, blood, energy drinks (glucose), blood –derivatives, first aid kit to the both rural and urban place health centers to all over the India. In the active world, the medical emergency help does not reach the patient (or) the needed people on time due to some bad conditions such as Traffic, transportation problems (vehicles), Road constructions (or) damage . In order to replace these drawbacks UAV-unmanned aerial vehicle is used as ambulance service. Drone delivery was faster and better when compare with roadways. The design of the flying drone consists of Quad-rotor with four propelling wings which are connected to four ESC (Electronic speed controller).The locations coordinates for the service will be reached by the drone with help of GPS device. There would be some centralized distribution center from where the drone will be launched and retrieved. The drone is autonomously perform the delivery of emergency kits to the needed location. After the delivery process is successfully completed. The drone will return to its hospitals (or) to the base.

Keywords: Ambulance Service, Base Station, Delivery Location Coordinates, Electronic Speed controller (ESC), Flight Controller (FC), Global Positioning System (GPS), medical emergency, Unmanned Aerial Vehicles (UAV).

1. INTRODUCTION

Quad-copter comes under the unmanned aerial vehicles which are also called as drone. Quad-copter can fly autonomously (by its own) without a pilot or humans control. There are majorly three styles of the drone particularly fixed wing, rotator wing and multi-rotor.(1) Fixed wing drone have wings instead of rotors to provide lift.(2) The rotator wing type drone consists of only one rotor. It can be said as the small version of the helicopter.(3) Multi rotor drones are most commonly used in modern world. The can be further classified by the number of rotors: tri-copters have three rotors; quad copters have four motors and hex-copter has 6 motors and octo-copter has 8 motors. Multi rotor drones typically have a limited flying time of only 20 to 30 minutes because most of the drone's energy is used to power each rotor to help it stay balanced.

Many companies stated their new venture on drone delivery with different types of methods to deliver the product or the service, companies like Google, IBM, Amazon, and FedEx. Amazon use multi-rotor miniature unmanned aerial vehicle (UAV) technology to autonomously fly individual products to the customers within a low time. IBM developed a drone that could detect when a person is lazy, tiring, exhausting and fly over with a hot cup full of coffee into the person's hands. Project wing started by the Google to deliver the household product and going to include the food items such as lunch, breakfast and snacks reaches the customer within a low time after placing the order.

2. HISTORY OF DRONES

History of a drone has different stages of evolution. Unmanned aerial vehicles came into existence in the time of 1st world war 1916 Austrians attacked Italian city of Venice using unmanned balloons that are heavily filled with explosive. Later development of science and technology were increased, micro drone came into existence with a camera fixed on it. These micro drones are used by the military, navy, firefighters and civilian.

The usage and development of drone were increased in the 21st century. Civilian started using drones for photography, Surveillance, entertainment, mining, disaster relief etc. The drone traffic was rising year by year so the government of every country stared FFA Federal Aviation Administration. The FFA has some rule and regulation to fly a drone in the air.

- Drone should not be allowed to fly more than four hundred feet vertically.
- Drone should not be flown in areas specified where there is "NO FLY ZONE", which includes areas near airports, signal towers, international borders, state secretariat complex in state capitals, military, navy, air force installation.
- Permissions to fly in controlled air space can be obtained by filing a flight plan and obtaining a unique air defense clearance.
- The DCGA has divided the drone into five classifications depends on their maximum take-off weight (MTOW)
- Nano-less than or equal to 250 grams.
- Micro-greater than 250 grams and less than or equal to 2 kilogram.
- Mini-greater than 2 kilogram and less than or equal to 25 kilogram.
- Small-greater than 25 kilogram and less than or equal to 150 kilogram.
- Large-greater than 150 kilogram.

3. PROPOSED WORK

Our proposed work using drone to provide first aid kit or medicine to the injured person or needed people. When a medical emergency takes place, the response time can make all the difference between a life saved and a life lost. In some rural areas, people are left for waiting hours for emergency support. Unfortunately, ambulances can get stuck in traffic on average they arrive with time delay after the emergency call has been made. We can increase the survival rate by decreasing the time delay of the primary care. Speeding up

emergency response can prevent loss of life and accelerate recovery dramatically by providing first-aid with the help Medical Drone. The drone is modeled on a standard quad-copter and is driven by GPS, a pilot, or a combination of both. The drone concept does not need a pilot, and is small enough to easily land on a street, unlike large helicopter ambulances. Quad copter has four motors are fixed at equal distance on frame. With the help of these four motors the drone can lift the weight of 2.25 to 3.0 kilogram. With the help of GPS, the drone reaches the emergency place; drop the required medical kit to needed person or to doctor near the emergency spot. After delivered, the drone return to it initial point.

4. COMPONENTS OF QUAD COPTER

Every delivery drone must have this list of components mentioned below.

4.1 CHASSIS: The outline of the drone with all components is fixed on it. The size on the specific application we are using and the weight of the drones in accordance with the payload. As the load increases, it requires some stronger motors and longer propellers for better performance in air or when flying.

4.2 PDB: It stands for power distribution board. It gets the power supply from the battery and then transmits it to all the components of the drone along with the interfaces components linked.
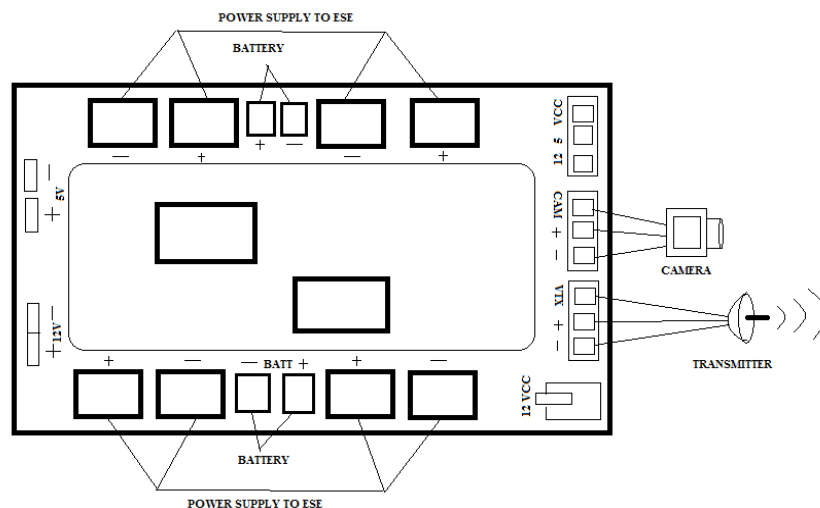

Fig 1: Power distribution board

4.3 MOTORS: Essentially, there are two styles of motors AC and DC. Drone motors are rated in "KV" units which equates to the number of revolutions it can achieve per minute when a voltage of 1 volt is supplied to the motor with no load. Provides with more revolution per minute (RPM) will have less torque to spin a larger propeller that generate more thrust. It also depends on the props we used.

4.4 ESC: The electronic speed controller (ESC) provides a controlled current to each motor to produce the correct spin speed rate and direction.

4.5 FLIGHT CONTROLLER: FC was the short form, it is a micro controller. It is a system of communication (SOC) which sends the signal, received from the RC Receiver and transmits this signal to the ESC for the controlling of the drone. This FC is also used for the controlling many interfaces like SONAR, Parachute, camera, FPV, etc.

4.6 PROPELLERS: Four propellers are to be used in a quad copter; these propellers are connected to four brushless motors that transmit power by converting rotational motion into thrust. The thrust necessary for the drone is dual of its payload or weight.

4.7 BATTERY: Power source, lithium polymer batteries are used due to high power density and ability to recharge. These are differed by size and different configurations. Configurations like number of cells present (cells define the voltage each cell is 3.7volts), current (in terms of mille ampere hour (mAh)), discharging rate (also said as C rating).

4.8 RC RECEIVER: It is also called as radio receiver. It receives the signals/commands from the RC transmitter given by the drone pilot then sends it to the flight controller (FC) for the controlling of the quad copter or drone will fly as per the command given by the RC receiver.

4.9 RC TRANSMITTER: It is also called as radio transmitter. An RC transmitter is a tool that permits the pilots to govern a drone wirelessly. The transmitters are differentiated by the number of channels (example: 4, 6, 9 up to limited number of channels) present and the signaling range (it depends on the antenna). The diagram beneath will give an idea what is the RC transmitter.
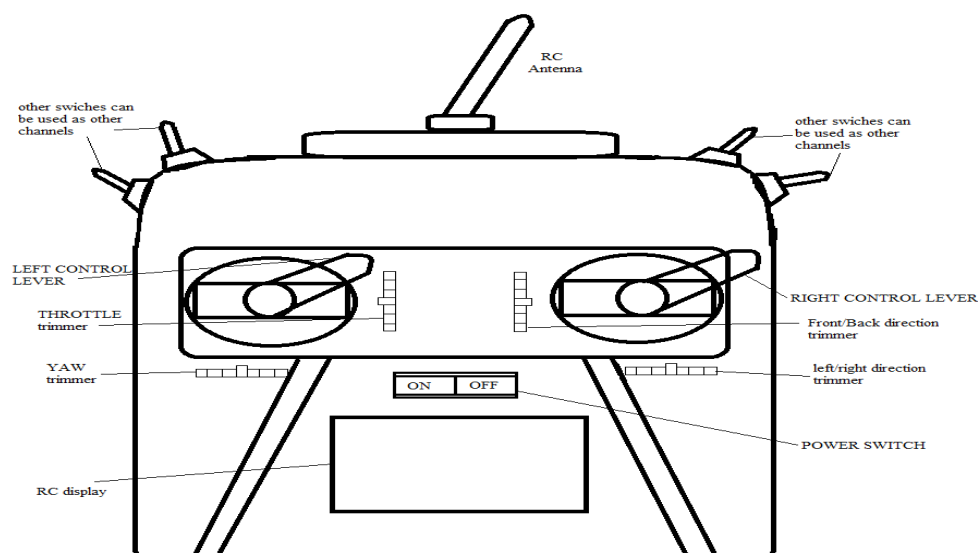

Fig 2: RC Transmitter

4.10 GPS: It is stated as the Global Positioning System. By connecting a GPS and telemetry module to the drone we can communicate with drone and make it autonomous.

4.11 Medical Tool Kit**:** A cargo box which contains supplies and equipment that is used to give first aid or medical treatment, the differing first aid requirements of the area where it may be used and variations in act or regulation in a given area.

5. INTERNAL WORKING OF THE QUAD COPTER

Every device needs energy to work. So, Power supply to quad copter is given by battery to the power distribution board. From power distribution board the total power from the battery is equally distributed to four ESC (Electronic Speed Controller). Li-Po batteries were used. From power distribution board the dc current is transmitted to electronic speed controllers. This electronic speed controller has 3 input terminals and 3 output terminals. The 3 output terminals are directly connected to the brushless motor. Coming to input terminals, two terminals are connected to the power distribution board and remaining terminal is connected to flight controller. Electronic speed controllers are used to control the current fluctuation which are coming from battery and also controls the RPM (rotation per minute). The brushless motors rotate in both direction clockwise and anti-clockwise direction. Power supply to the flight controller is given by electronic speed controller. Here all the other components like GPS, Receiver, buzzer, telemetry, PPM are connected to the flight controller and these parts take the power from flight controller. When it comes to receiver it receives the commands given to the drone by the radio transmitter. From receiver the signal is transmitted to flight controller and then it is given to the electronic speed controllers and from speed controllers it goes to the motors. Then the motors run and propellers work accordingly with given commands.

6. METHODOLOGY

This project aims in delivering first aid or any other medicines whenever an emergency is occurred. This is done with the help of an automated drone. When an emergency is occurred a message is sent to the database or base station. Then the coordinates of the emergency occurred area are tracked down. These coordinates are sent to the GPS attached to the drone.GPS means Global Positioning System and is used to track the location. Since it is an automated one the drone itself reaches the destination without requiring a manual guidance. The drone is also associated with a remote controller and it is exceptional. The remote is used only when drone fails to grab the initial momentum. Then the drone starts from the base station and reaches the destination with the help of the coordinates given in the GPS and delivery the first aid kit. Once the delivery of medicines is done the drone returns back to the base station.
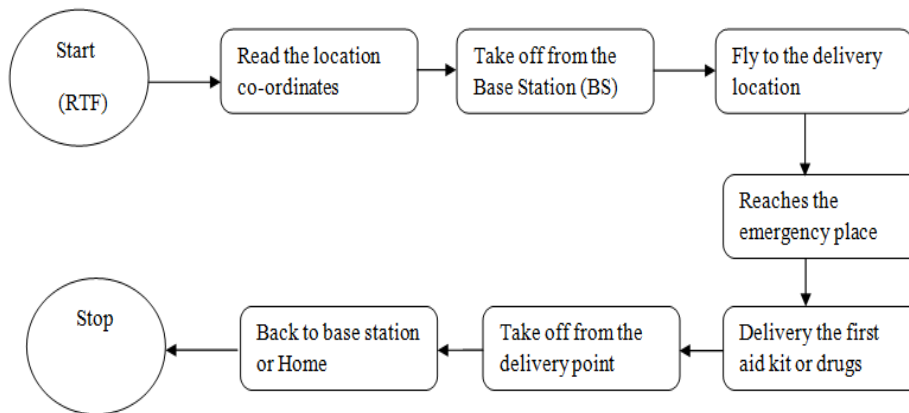
Fig 3: flow chat for drone based medical facility

7. CONCLUSION

In this paper we mentioned about the autonomous drone medical delivery. Now-a-day's different type of technology has been implemented on drone. This kind of medical drones can save the life of people and emergency help can be reached on time. Later on, these drones are going to become the most common and effective used device in future. By using the mobile communication principle, the receiver can get any kind of information from the emergency location. Many lives can be stored back which are not gained due to the lack of proper caring in a short period. By 2025 the usage of drone enlarges.

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GPS used for drone