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# Ambulance Drone using Arduino

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**ABSTRACT:** The purpose of this paper is to develop a prototype of drone ambulance to assist the ambulances insaving human lives .According to study conducted by the Centre for Science and Environment, traffic in its peak hourson an average does not exceed 30-40 km/h 92% of the times. In existing systems, a drone carries only the defibrillator tothe emergency spot. Thus, it takes into account only a single parameter. This paper aims at developing a system thatwould be able to fly to the emergency spot earlier than ambulance and take into account multiple real time healthparameters of the patient such as temperature, heart rate and heartbeat. The values of these essential parameter are then transmitted to the ambulance. The range of the drone ambulance is approximately 500m. The experimental results of themeasuredparametersareobservedandpresented.

**KEYWORDS:** Ambulance, Drone, Sensors, Arduino

## I. INTRODUCTION

In todays world , there is a lot of traffic on roads which leads to congestion in the whole city. So in the time of emergency crisis situation, an ambulance which travels via road may not be able to reach the destination in time and patient may loss his/her life. So, it is necessary to introduce a distinct means that would take the objective of saving human life one step closer. A drone or a quadcopter takes aerial route and is not driven by human .Using more number of motors and propellers attached to it makes it the optimal design and provides the necessary thrust. Four 2200mAh batteries provide power supply to drone. The drone comprises of a medbox which is capable of reaching emergency situations faster than the ambulance and can measure patients real time health parameters. The various sensors in this prototype comprises of heartbeat sensor, temperature sensor and ECG sensor. An ECG Sensor with disposable electrodes is attached directly to the chest to detect every heart beat. The electrodes convert heartbeat to electrical signal and thus ECG sensors are able to measure continuous heartbeat and gives data of heart rate. The temperature of patient body is detected by temperature sensor. The heartbeat or the pulse rate sensor is used to detect the number of heartbeats per minute of the patient

## II. RELATED WORK BACKGROUND RESEARCH

The aging population and increasing number of patients a huge economic burden on not only themselves , but the government and providers as well , because of this, there have been many different healthcare model and methods produced over the years. For example, the homecare model provides patients with certain types of care in their own homes. Video based treatment called video conferencing is another model that provides two way video services and voice contact between patients and doctors or patients and their relatives.. Using devices with a touch screen , patient can easily consult with doctors or relatives when they need to. This method enables patients who are far from urban areas or centralized hospitals to receive video therapy, recovery support and specialty services .Doctors can collect and share patients data and information such as blood pressure and heart rate to make an accurate and rapid diagnosis with specialists in other areas. Patient living in rural areas have limited or no access to transportation methods or caregivers who are able to deliver or pick up medicine and test kits for them. Recently, some reasearchers have proposed the use of drones for healthcare services. However, they are not applicable to patients who need routine healthcare services as we consider in this paper .Therefore, a new healthcare model should be developed to ease the burden for patients with chronic diseases living in rural areas. Many drone applications involve surveillance using an onboard camera. HoweIn todays world , there is a lot of traffic on roads which leads to congestion in the whole city. So in the time of emergency crisis situation, an ambulance which travels via road may not be able to reach the destination in time and patient may loss his/her life. So, it is necessary to introduce a distinct means that would take the objective of saving human life one step closer. A drone or a quadcopter takes aerial route and is not driven by

human .Using more number of motors and propellers attached to it makes it the optimal design and provides the necessary thrust. Four 2200mAh batteries provide power supply to drone. The drone comprises of a medbox which is capable of reaching emergency situations faster than the ambulance and can measure patients real time health parameters. The various sensors in this prototype comprises of heartbeat sensor,temperature sensor and ECG sensor.An ECG Sensor with disposable electrodes is attached directly to the chest to detect every heart beat.The electrodes convert heartbeat to electrical signal and thus ECG sensors are able to measure continuous heartbeat and gives data of heart rate.The temperature of patient body is detected by temperature sensor.The heartbeat or the pulse rate sensor is used to detect the number of heartbeats per minute of the patient ver,drones also are capable of carrying devices other than cameras and capable delivering small loads.Drones have been used extensively by the military in combat and for humanitarian aid. Useful non-military drone application in different industries include agriculture surveillance and crop spraying, shark surveillance at beaches, monitoring wild life for conservation, monitoring fires, scientific research and exploration, monitoring riots and international borders by police and government , sports and entertainment event coverage, other media coverage , emergency services and disaster response. Arguably, humanitarian drone application are the most useful since human lives are at stake.For example, in Nepal after the 2015 earthquake , drones helped rescuers locate survivors.

### III. EXISTING SYSTEM

In a situation of myocardial crisis, a hospital drone can be used for supplying defibrillator. At remote locations , anemergency air ambulance can surve as a drug delivery system in emergency situation .People suffering from respiratorysyndrome can be provided with the drone which carries oxygen supply to them.The existing systems take into accountonlyasingle parameter.

### IV. PROPOSED SYSTEM

The prototype proposed in this paper is a drone ambulance which is equipped with a medbox comprising of sensors such as temperature sensor,ECG sensor and heartbeat sensor which reaches the emergency spot earlier than the ambulance and not only measures the real time health parameter , but also transmit them to the ambulance.The doctor present in the ambulance can analyse the real time health parameters such as the condition of the heart, provided by the ECG sensors data.This enables them to prepare for the pre-medication to be given to the patient.If the condition is more critical , then the doctor can inform to the hospital well in advance to be ready for the next step in saving the patients life.It also helps the doctor in the ambulance to come prepared by examining the patient health parameters. The advantage of this prototype is that the mortality rates are reduced to great extent.This prototype is well designed for assessment of various health parameters.It is life saving and effective process.The drone travels via air so faces no traffic and thus reaches the emergency place faster than the ambulance which travels via road.It is relatively simple to use and provide the purpose of lifesaving which is one of the society and mankind.

### V. QUADCOPTER PROTOTYPE

The use of drones in healthcare is the purpose of proposed prototype.For this reason, the first step is to develop a quadcopter. Both the thrust and the torque are produced by every quadcopter and it is produced about its COR(Centre of Rotation).In addition to this,a drag force is also produced in the opposite direction to its flight.Every quadcopter tries to achieve lift,yaw,roll and pitch via the thrust produced by the four motors attached to it.This way, the propellersfixed on the motors can be used for the fligh I. PROPOSED SYSTEM of the quadcopter in all directions.

By differentiating the four rotors thrust, the pitch and roll of the quadcopter can be controlled.The moment arm of each rotors thrust about CG,in steady state of the UAV should be equal.

$$M = MI Xa$$

$$\text{Simplifying } T = mra$$

$$+mg \text{ Differentiating,}$$

$$Dt/da = mr$$

Additionally, to increase stability, mass at the rotor(m) or the distance between the rotor and CG ® have to be increased.

For Yaw stability,two of the quadcopter rotorare counter rotating ,thus the reaction torque of two rotor have becountered.Equatingthrustandweight. $3T \cos\theta = Moxg$

When quadcopter or drone flies , a group of different forces and torques act on it.Drag, lift, weight, thrust is the fourmain forces acting on the quadcopter.The quadcopter will be able to fly only if the all these forces acting on it arebalanced.The fabrication of quadcopter is a sequence of steps.Firstly, four aluminium rods had been cut into 15 cm each.Then, the hub was cut using a cutter and then holes were drilled on aluminium rods which were measuredaccording to the need of propeller base.The next step was to integrate hub and aluminium rails in order to form anXlikestructureofquadcopterframe.



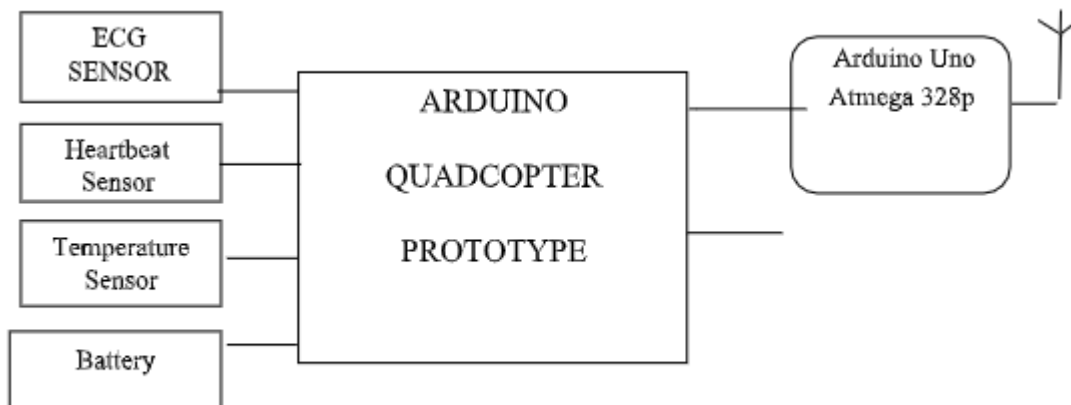
Fig.1 . Hub with Aluminium rails

The next step was to incorporate 4 brushless DC Motors on each of the rails and then integrate for Electronic SpeedControllers on each rails and connect the common positive and negative terminal of battery.Post this, propellers wereincorporated to the motors with the aimof two diagonally opposite propellers to move in clockwise direction and theremaining two in the anti clockwisedirection.This marked the end of quadcopter fabrication and now the 6 channel IRremotewasusedinordertoflythedrone.

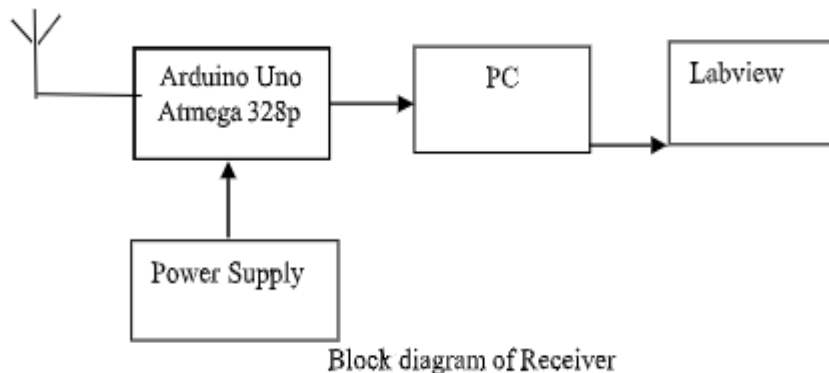


Fig.2.QuadcopterModel

### V. BLOCKDIAGRAM



Block diagram of Transmitter



**Arduino** : It is a microcontroller board based on the ATmega 328p. The Arduino is used in order to drive the transmitter module.

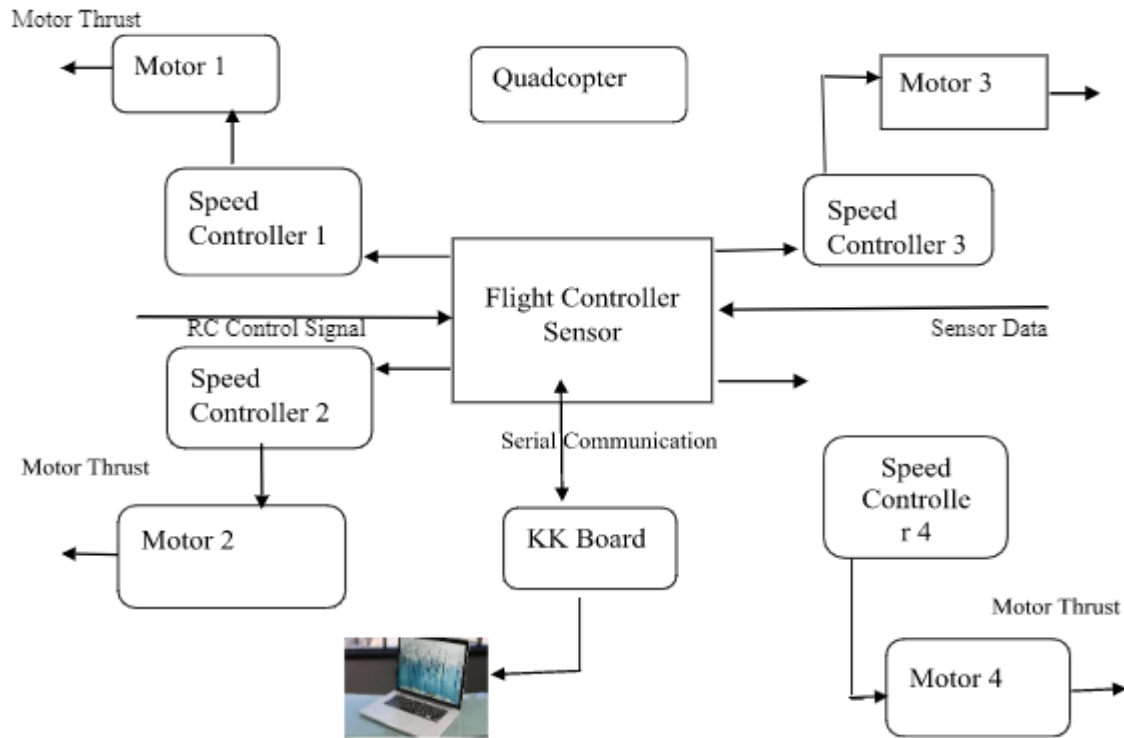
**ECG (Electro Cardio Gram)** : AD8232 is used as the ECG sensor in the prototype. This sensor tracks the electrical activity of the heart. Generally ECG waveforms seem noisy. The AD8232 sensor acts as an operational amplifier which yields a good signal without noise. The pulse rate is indicated by an LED. Three ECG electrodes are used to get the ECG data. The three electrodes are connected to the left arm, right arm, and right leg. The ECG electrodes convert heart rate into an electrical signal which can be analyzed in software upon reception.

**Heartbeat Sensor** : Contraction and relaxation of the heart determine the heartbeat of a person. A finger probe is present in the sensor device. When a finger is placed in the probe of the sensor, the heartbeat of the patient is determined. Volume of the blood in tissue is the main factor upon which the light absorbed depends. The normal heartbeat lies between 60 and 80 beats per minute.

**Temperature Sensor** : LM-35 is used as the thermistor. This sensor is widely used for experimental purposes. It operates on 5V.

**LCD Display** : 16\*2 LCD is used to display the temperature, which is measured by the sensor.

### VII. QUADCOPTER ARCHITECTURE



**Rails :** Rails of quadcopter are generally made of Aluminium rails.They are used because they are rigid, light weight and cost effective.

**4 BLDC Motor :** 1400kv.Weight 52 grams approx.

**Propellers :** 10 x 4.5”

**Lipo Battery –** 2200 mAh

**Electronic Speed Controller :** Input voltage : DC 6-16.8V. Running Current :30A, Weight :32 g

**Flight Stabilizer Board :** kk2.1 board to control the flight of the drone.

**RF Transreceiver Remote :** 6 channel, 2.4Ghz, 12 v DC.

### VIII. ADVANTAGES

1. This flying medical drone reach the spot before the normal ambulance arrives the scene.
2. Most impressively, there are even plans to develop a series of autonomous , flying ambulance drone that can land at the scene of an accident and transport patient to nearest hospital , without a human pilot.

### IX. DISADVANTAGES

1. Themost disadvantageisina futureitcanbe aRobotic dronemissile, todestroyanycountry.

## X. APPLICATION

1. Ambulance drone can be used in Army force.
2. And most important it can be used in locating survivors, inside building on fire.

## XI. RESULTS

The following were observed:

The prototype of the quadcopter was developed successfully.



Fig .3. Quadcopter Prototype Model

The development of the quadcopter was done and a medbox was installed at the base of the quadcopter .The drone was able to fly within the specified range.

The real time health parameter of the patient which are transmitted are observed in the Labview Software and those results and graphs are presented below. The results include measured data of ECG sensor, temperature sensor and heartbeats sensor which are shown as graphs whose y-axis represents amplitude and x-axis represents time.

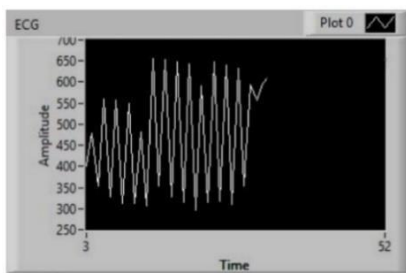


Fig.4. Heartrate data

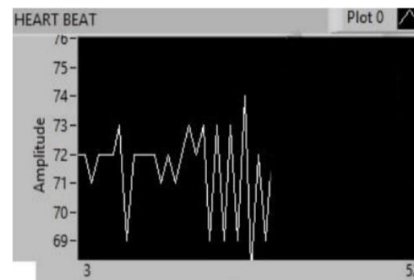


Fig.5.Heartbeatdata

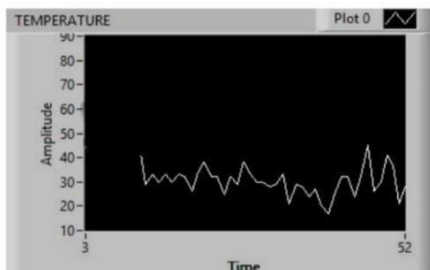


Fig.6. Temperaturedata

The results shown above represents the data of the patient and these data can be sent to the ambulance where it can be analysed by the doctor so that he can evaluate the situation better and take other premedication choices. The data that is taken essentially proves beneficial for the patient and thus the purpose of the drone ambulance serves

which is to assist ambulances in saving human lives.

## XII. CONCLUSION

The prototype of Drone Ambulance is developed in order to assist ambulances in saving human lives. The developed prototype takes less time to reach the emergency situation spot and helps to measure and transmit real time health parameters of the patient to the ambulance where they can be analysed in Labview Software. This prototype helps in a measure irreplaceable contribution in saving life of patient.

## XIII. FUTURE PLAN

Much further advancement can be done. The drone can be made autonomous. The GPS module can be used to acquire the location of the target and machine learning can be used to help the drone to calculate shortest path to reach the destination. A camera can be implemented in the drone so that the current situation can be viewed by the doctor in the ambulance. A much more robust drone can be developed for carrying out this specific operation. Usage of drones in the medical industry is a developing field which has a tremendous scope for further research.

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