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Research Article

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Quadcopter for Medical Services

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Abstract:

Lack of immediate medical attention post trauma is the major factor of the increased death rates in road accidents. In order to provide timely medical attention, a system is to be designed which is a means that does not have the road constraints of an emergency medical system. This is the Air Ambulance- Quadcopter. Attempting to bring about faster accessibility of medical services to the patient especially in rural areas is the motivating factor. The system will help in implementing this idea of faster site accessibility to a large extent, by providing timely first aid and serving the society through means of a Quadcopter. To design such an equipment, an elaborate survey has been made on the topics of Wi-Fi, Sensor. This paper is an outcome of the survey done which has enriched us with an in-depth knowledge of the various components and techniques required to design and build a Quadcopter.

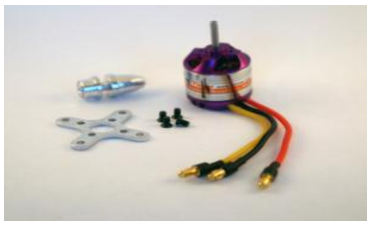
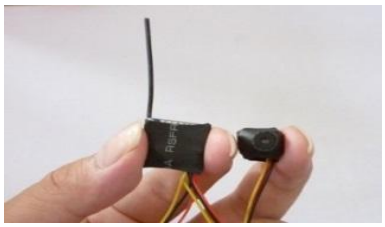
Keyword: Road accidents, Quadcopter, First-aid, Quadcopter components, Traffic congestion.

I. INTRODUCTION

Nowadays newspapers are jam-packed with the headlines of incalculable accidents resulting in immeasurable loss of lives. The lack of timely medical assistance and immediate treatment is one of the main reasons for this loss. Hence we have come up with a system that will provide timely first aid, thereby saving lives, remarkably. The present medical emergency systems inclusive of ambulances are of great benefit in saving numerous lives, but a mode which incorporates faster accessibility to the casualty site will help in reducing the number of immediate deaths. Our system will help in enforcing this idea of faster site accessibility to a great extent, by providing timely first aid and be of assistance to the society through the means of a Quadcopter. The objective is to devise a prototype of the system that would cater to the need of equipping timely first aid to the victims of accidents and thus help reduce loss of lives considerably. The above aim can be accomplished by building a Quadcopter which will help deliver the first aid kit using the necessary communication technology.

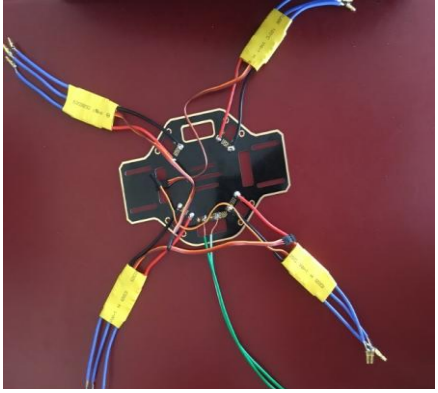
II. COMPONENTS OF THE QUADCOPTER

Quadcopter Frame 	Development Board 
Propellers 	Remote Controller 

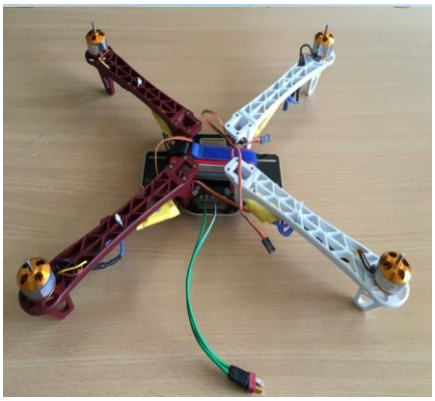
BLDC Motors 	Wireless Camera 
Electronic Speed Controllers 	LiPo Battery 
GPS Module 	Ultrasonic Sensor Module 
Raspberry Pi 3 	Power Bank 

Building the Quadcopter

This stage begun with soldering of bullet connector to ESC's and motors, we used 2.5 mm female connectors for the ESC's and male connectors to the motors. The main purpose of soldering the bullet connectors was to establish a connection between the ESC and the motor as the Esc provides the power supply to the motor. Next the Esc's were soldered on to the base plate of the frame, we also soldered a T-connector to the base plate using a pair of wires so as to connect the LiPo battery which provides the main power supply to the Quadcopter.



We attached the arms of the Quadcopter to the base plate with the help of screws. The BLDC motors were also screwed on to the ends of the arms and a connection was established between the ESC and the motor.



Next we fixed the top plate over the arms of the Quadcopter. This formed a solid base to mount the Development Board. The board which we used was the KK Board 2.1.5. The power to the KK Board was supplied by connecting the ESC cable to the Aileron channel. The KK Board has several settings which can be modified to suit the needs of the Quadcopter.

In order to establish a communication between the Quadcopter and the base station, the transmitter i.e the Remote Controller and the receiver are necessary. First the receiver needs to be bound with the transmitter. Once this is done, the receiver responds to the signals sent by the transmitter.

We made use of a 3 pin female-female jumper wire for linking the KK Board to the receiver. To check the motion of the transmitter, we use the receiver test. The receiver test recognises four signals namely:

- Aileron- To navigate to the left and right directions
- Elevator- To navigate forward and backward motion
- Throttle- Responsible for take-off, maintaining height and landing
- Rudder- To arm and disarm the Quadcopter.

If during the receiver test, the movement of the sticks on the transmitter does not correspond to the above mentioned directionality, changes are required to be made in the transmitter accordingly.

The Show Motor Layout setting on the KK Board allows us to choose the type of the aircraft it is going to be working with. It also suggests the directions of the motor rotation on each arm as well as the layout of the aircraft. In any Quadcopter, the two adjacent motors must rotate in opposite directions so as to provide the upward thrust for the Quadcopter to take-off. If the motor rotation is not as per our requirements, the wires of the ESC's which are connected to the motors need to be swapped.

The next major step was ESC Calibration. ESC Calibration is done for the ESC's to get accustomed with their respective motors. The below steps need to be followed:

- The ESC that needs to be calibrated is connected to Channel 3 of the receiver.
- To power up the KK Board another ESC has to be connected to the Aileron channel.
- The transmitter is turned on and the throttle is set to the maximum.
- The LiPo battery is then powered on. After 2 beeps are heard, the throttle is set to minimum. We will hear 3 beeps, one for each cell of the LiPo battery, and a long beep indicating that the ESC has been calibrated.
- Using the throttle stick on the transmitter, we can check the rotation and directionality of the motor.
- Above steps are to be repeated for the remaining ESC's.

ACC Calibration is performed to check the balance of the Quadcopter. For this test, the Quadcopter must be placed on a flat surface for the calibration to succeed.

Once all the settings are complete, the propellers can be mounted onto the motors.

III. WIRELESS CAMERA

Once we were accustomed to the flight of the Quadcopter the next stage was to attach the wireless camera for live streaming purposes.

The receiver of the camera needs to be connected to the television using the AV cables. Using a rechargeable battery the camera is powered on. A constant tuning of the antenna on the receiver will provide the live video streaming on the TV. Due to the lack of AV ports on the laptop we resorted to using an AV to USB converter. For this purpose the honesTech software needs to be installed on to the laptop. On doing so we are able to view the live feed from the Quadcopter.

IV. RASPBERRY PI 3

The whole purpose of using a Raspberry Pi module was to interface the GPS and Ultrasonic modules. Since Raspberry Pi is an Operating System in itself, we cannot use it directly on the laptop. This led to us installing a software named VNC. VNC Viewer is to be installed on the laptop whereas the VNC Server is to be installed on the Pi. Both the Pi and the base station laptop need to be connected on the same WiFi network so that we can wirelessly access the Pi.

GPS Module

The GPS Module is placed on the quadcopter to detect the coordinates of the current location of the Quadcopter. We devised a Python code to activate the GPS Module and give back the coordinates of its location. Once the coordinates of the Quadcopter matches to that of the accident site, it means that the Quadcopter has reached its destination.

The GPS module that we used is GY-GPS6MV2. This module tends to generate a large chunk of data from which we need to extract the required coordinates alone. The code starts with an infinite loop which can be broken using a Keyboard Interrupt. Within the loop, the module is made to generate its data every 2 seconds. From the data, we parse out the necessary coordinates and display it at the base station.

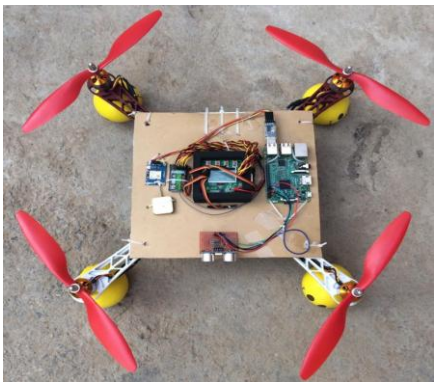
Ultrasonic Sensor Module

An Ultrasonic sensor is a device that measures the distance to an object from the sensor by using sound waves. The Ultrasonic Sensor is installed on the Quadcopter, which measures distance by sending out a high-frequency sound pulse and then times how long it takes for the echo of the sound to reflect back .The sensor has two openings on its front.One opening transmits ultrasonic waves, (like a tiny speaker) and the other receives them,(like a tiny microphone).

The speed of sound is approximately 340 m/s in air. This information along with the time difference between sending and receiving the sound pulse is used by the Ultrasonic Sensor to determine the distance of the object.It uses the following mathematical equation:

$$distance = \frac{speed\ of\ sound\ \times time\ taken}{2}$$

Time taken=The time between when an Ultrasonic wave is transmitted and when it is received.



REFERENCES

[1] A Wireless Control Quadcopter With Web Camera And Self Balancing System by VaishaliNirmal, DengaleSupriya, DivekarPallavi, Dipti Shah, International Journal of Research in Engineering & Advanced Technology, Volume 3, Issue 1, Feb-Mar, 2015.

[2] Simple GUI Wireless Controller of Quadcopter , DirmanHanafi, MongkhunQetkeaw, RozaimiGhazali, Mohd Nor Mohd Than, WahyuMulyoUtomo, Rosli Omar. Int. J. Communications, Network and System Sciences, 2013, 6, 52-59.

[3] The Role of Propeller Aerodynamics in the Model of a Quadrotor UAV, Pierre-Jean Bristeau, Philippe Martin, ErwanSalun, Nicholas Petit, Proceedings of the European Control Conference 2009 **.**Budapest, Hungary, August 23-26, 2009

[4] Design and control of electronics based medical emergency system using a Quadcopter, Mansi Joshi, Aswina P. Mohanan,Vilas J Kharat,B.Tech ,UMIT, SNDT Women's University, Mumbai, India.International Journal on Recent and Innovation Trends in Computing Volume: 4 Issue: 5.

[5] Quadcopter video surveillane and control using computer, Prem Kumar. P, Amirtharaja.S, Harie. S, Kishore Rohy.S, Kiruba.V. IJEEE, Volume 07, Issue 01, Jan- June 2015.

[6] Video streaming over wireless networks, Xiaoqing Zhu and Bernd Girod, Information Systems Laboratory, Stanford University, Stanford.

[7] Positioning and navigation system using GPS by J.Parthasarathy, International Archives of the Photogrammetry, Remote Sensing and Spatial Information Science, Volume XXXVI, Part 6, Tokyo Japan 2006.

[8] Global Positioning System for Object Tracking, AbhaDamani Integrate M.Sc.(IT), UkaTarsadia University, Bardoli, Gujarat. Hardik Shah Integrate M.Sc. (IT), UkaTarsadia University, Bardoli, Gujarat. Krishna Shah Integrate M.Sc. (IT), UkaTarsadia University, Bardoli, Gujarat.

[9] The Global Positioning System: Past, Present, and Future ,Richard B. LangleyInternational Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (An ISO 3297: 2007 Certified Organization) Vol. 2, Issue 10, October 2013, Infrared Sensor Rig in Detecting, Various Object Shapes SitiAsmahDaud, NasrulHumaimiMahmood, Pei Ling Leow, FauzanKhairiCheHarun.

[10] Distance Sensing with Infrared Sensors, Lisa Goldman Supervisor: Dr. AryeNehorai Department of Electrical and Systems Engineering ,Washington University in St. Louis Fall 2010

[11] Using Ultrasonic and Infrared Sensors for Distance Measurement, Tarek Mohammad

[12] An Ultrasonic Sensor for Distance Measurement in Automotive Applications, AlessioCarullo and Marco Parvis, Senior Member, IEEE, IEEE SENSORS JOURNAL, VOL. 1, NO. 2, AUGUST 2001.

[13] Distance Measurement of an Object or Obstacle by Ultrasound Sensors using P89C51RD2, A. K. Shrivastava, A. Verma, and S. P. Singh, International Journal of Computer Theory and Engineering, Vol. 2, No. 1 February, 2010.

[14] Object recognition with ultrasonic sensors, M. ˙IhsanEcemis¸ and Paolo Gaudiano_, Boston University Neurobotics Laboratory.

[15] Wi-Fi Enabled Sensors for Internet of Things: A Practical Approach, SerbulentTozlu, Murat Senel, Wei Mao, and AbtinKeshavarzian, Robert Bosch LLC.

[16] Wi-Fi Based Notification System Prof. V.P.Patil, OnkarHajare, ShekharPalkhe,BurhanuddinRangwala. The International Journal of Engineering And Science (IJES).

