Ambulance Drone-Saving Life One Step Closer

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Numerous lives are lost each day as a result of ambulance services arriving at accident scenes late. To address this, our project is creating a prototype for a drone ambulance system that will support conventional ambulance services in saving lives. This device could drastically lower the amount of fatalities brought on by delayed emergency medical services by delivering a quicker and more effective response. According to a research by the Centre for Science and Environment (CSE), 92% of the time during peak traffic hours, the average speed is not more than 30 to 40 km/h. A prototype of a drone ambulance system is being created to give patients quick medical attention in order to handle the urgency of emergency situations. The drone can reach the scene before the regular ambulance since it is fitted with sensors that can monitor several health indices including temperature, heart rate, and heartbeat. The sensors can be used to diagnose the patient's status with the help of paramedics by nearby professionals or on-site observers. To ensure that everyone involved in the patient's care is ready to meet their demands, the drone will send the information to the hospital personnel and the ambulance. This technology may save lives by getting to the patient before the ambulance. Utilizing a predetermined phone number and GPS, the prototype tracks the user's location and navigation. A fast and precise diagnosis is made possible by the drone's ability to measure real-time health data, increasing the likelihood that the patient will survive. This flying medical drone serves as a toolkit for emergencies, assisting the medical team in giving those in need quick care.

Keywords: Drones, emergency, lifesaver, patients, survival variable sensors, peak hour

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1. Introduction

One of the major challenges faced by emergency medical services is the delay caused by traffic congestion, especially in urban areas. This delay can have serious consequences for patients, particularly those in critical condition. Drones, being able to fly over obstacles and traffic, offer a promising alternative for emergency medical services, and could potentially save lives by reducing response times.[2]Emergency response times can be greatly impacted by traffic congestion, especially in densely populated locations with high traffic volumes. Drones can offer a speedier and more efficient mode of transport than regular ambulances in these circumstances. Drones can quickly reach the patient's location and bring them to the hospital or other healthcare facilities by avoiding traffic, which shortens reaction times and can even save lives. [3]

The COVID-19 epidemic has brought attention to the necessity for technology-supported health services, as conventional methods of providing healthcare have been discontinued globally to maintain societal distance [4]. Drones are being looked at more and more as a viable option to improve the effectiveness and capacity of healthcare practitioners to offer healthcare to people, especially those in hard-to-reach locations.[5]With the goal to assess the potential of drones to address medical-related problems, several kinds of studies have been conducted globally. The continent of Sub-Saharan Africa is home to a significant number of drone-use pilot programmes that support national healthcare priorities and initiatives. In order to provide safe and effective treatment during times of crisis or health epidemics, understanding the potential of established and developing IoT technologies, such as drones, is becoming more and more crucial.[6]By providing a quicker way to get vital care to those who need it, the use of drones in emergency medical response can help save lives. The time it takes for medical personnel to arrive on the scene may be shortened by the use of drones, which may rapidly and effectively reach remote or difficult-to-access sites. [7] Every moment counts in a critical situation, and drones can help shorten the time gap between an incident and medical attention. Drones with sensors can also gather crucial information about patient health and activity levels, enabling medical experts to plan effective treatments even before they get on the scene. The use of this technology might alter the way emergency medical services are provided and enhance patient outcomes. [8]

Additionally, drones can also be fitted with a variety of sensors, cameras, and other technology, enabling them to carry out a variety of operations in contrast to simple delivery and navigation. For instance, chemical sensors can be used to find hazardous chemicals in emergency circumstances, while thermal imaging cameras can be used to locate missing people and identify heat signatures. Some drones are capable of analysing data and make judgements on their own because they have artificial intelligence built into them. Drones are useful tools for a range of sectors and purposes, including agricultural, environmental monitoring, search and rescue operations, thanks to these cutting-edge features. The Figure.1 shows the various utilization of drones. The potential applications for drones are essentially endless as technology advances and becomes more sophisticated.[9]In addition to measuring the victim's health indicators, it is utilised to fly to emergency situations. We employ heartbeat sensors, which provide a precise reading of the victim's heart rate. The patient's current body condition is assessed using a temperature sensor. If the condition is more serious, the doctor can notify the hospital well in advance so that they are prepared for the next stage in the patient's life-saving treatment. By analysing the patient's health parameters, the doctor in the ambulance can arrive prepared. [10] The use of drones for emergency response and medical delivery, which can send real-time patient data and carry supplies to remote or disaster-prone places. Given that it offers a more effective way to deliver healthcare, this technology can be especially helpful in underdeveloped nations or regions with weak infrastructure. [11]The drones are also ideally suited for emergency scenarios where conventional routes of transportation could be impractical due to their portability. Overall, the use of this technology in life-threatening situations has the potential to save a great number of lives by delivering quicker and more efficient medical care.

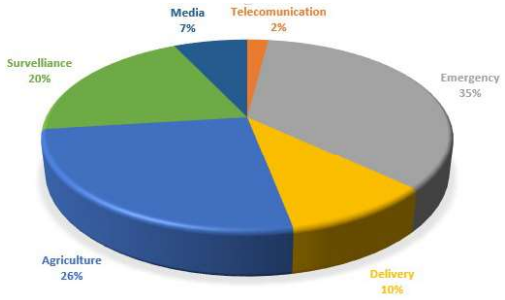

Figure 1. Drone usage in different sectors

2. Existing System

A hospital drone can be used to deliver a defibrillator in the event of a cardiac crisis [12]. An emergency air ambulance can be used as a drug delivery mechanism in dire circumstances in remote places. A drone that delivers oxygen to people with respiratory illness can be made available to them. Only one parameter is taken into account by the current systems [13]. According to Josefin Lennartsson, "A hospital-affiliated drone that is equipped with a defibrillator is used to fly to emergency situations for helping victims suffering from myocardial infarction [14]."Drugs, vaccines, and medical supplies are delivered using it in emergency disaster situations

3. Proposed System

In this system with the help of mobile, on receipt of information, the hospital authorities will track the patient location using the GPS feature within mobile app and trigger the ambulance Drone, to fly to the desired location.Figure.2 shows the prototype of a drone ambulance. Once the ambulance Drone reaches the desired location, it starts streaming of patient data to the medical centre or to the paramedic .Through the Medical Drone the medical centre /paramedic can give suitable directions to the spectators or nearby specialists present close to the patient as to how and which equipment is to be used for immediate patient diagnosis. The doctor in the ambulance can examine the real-time health metrics provided by the various sensor data, such as the status of the heart. They can then get ready to administer the patient's pre-medication thanks to this. If the condition is more serious, the doctor can notify the hospital well in advance so that they are prepared for the next stage in the patient's life-saving treatment. By looking at the patient's health indicators, the doctor in the ambulance can arrive prepared [15].

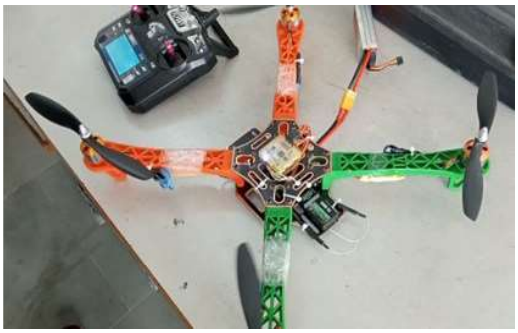

Figure 2. Ambulance Drone

4. Working of Proposed System

The nearest hospital would receive an emergency call from a random person on the scene of an emergency situation. The drone ambulance would then be launched and navigate to the patient's location using GPS and other sensors to determine the patient's location. Figure.3 shows the connection diagram of drone with various sensors. Upon arrival at the patient's location, the person who notified the hospital about the emergency would assess the patient's condition and provide emergency medical care as needed. In addition, the patient's real-time signals would be displayed on the doctor's screen, who would then analyses the patient's condition and prepare further.[16]In an emergency circumstance where a drone ambulance is requested, the patient will most likely receive initial aid from the emergency services team. Depending on the nature of the situation and the resources available, this may include paramedics, EMTs (situation Medical Technicians), fire-fighters, or police officers. Before the arrival of the drone ambulance, the emergency services team would examine the patient's condition and offer any necessary medical care on-site. They may also work with the dispatch centre to offer any pertinent information regarding the patient's condition or location.[17]

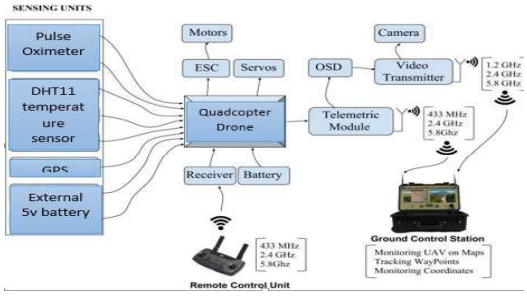

Figure 3. Block Diagram of Drone with Sensors

5. Working Principle of Drone

In the design and development of aircraft and drones, fluid dynamics is crucial. This subject covers the fundamentals of aircraft aerodynamics. To pull the vehicle up against gravity, or lift, a significant amount of upward force is needed. A force is produced to propel a body or a vehicle. Fluid flow kinematics can be employed to investigate these forces. Pressure, viscosity, and drag force all have an impact on the profiles created as air passes over an aerofoil. The air velocity at the inlet is correlated with force. The flow pattern around the cross-section of the aerofoil or propeller is shown in the figure.4below. High fluid pressure at the bottom and low pressure at the top of the propeller generate the upward force, or lift. This force can lift the weight of an aeroplane or drone. The amount of lift force is impacted by the tilt of the aerofoil or propeller. The top of the airflow accelerates as it passes over an aerofoil or wing because of Bernoulli's principle, which asserts that the total amount of energy in a fluid stays constant along a streamline. The air pressure, however, decreases.[18]

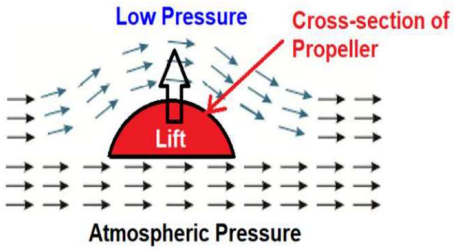

Figure 4.Working principle of Drone

6. Components

The physical framework that connects all the other parts of a drone is called the frame. It can be built of a variety of materials, including metal, plastic, and carbon fibre. Electric motors are used by drones to turn their propellers and create lift in the air. The size and weight of the drone determines the number and size of the motors. The engines' associated propellers provide the lift necessary to maintain the drone's altitude.[19]Depending on the type of drone, they come in a variety of sizes, shapes, and propeller counts. The drone's flying is managed by the flight controller, which is its brain.In order to maintain stability and steer the drone, it uses input from sensors like accelerometers, gyroscopes, and compasses to change the speed of the motors. The drone's motors and other electrical parts are powered by the battery. The components used are shown in Figure.5 below. The weight and required flight time of the drone determine the size and kind of battery. The drone is flown from the ground using the remote control. In order to change the drone's speed, altitude, and direction, it transmits signals to the flight controller.

Figure 5. Components Used in the Drone

Numerous sensors, including GPS, altimeters, and cameras, can be added to drones. The drone can navigate and avoid obstacles with the assistance of these sensors, which give it information about its position, altitude, and direction. [20] The drone can be equipped with a camera to record photographs or video while it is in the air. For surveillance or aerial photography, this is helpful. Signals between the drone and the remote control or other ground-based equipment are sent and received using antennas.

7. Sensors

The patient's body temperature as well as the temperature and humidity inside the drone ambulance may both be measured using the DHT11 temperature and humidity sensor. The data gathered by the sensors can be sent in real-time to a distant location, such a hospital or medical facility, using the ESP8266 Wi-Fi module. Figure.6 shows the connected sensors to a PCB board. Additionally, it can be utilised to get directions from a distance, such where to land the drone ambulance. The patient's heart rate and blood oxygen level can both be determined using pulse oximeters. [21] It commonly rests on the patient's finger or earlobe and measures the blood's oxygen saturation using light. In addition to these sensors, a drone ambulance system can also use other sensors like GPS, altimeters, and cameras to offer more details on the patient's location, altitude, and visual views of the surrounding area. Together, these sensors offer a complete picture of the patient's status and aid medical professionals in determining the best course of action. [22]

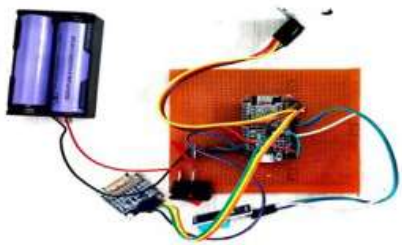

Figure 6. Sensors Connected to PCB Board

8. Software Used

The operation of a drone ambulance is highly automated and depends on modern technologies like GPS, sensors, and artificial intelligence. To ensure that the system runs correctly and securely, it also needs competent operators and medical professionals. The development of a drone ambulance may benefit from the use of the software platform Blynk, which enables the creation of Internet of Things (IoT) applications. The drone ambulance may have several sensors attached to gather information on the patient's vital signs and other health-related factors. [23]These sensors can be combined with an ESP module, which is then mounted on a PCB board and connected to the Blynk software platform via Wi-Fi or cellular connectivity. For creating custom Internet of Things (IoT) apps that can show real-time data and remotely manage devices, Blynk offers an intuitive user interface. [24] Real-time monitoring of the patient's vital signs and other health indicators is possible once the sensors have been integrated with Blynk and connected to the sensors.Figure.7 shows the different measured parameters of a patient through Blynk. The Blynk app displays the data in a variety of forms, including graphs, charts, and gauges, and can alert you if any of the parameters are outside of acceptable limits.[25]

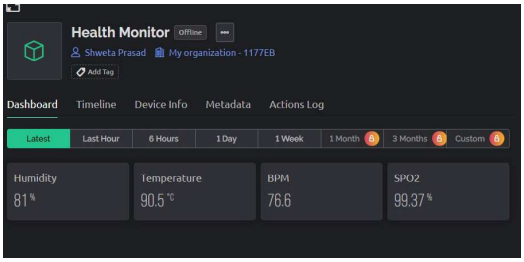

Figure 7. Blynk platform measuring the different parameters

9. Results

A prototype for a "DRONE AMBULANCE" is being developed to help ambulances save lives. The developed prototype arrives at the emergency site more rapidly and helps monitor and send real-time patient health information to the paramedic. By significantly enhancing a patient's chance of a full recovery, this prototype performs the "lifesaving" function. Based on the patient's health condition, the cloud-based server must be able to advise the local medical personnel how to help them. The drone must be equipped with GPS and other sensors to allow for safe terrain navigation and obstacle avoidance. It ought to have a remote control system so that medical experts on the ground can use it. In locations like remote areas or heavily populated areas where access to ground ambulance services is constrained, drone ambulance technology should be deployed. As a result, the difficulties faced on the ground can be considerably reduced by developing a drone-based ambulance system that can provide prompt medical attention to those in need during the "golden hour."

10. Conclusion

An intriguing and cutting-edge field of research and development is the use of drones in emergency medical treatment, specifically for measuring real-time parameters. Although there are still numerous obstacles to be cleared, including those related to guaranteeing the reliability and accuracy of the data collected, safeguarding patient privacy, and abiding by healthcare rules, this technology has enormous potential benefits. Rapid and accurate medical data collection in remote or difficult-to-reach regions has the potential to significantly improve patient outcomes and speed up emergency response times. To properly assess the efficacy of drone ambulances for measuring real-time metrics and address the issues related to their implementation, more study and development are necessary.The developed prototype travels more quickly to the scene of the emergency and assists in measuring and transmitting the patient's real-time health indicators to the ambulance where the paramedic may examine them. This prototype accomplishes the goal of "lifesaving" by making a significant, irreplaceable impact to the patient's survival.

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