HEXACOPTER SURVEILLANCE FOR NATURAL DISASTER SEARCH AND MEDICAL RESCUE

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Abstract:
Drones which are also known as UAVs (unmanned aerial vehicles) are successful in replacing humans in many aspects and they have a vast range of applications such as Aerial photography, Geographic mapping, Precision Agriculture, Search and Rescue, Military Purpose, Photogrammetry, delivery of medicine, conservation surveillance and many more. In this paper, we are going to explain in-depth the usage of drones in Surveillance and Health monitoring. In case of a natural disaster, it can scan the vast affected region and make the search and rescue (SAR) faster to save more human lives and provide crucial medical attention as early as possible. Drone surveillance facilitates gathering information about a mark as captured from a distance or altitude. Unmanned aerial vehicles (UAVs) can also contribute real-time visual data and information in the aftermath of an earthquake or hurricane. When an incident or disaster threatens lives and livelihoods, emergency responders need knowledge and real-time imagery to make promising outcomes and save time. UAVs can give situational perception over a large area quickly, lessening the time and the number of rescuers required to locate and protect a lost or injured person. They are also called the eye in the sky. Rescue drones are designed to procure cost-effective, imaging, and real-time data, day or night, in challenging situations and without any hazard to personnel.
Keywords: UAV, Aerial photography, Geographic mapping, Precision Agriculture, Photogrammetry, conservation surveillance, Earthquake, hurricane

1. Introduction:

Drones can accomplish a variety of activities in locales where people cannot go in. Continuous surveillance can be done utilizing a drone. Surveillance entails the survey of a person, a group of people, their actions, infrastructure, or buildings to collect, manage, or guide information.
Surveillance can take numerous forms, including camera surveillance, GPS monitoring, radio surveillance, and biometric surveillance, among others. Traditional manual monitoring methods have complications in efficiently locating and reaching areas of concern or defects in facilities. Furthermore, traditional surveillance is a labour-intensive task: many repetitive actions in diverse job occasions necessitate a large number of people, and labour expenses raise year after year. UAV systems are becoming more stable and mature as unmanned aerial vehicles (UAVs), computer vision, and sensor technologies advance, allowing them to handle these tough jobs at a cheaper cost and with greater security and reliability.

Through our system, when there is an emergency in a nearby area that the rescue team cannot reach in time due to heavy traffics and road damage at those particular periods, we will be sending our surveillance and health monitoring drone to the affected area. Using our system, we will be measuring the heartbeat rate and temperature of the victim by pulse sensor and temperature sensor. These results will be displayed on LCD and a message is sent automatically if the results are abnormal to the emergency numbers through the GSM module.
The rescue team will review the victim's results and provide medical help as quickly as feasible.

2. Literature Review:

From [1], the modelling of a four-rotor vertical take-off and landing (VTOL) UAV known as the quadrotor aircraft is surveyed and also explained the development of a PID (proportional-integral-derivative) control method to obtain stability in flying the Quad-rotor flying object. In the study of [2], they studied and depicted the behaviour of the Hexacopter under diverse payload parameters and assisted in minimizing the stress by executing stress Analysis at numerous points. From [3], in this work, they have evolved a quadrotor helicopter that is capable of fully self-sufficient inquiry in unstructured, foreign, and densely populated outdoor habitats without a prior map, relying entirely on sensors onboard the carrier. The quadcopter is monitored using RF remote controller and graphical user interface (GUI) and Communication between the quadcopter and GUI is done through Zigbee wireless communication.

From [4], the study of Real-time crises and crucial habitats are technically covered by smaller UAVs with refined strategies for forest surveillance in which, animal detection and recognition activity is playing a crucial role. The main idea of a surveillance drone [5], is to survey where we humans can't reach. There are many locales like industries and mines where human has to stake their life. So, the solution to this crisis can be brought up by employing a remote-controlled drone for surveillance. From [6], the protocol to design a UAV has been perspicuously expressed and a brief look at the UCAV and other arising technologies hardly scratched the surface of assigning UAVs in a strike function.

From [7], they employed a drone for surveillance in hazardous locales with chemical and biological hazards. They mainly surveyed about usage and differential diagnosis and treatment of patients using telecommunication in telemedicine and also drone as medical transport systems. From [8], the design of a Hexacopter which is utilized for carrying payload warehouse requests is illustrated and they are governed under different facets like Hexacopter design, multi-rotor design, Computer vision, ROS, Modelling, and Simulation.

From [9], the related strategies have been assessed according to their optimization objective, target type, operating mode, and the number of UAVs. They also surveyed the minimization of the number of UAVs for Surveillance and contributed some formulations for the deployment of a single UAV by inferring the availability of target provinces. Design of Service for Hospital Internal Transport of Urgent Pharmaceuticals via Drones [10], they acquired a co-creation methodology which is described as a blend of participatory actions from numerous stakeholders and users and a unique procedure arises.

3. Block Diagram and Block Description:

3.1 Block diagram and description of Drone:

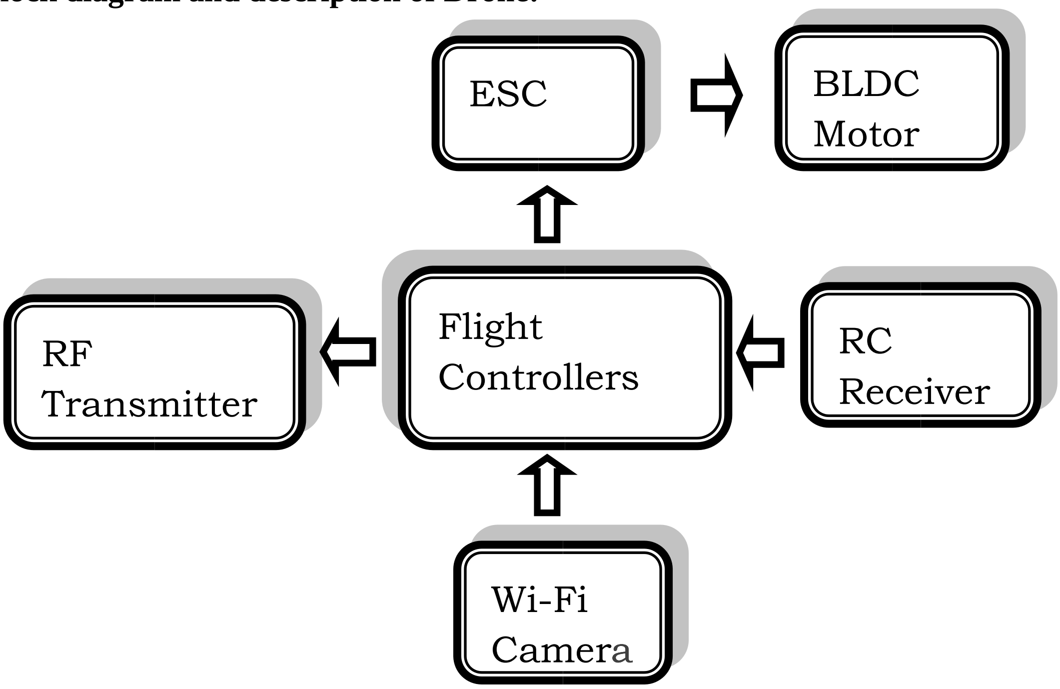

Fig.1. Block Diagram of Drone

The Hexacopter is made of six motors and six arms. The Flight controller KK 2.1.5 is the brain of the drone. The KK 2.1.5 flight controller is a circuit with a board of sensors that inspects the user's commands and movement of the drone. To accomplish the result the Flight Controllers require a list of input signals from diverse sensors such as accelerometers, gyroscope Sensors, and Magnetometers.
The Esc (electronic speed controllers) which is employed to control and modify the speed of the aircraft's electric motor is attached to the Flight controller board which is connected to the RC receiver. The RC Receiver FS-R6B gets its signals from the RF (Radio Frequency) Transmitter FSCT-6B which is controlled manually. The ESCs are used to control three directions which are roll, pitch, and yaw. Roll is the movement of the drone towards left or right, Pitch is the movement of the Drone toward Front or back and Yaw is the rotation of the drone Clockwise or Anti-clockwise direction.
The six arms of the drone are connected to six BLDC motors. The Brushless D.C 935 KV motor is to spin the propellers of multirotor drones to facilitate them to fly. Brushless motors are less weight and last longer. The Drone uses 1045 propellers to alter Rotary motion into linear thrust. The ESC module acts as an interface between BLDC motors and the controller.
The RF Transmitter and receiver board receives the data and transmits it wirelessly to the components via its antenna. The Flight controller IC processes the received signals and passes them to ESC which makes adjustments to BLDC motor rotational speed which in turn steadies our drone. The Wi-Fi camera is assembled into a Wi-Fi module that continuously monitors and sends images through the module.

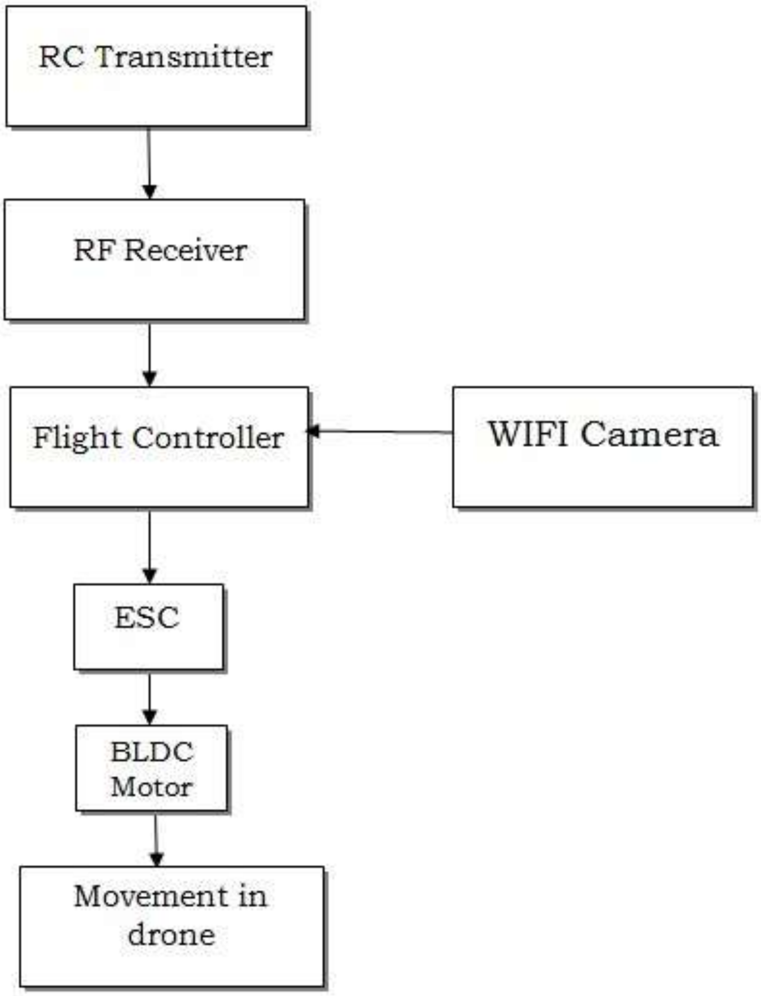

Fig.2. Flow Chart on working of Drone

Fig-1 is the block diagram of the drone which depicts the components and the connections, Fig2 is used to depict the flow chart on working of the drone and Table-1 indicates the Specifications of each component which are used to build the drone.

Table.1. Component Specifications of Drone

SNO	Components	Specifications
1	Flight controller	KK 2.1.5
2	Brushless motors	920Kv DC
3	Electronic speed controller	30 A
4	Battery	4200 MAH
5	Hexacopter frame	Plastic Frame
6	Propellers	1045 size
7	Transmitter	FSCT 6B
8	receiver	FS-R6B
9	Camera	Wi-fi

3.2 Block diagram and description of Health Monitoring Kit:

The open-source microcontroller board Arduino UNO is established on the Microchip ATmega328P microcontroller. The Pulse Sensor is connected to the analog pin-1 of the Arduino UNO. A pulse sensor is also known as a heart rate sensor or heartbeat sensor. The pulse sensor is connected to the fingertip or human ear to the Arduino board to measure the heart rate.

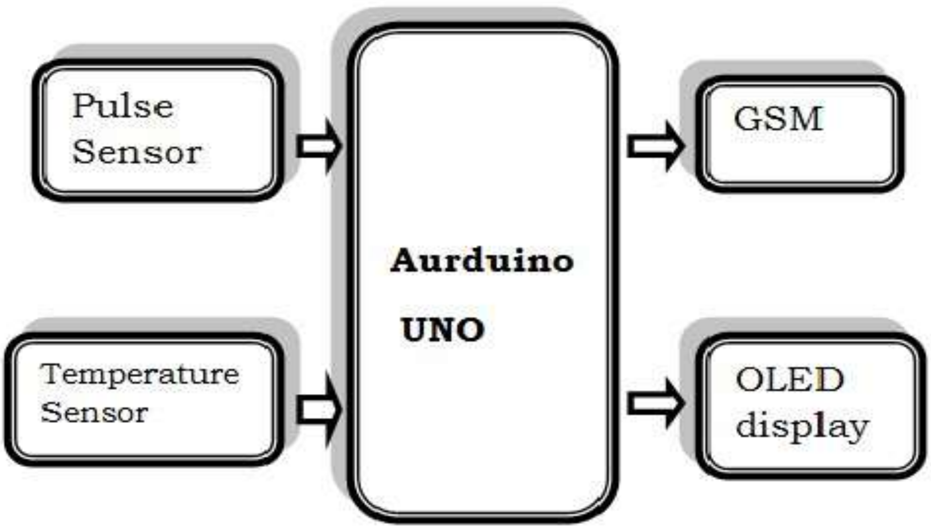

Fig.3. Block Diagram of Health Monitoring Kit

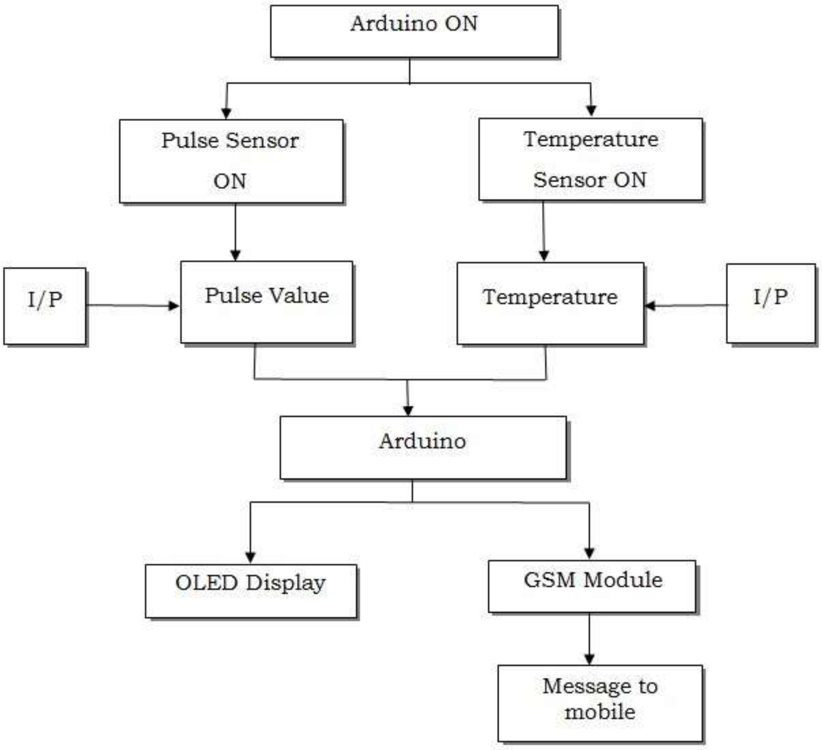

Fig.4. flow chart of Health Monitoring Kit

The 1-wire programmable Temperature sensor DS18B20 which is connected to digital pin-13 is widely utilized to measure temperature in harsh environments like in chemical solutions, mines or soil etc. The outputs from the above sensors are given to the GSM module and OLED display through Aurduino. A GSM modem or module (SIM9000) is a hardware appliance that uses GSM (Global System for Mobile communication) mobile telephone technology to procure a data link to a remote network. OLED (128X64) is an organic light emitting diode that radiates light in response to an electric current. An OLED display functions with no backlight so it can exhibit a deep black level.

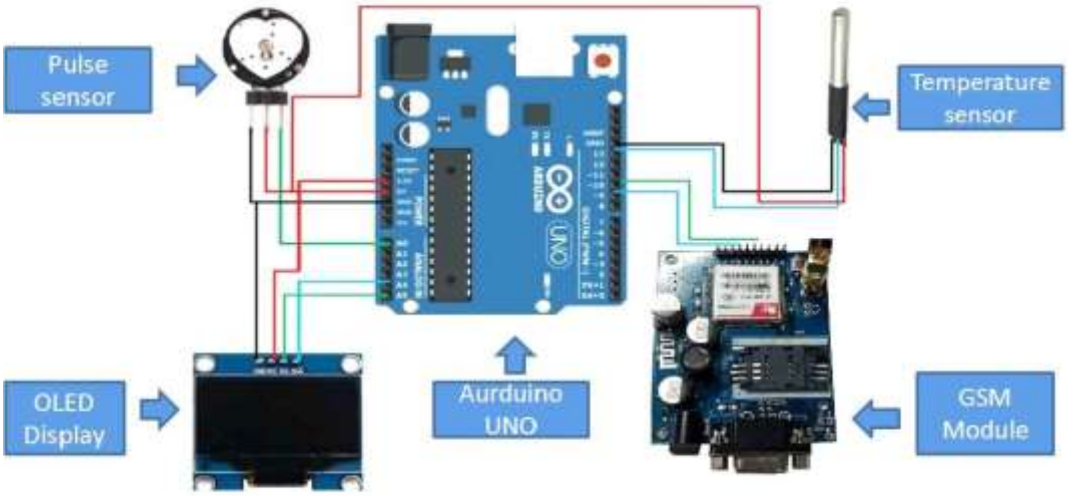

Fig.5. Circuit Connections of Health monitoring Kit

When the Power supply is given to the Aurduino the Pulse sensor and temperature sensor when provided the required inputs produce the results which are given to the OLED display and GSM module. The GSM module sends these results to specific mobile numbers.

Fig-3 is the block diagram of the health monitoring which depicts the components and the connections, Fig-4 depicts the flow chart of working of Health monitoring kit, Fig-5 shows the circuit connections of the health monitoring kit and Table-2 indicates the Specifications of each component which are used in Health monitoring kit.

Table.2. Component Specifications of Health monitoring Kit

S.NO	COMPONENT	SPECIFICATION
1.	Aurduino UNO	UNO
2.	GSM module	SIM 900A
3.	OLED Display	128X64
4.	Pulse Sensor	PULSE
5.	Temperature Sensor	DS18B20
6.	Resistor	4.7K
7.	Battery	9V
8.	Heat sink	6mm,9mm

4. Results and Simulation:

4.1 software simulation:

The software implementation of the health monitoring kit is depicted in Fig-6 and the simulation outcome for the health monitoring kit is depicted in Fig-7 which indicates both the temperature and pulse readings and the output is also displayed on the OLED screen. The BPM output for various conditions is changed using a pulse controller and under different circumstances, the values are obtained.

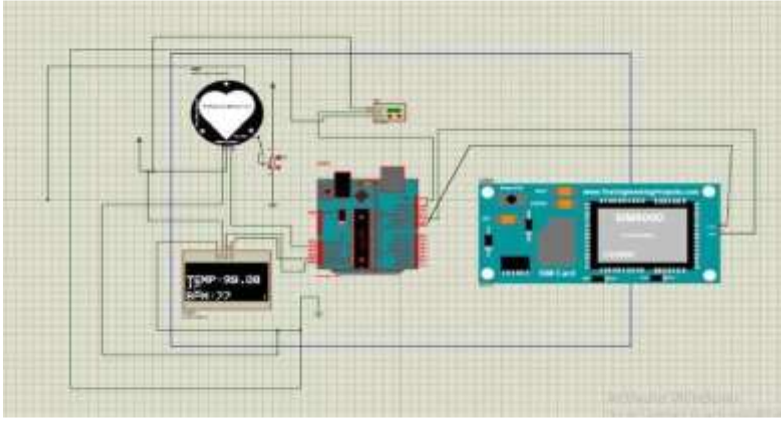

Fig.6. software implementation of health monitoring kit

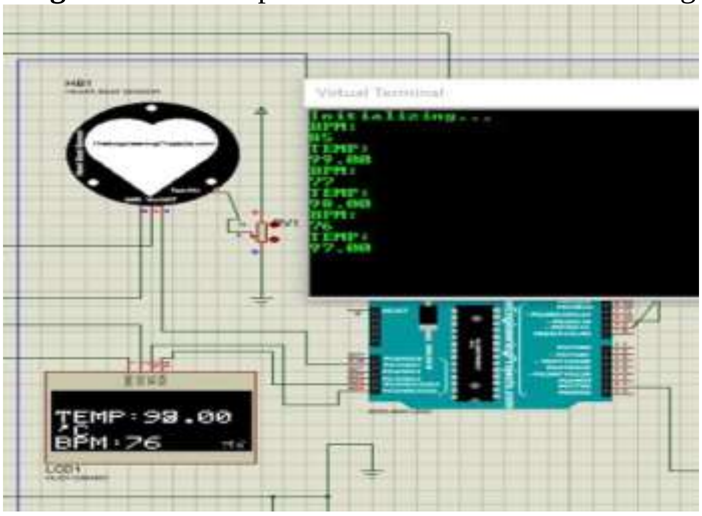

Fig.7. Simulation output of health monitoring kit

3.2 Hardware implementation:

The Hardware implementation of the health monitoring kit and the hardware output is depicted in the Fig-8 and the Hardware implementation of the Hexacopter is depicted in fig-9. The Hexacopter is then attached to a health monitoring kit depicted in fig-10 which is used for medical rescue and surveillance in the places where rescue teams couldn't reach during natural disasters and when the UAV during surveillance spots a person in need of immediate rescue will be provided.

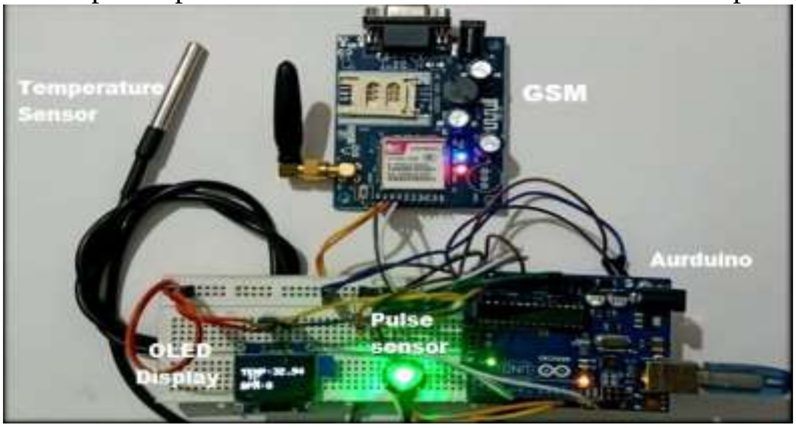

Fig.8. Hardware implementation of the health monitoring kit

Fig.9. Hardware implementation of the Drone

Fig.10. Drone with Health monitoring kit for surveillance

5. Future Scope:

The usage of UAVs has promptly changed over the past years and the future openings in the area are endless. The Future holds a tremendous scope for self-piloting drones. Drones are widely used in fields like Agriculture, Conservation, Disaster mitigation, Filmmaking, Journalism, etc.

Drones with their capacity, incredible features, advanced technologies, and robust nature can be widely used in a large number of fields reducing the manpower and threat to lives.

6. Conclusion:

There are many circumstances where medical assistance is not available promptly, resulting in many individuals losing their lives. We will give continuous surveillance and health monitoring to victims of natural catastrophes using our system. The modules used are smaller and lighter, allowing them to be moved around more easily. It has a simpler circuit and consumes less power. We can lessen the loss of human life by giving in-time medical aid by providing continuous monitoring. This research is critical for surveillance and health monitoring in rural regions and after natural disasters. It will aid in the reduction of human life loss by informing victims of the target.

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