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# WIRELESS VIDEO SURVEILLANCE AND COMMAND THROUGH AUDIO TRANSMITTING SYSTEM IN AERIAL VEHICLE

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*ABSTRACT*

A drone is defined as an aerial vehicle which uses aerodynamic forces to provide vehicle lift, can be recoverable or expandable, can be piloted remotely or fly autonomously, does not carry a human operator, and can carry a non-lethal or lethal payload. Beforehand, drones were used only for military applications like spying on both international and domestic threats because they do not put the life of a pilot at risk in combat zones. In addition, they do not need rest, which enables them to fly as long as there is fuel in the craft. Currently, the developed drones can be used in a vast number of applications, such as deliveries, policing, monitoring flooded areas, and many others that were discussed in this report. The mechanism described in this report targets multiple disciplines that fall under the Mechatronics umbrella, which comprises mechanical, electrical, and digital components. This project focuses on designing and developing Wireless video surveillance and command through Audio Transmitting system in aerial vehicle that can be used in different applications, specifically in Monitoring and for conversation. Different analyses were made on the drone to choose the best available material, guarantee its longevity, and ensure its safety.

Keywords: UAV technology (drone), Flight Mechanism, Aerial Vehicle

## 1.INTRODUCTION

The UAV technology (drone) has gained a lot of interest in the last couple of years. It is one of the fastest growing sectors related to IT. The concept of using drones to hover around crime scenes to collect information and evidence in order to speed up remote investigations and to provide fast-response units is already implemented in the United States. Nowadays, drones are able to use sensors such as laser, infra-red, and optical sensors to keep track of its environment from multiple angles to imitate the human eye. By taking advantage of this technology, a drone is able to navigate on its own to accomplish any task that it was set to perform. With the advancements in technology, more precisely intelligent systems, it is now possible to customize and increase the autonomy of drones.

This amazing advancement of an astonishing technology in drones has produced and developed applications that led to new fields. Now, drones can be used for several purposes

in various areas. Drones can be utilized as a guiding unit for disabled people for navigation purposes.

## 2.0 SAFETY SENSOR

Understanding and dealing with safety aspects of crowd dynamics in mass gatherings of people related to sports, religious and cultural activities is very important, specifically with respect to crowd risk analysis and crowd safety. Historical trends from the Kingdom of Saudi Arabia hosting millions of pilgrims each year during the Hajj and Omrah seasons suggest that stampedes in mass gatherings occur frequently and highlight the importance of studying and dealing with the crowd dynamics more scientifically. In this regard, efficient monitoring and other safe crowd management techniques have been used to minimize the risks associated with such mass gathering. An example of these techniques is real-time monitoring of crowd using a UAV (Unmanned Aerial Vehicle); this technique is becoming increasingly popular with the objective to save human lives, preserve environment, protect property, keep the peace, and uphold governmental authority.

Yun Sun et al., suggests a methodology (conception and principles) for building two-mode monitoring systems (SMs) for industrial facilities and their adjacent territories based on the application of unmanned aerial vehicle (UAV), Internet of Things (IoT), and digital twin (DT) technologies, and a set of SM reliability models considering the parameters of the channels and components. The concept of building a reliable and resilient SM is proposed. For this purpose, the von Neumann paradigm for the synthesis of reliable systems from unreliable components is developed. For complex SMs of industrial facilities, the concept covers the application of various types of redundancy (structural, version, time, and space) for basic components sensors, means of communication, processing, and presentation in the form of DTs for decision support systems. The research results include: the methodology for the building and general structures of UAV-, IoT-, and DT-based SMs in industrial facilities as multi-level systems; reliability models for SMs considering the applied technologies and operation modes (normal and emergency); and industrial cases of SMs for manufacture and nuclear power plants.

### 2.1 REAL TIME MONITORING

The Unmanned Aerial Vehicle (UAV) is an emerging technology being adaptedfor a wide range of applications. Real-time monitoring is essential to enhance the effectiveness of UAV applications. Sensor networks are networks constructed from various sensor nodes. International standard such as OGC's SOS (Sensor Observation Service) makes it possible to share sensor data with other systems as well as to provide accessibility to globally distributed users. In this paper, we propose a system combining UAV technology and sensor network technology to usean UAV as a mobile node of sensor network so that the sensor data from UAV is published and shared real-time. A UAV can extend the observation range of a sensor network to remote areas where it is usually difficult to access such as disaster area. We constructed a UAV system using remote-controlled helicopter and various sensors such as GPS, gyrocompass, laser range finder, Digital camera and Thermometer. Furthermore, we extended the Sensor Observation Service (SOS) andSensor Service Grid (SSG) to support mobile sensor nodes. Then, we conducted experiments of flying the helicopter over an area of the interest. During the flight, the system measured environmental data using its sensors and captured images of the ground. The data was sent to a SOS node as the ground station via Wi-Fi whichwas published using SSG to give real time access to globally distributed users

3.0 DESIGN FOR THE QUADCOPTER

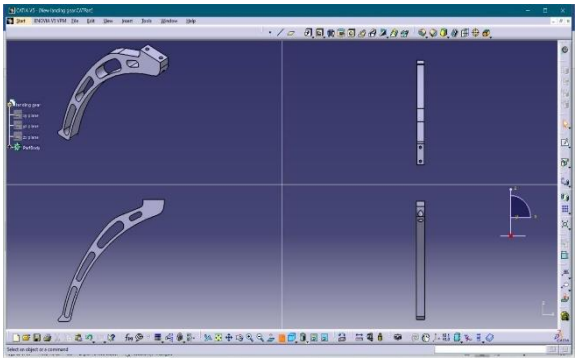


Fig:3.1 – Landing Gear

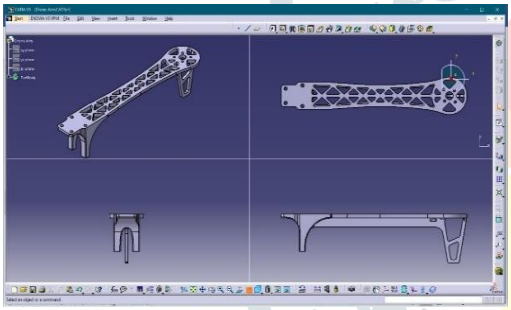


Fig: 3.2 Arms

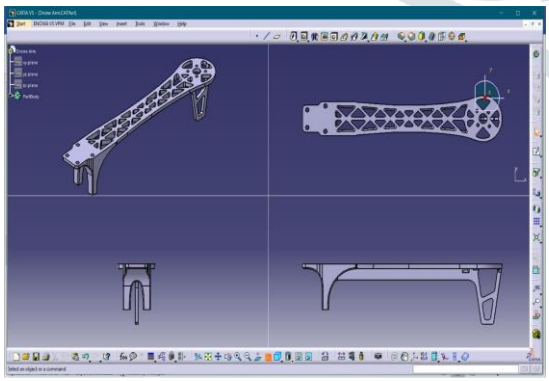
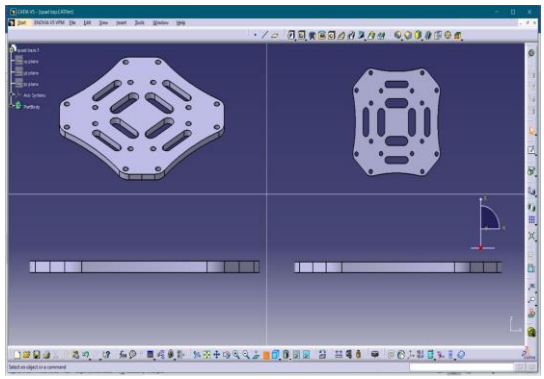


Fig: 3.3 – Power Distribution Board

Fig: 3.4 – Arm Holder



3.1 SUMMARY

CATIA is a 3D computer-aided design software used for drone design. It enables users to create and analyze complex models and simulations for aerodynamics, structural integrity, and manufacturing. With its intuitive interface and comprehensive tools, CATIA is an ideal solution for designing and optimizing drone prototype.

**4.1 Motion of UAV**

The presented concept has been implemented and integrated in the self- developed quadcopter of the chair. The SRF05 ultrasonic sensor has been chosen because of its low price, high range of measurement, and easy communication interface for several entrants using I2C interface. The sensors would be mounted using wooden plates cut with a CNC. One sensor holder with three ultrasonic sensors has been mounted on each side arm of the quadcopter. The three sensors of one side arm are fused to calculate the distance data for the collision avoidance of one direction. Hence the collision avoidance module uses four directions and consists of two collision avoidance state machines dedicated to the roll and pitch angles.

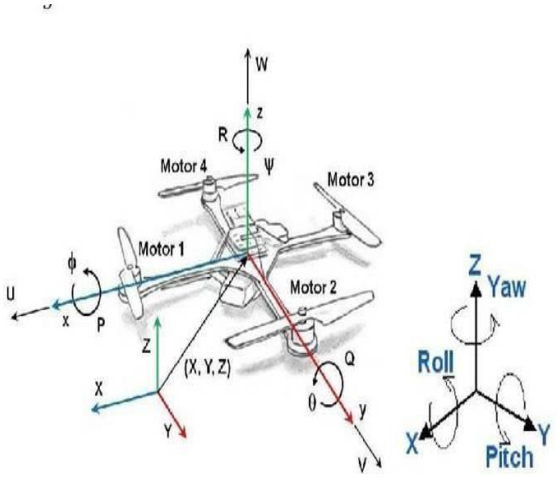



Fig: 4.1 – Motion of Drone

Another problem is the fact, that the rotations of the quadcopter manipulate the ultrasonic measurements. Therefore, measurements from the IMU like the angular rate from the gyroscope are used to detect rotations and dismiss incorrect measurements of the ultrasonic sensors.

## 4.2 WORKING PRINCIPLE

A quadcopter has four propellors at four corners of the frame For each propeller, speed and direction of rotation are independently controlled for balance and movement of the drone in a traditional quadrotor, all four rotors are placed at an equal distance from each other To maintain the balance of the system, one pair of rotors rotates in a clockwise direction and the other pair rotates in an anti-clockwise direction to move up (hover), all rotors should run at high speed. By changing the speed of rotors, the drone can be moved forward, backward, and side-to-side.

## 4.3 EXISTING METHODOLOGY

A surveillance drone, also known as an unmanned aerial vehicle (UAV), is an aircraft that is controlled remotely by a human operator. The primary purpose of a surveillance drone is to capture images or video footage of a specific area, which can then transmit wirelessly to a ground station for analysis. Here is a general overview of how a surveillance drone works:Launch: The drone is launched from a ground station or by hand. Flight: The drone is flown to the desired location, either manually by a human operator or using pre-programmed flight patterns.Surveillance: The drone uses its onboard camera to capture images or video footage of the area being surveilled. This footage is transmitted wirelessly to a ground station or other remote location for analysis.Analysis: The footage captured by the drone is analyzed by human operators or software algorithms to identify any potential threats or other relevant information.Response: Based on the analysis, appropriate action can be taken, such as dispatching emergency services or providing additional resources to the area.Landing: The drone returns to its launch location and lands either automatically or with the assistance of a human operator.

## 4.3 PROPOSED METHODOLOGY

The proposed system of wireless video surveillance and command through audio transmitting system in an aerial vehicle for human use is a technology that utilizes unmanned aerial vehicles (UAVs) or drones to transmit real-time video footage and audio commands from a remote location to a ground station. This technology can be useful in a variety of applications, including military operations, law enforcement, and search and rescue missions.

The system works by using a camera installed on the drone to capture video footage, which is then transmitted wirelessly to a ground station using a video transmission system. The audio transmitting system is used to send commands from the ground station to the drone. The drone is controlled by a human operator who sends commands to the drone via the audio system.

## 4.4 HARDWARE IMPLEMENTATION

We have used aluminum bar instead of carbon fiber bar to minimize cost. A plastic made

landing gear is used to land the machine softly and spread the landing force over the body. Four brushless motors are mounted on the top of the aluminum bar and a servo motor is placed underneath of each brushless motor. Middle part of the body contains all the payloads (ESC, Controller, RF receiver, battery and mobile device). the total connections between all electronic components.

## 5.0 RESULT AND DISCUSSION

The Main aim of this project was to develop a Drone which can be used in several surveillance and for commanding purposes. This project focuses on designing and developing Wireless video surveillance and command through Audio Transmitting system in aerial vehicle that can be used in different applications, specifically in Monitoring and for conversation. Different analyses were made on the drone to choose the best available material, guarantee its longevity, and ensure its safety.

## 6.0 CONCLUSION

Wireless video surveillance and command through audio transmitting system in aerial vehicles, also known as drone surveillance, has become increasingly popular in recent years due to advancements in technology and the need for remote surveillance capabilities. The system involves using a drone equipped with a camera and a wireless audio transmitting system to capture video footage and transmit it back to a remote control center. One of the main advantages of wireless video surveillance and command through audio transmitting system in aerial vehicles is the ability to monitor remote or inaccessible areas from a safe distance. This can be particularly useful in situations where it is dangerous or difficult for humans to access, such as in disaster zones, hazardous environments, or conflict zones. Another advantage is the ability to rapidly deploy the system and quickly gather visual and audio data. Drones can be easily transported to the desired location and can begin recording and transmitting data within minutes of arrival. However, there are also several limitations and challenges associated with drone surveillance. One major concern is privacy, as the use of drones for surveillance can potentially violate individuals' privacy rights. It is important to ensure that appropriate privacy laws and regulations are followed when using drone surveillance. Another challenge is the limitations of the wireless transmission system, as the quality of the video and audio data may be impacted by factors such as distance, interference, and environmental conditions. It is important to ensure that the wireless system is robust and reliable to ensure high-quality data transmission.

In addition, there are also technical limitations related to the drone's battery life, flight time, and payload capacity, which can impact the length and quality of the video and audio data that can be captured.

For controlling the Drone, 2.4 GHz radio frequency transmitter, receiver, microcontroller, electronic speed controller, brushless DC motor and RF transmitter receiver have been used. The proportional, integral controller action shows the better performance of controlling the roll of developed Drone, for live audio commanding and live video footage feedback is also demonstrated. Demonstration shows the successful operation of Drone commanding and video footage transmission from Drone.

## 7.1 FUTURE ENHANCEMENT

The future scope for wireless video surveillance and command drones with audio transmitting systems is promising, with potential applications in law enforcement, disaster response, search and rescue, environmental monitoring, industrial applications, military operations, and agriculture. As technology continues to evolve, we can expect even more advanced and capable drones with even more diverse applications in the future.

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