MINI WINGS OF LIFE

A report submitted in partial fulfilment of the Academic requirements for the award of the degree of

Bachelor of Technology

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UNDER THE COURSE

SOCIAL INNOVATION IN PRACTICE

CENTRE FOR ENGINEERING EDUCATION RESEARCH

CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous)

(NAAC Accredited with 'A+' Grade & NBA Accredited)

(Approved by AICTE, Permanently Affiliated to JNTU Hyderabad)

KANDLAKOYA, MEDCHAL ROAD, HYDERABAD-501401 2022-2023.

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CERTIFICATE

This is to certify that the report entitled **" MINI WINGS OF LIFE "** is a bonafide work done by P. Alekhya(21H51A0495), P. Sai Kiran Goud(21H51A0497), P. Gopi Sai Kumar(21H51A0498), R.Srinu(21H51A0499), D. Madhumitha(21H51A0B0), T. Parthusha(21H51A0C8) of II year B.Tech, II Semester in partial fulfilment of the requirements for the award of the degree of Bachelor of Technology, submitted to Centre for Engineeing Education Reasearch, CMR College Of Engineering & Technology, Hyderabad during the Academic year 2022-2023.

(Names of the project coordinators) **(Mr. B. Suresh Ram)**

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DECLARATION

We, the students of II year B.Tech II semester of Centre of Engineering Education Research,

CMR COLLEGE OF ENIGNEERING & TECHNOLOGY, Kandlakoya, Hyderabad, hereby declare, that under the supervision of our course coordinators, we have independently carried out the project titled "MINI WINGS OF LIFE" and submitted the report in partial fulfilment of the requirement for the award of Bachelor of Technology in by Jawaharlal Nehru Technological University, Hyderabad (JNTUH) during the academic year 2022-2023.

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We own all our success to our beloved parents, whose vision, love and inspiration has made us reach out for these glories.

ABSTRACT

Mini drone surveillance cameras have emerged as a powerful tool for aerial surveillance and monitoring applications. These compact and agile drones equipped with high-resolution cameras offer unique perspectives and real-time visual information, enhancing situational awareness. The integration of stabilization mechanisms ensures steady footage and minimizes vibrations, providing clear and usable imagery. Additionally, autonomous flight features and intelligent algorithms enable predefined flight paths, automated tracking, and object recognition. Despite limitations such as flight time, payload capacity, and regulatory considerations, advancements in technology are continuously addressing these challenges. Future developments hold promise for improved battery efficiency, extended flight times, and enhanced object detection capabilities. In conclusion, mini drone surveillance cameras have the potential to revolutionize surveillance operations, providing valuable insights and enhanced surveillance capabilities from above.

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CHAPTER-1

1.INTRODUCTION

Mini Wings of Life is a project to develop a small, lightweight drone equipped with a esp32 cam . The drone will be used to search for people in distress in difficult-to-reach areas, such as forests, mountains, and urban rubble.The thermal camera will allow the drone to see people in the dark or through smoke and other obscurants. This will make it possible to find people who are lost, injured, or trapped in a disaster. The drone will be small enough to fly through narrow passages and over obstacles. It will also be able to hover in place, making it easy to scan an area for people.Mini Wings of Life has the potential to save lives. It will be a valuable tool for search and rescue teams, law enforcement, and other organizations that need to find people in distress.

The project is still in the early stages of development, but we are confident that it has the potential to make a real difference in the world. We are excited to continue working on the project and to bring it to fruition.

CHAPTER-2

2. LITERATURE REVIEW

1. Introduction:
    - Definition of mini drones with cameras
    - Importance and potential applications
2. Aerial Robotics and Mini Drones:
    - Overview of aerial robotics and drone technology
    - Evolution of mini drones
    - Types and characteristics of mini drones with cameras
3. Design and Construction:
    - Lightweight materials and components
    - Miniature camera systems
    - Sensor integration and stabilization mechanisms
4. Flight Control and Navigation:
    - Autonomy and flight control algorithms
    - Sensing and perception for mini drones
    - Obstacle avoidance and path planning
5. Computer Vision and Image Processing:
    - Object detection and tracking
    - Visual odometry and SLAM techniques
    - Image stabilization and quality enhancement

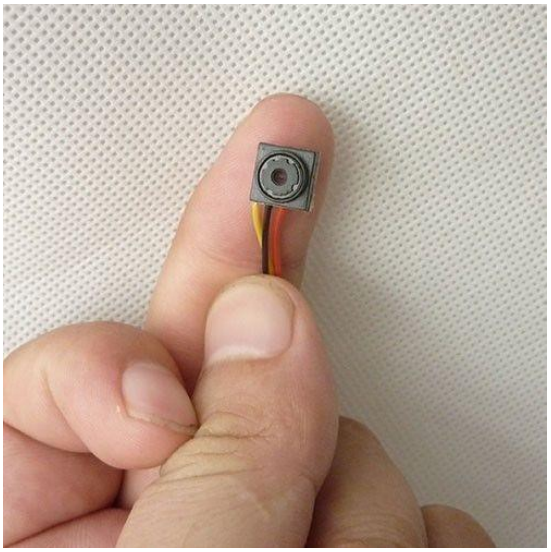

Fig. 2.1 mini camera

Aerial Photography and Videography:

- Applications in aerial photography and videography
- Camera capabilities and image/video capture techniques
- Image and video processing for aerial content

6. Challenges and Future Directions:

- Battery life and energy efficiency
- Safety and regulations
- Swarm intelligence and cooperative behaviors
- Integration with emerging technologies (e.g., AI, VR/AR)

7. Conclusion:
   - Summary of key findings
   - Potential future developments and applications
   - Areas requiring further research and exploration

Fig. 2.2 mini drone

The literature survey will include an extensive review of relevant scientific papers, conference proceedings, books, and patents to provide a comprehensive understanding of the current state of mini drones with cameras. It will also explore practical applications, technological advancements, and challenges associated with this emerging field.

CHAPTER-3

EXISTING SOLUTIONS:

A.Multi Rotor Drones:

Multi-rotor drones are the easiest and cheapest option for getting an 'eye in the sky.' They also offer greater control over position and framing, and hence they are perfect for aerial photography and surveillance. They are called multi-rotor because they have more than one motor, more commonly tricopters (3 rotors), quadcopters (4 rotors), hexacopters (6 rotors) and octocopters (8 rotors), among others. By far, quadcopters are the most popular multi-rotor drones.

Disadvantages:

Multi-rotor drones have limited endurance and speed, making them unsuitable for large scale aerial mapping, long-endurance monitoring and long-distance inspection such as pipelines, roads and power lines.They are fundamentally very inefficient and require a lot of energy just to fight gravity and keep them in the air.With the current battery technology, they are limited to around 20-30 minutes when carrying a lightweight camera payload. However, heavy-lift multi-rotors are capable of carrying more weight, but in exchange for much shorter flight times.Due to the need for fast and high-precision throttle changes to keep them stabilised, it isn't practical to use a gas engine to power multi-rotors, so they are restricted to electric motors. So until a new power source comes along, we can only expect very small gains in flight time.

Fig. 3.1 Multi Rotor Drone

B.Fixed Wing Drones:

A fixed-wing drone has one rigid wing that is designed to look and work like an aeroplane, providing the lift rather than vertical lift rotors. Hence, this drone type only needs the energy to move forward and not to hold itself in the air. This makes them energy-efficient.

Disadvantages:

Fixed-wing drones can be expensive.

Training is usually required to fly fixed-wing drones. The first time you launch a fixed-wing drone, you need to be confident in your abilities to control through the flight and back to a soft landing. A fixed-wing drone is always moving forward, and they move a lot quicker than a multi-rotor, and hence you might not get a chance to put it into a hover. In most cases, a launcher is needed to get a fixed-wing drone into the air.With fixed-wing, the flight is just the beginning. The hundreds and thousands of captured images have to be processed and stitched together into one big tiled image. There is a lot more to be done after this, including performing data analysis, such as the stockpile volume calculations, tree counts, overlaying other data onto the maps, and so on.

Fig. 3.2 Fixed wing Drone

C.Single Rotor Drone:

Single-rotor drone types are strong and durable. They look similar to actual helicopters in structure and design. A single-rotor has just one rotor, which is like one big spinning wing, plus a tail rotor to control direction and stability.

DISADVANTAGES:

Single-rotor drone types are complex and expensive.

They vibrate and aren't as stable or forgiving in the event of a bad landing.

They also require a lot of maintenance and care due to their mechanical complexity.

The long, heavy spinning blades of a single rotor can be dangerous.

Fig 3.3 Single Rotor Drone

D.Fixed-Wing Hybrid Vtol:

Hybrid VTOL drone types merge the benefits of fixed-wing and rotor-based designs. This drone type has rotors attached to the fixed wings, allowing it to hover and take off and land vertically. This new category of hybrids are only a few on the market, but as technology advances, this option can be much more popular in the coming years. One example of fixed-wing hybrid VTOL is Amazon's Prime Air delivery drone.

DISADVANTAGES:

Only a handful of fixed-wing hybrid VTOLs are currently on the market

The technology used in these drone types is still in the nascent stage.

Fig. 3. Hybrid vlot

CHAPTER-4

4.PROBLEM DEFINITION

4.1Community interaction with the concerned project team

With the aim of social innovation, we initially set our sights to a solution to a pesky problem that can turn out to be fruitful to many of the people living out there in the dark reality of sorrow. But, after visiting the village, one can easily acclaim it as a developing village i.e, on a verge of becoming a town. In the initial stages, we didn't come across any sort of serious problems that are being faced by the people in that village. We enquired some handful of houses only through which we came to know that their problems have been addressed earlier and even been cleared.

Into the last hour of the visit, we identified a problem, which turned out to be the chosen as our course project.

4.2 Problem statement

Around the world , daily so many people are missing in the forest areas , disaster areas . They all are dying because of not finding them in respective time . Human is the one , who can't go to multi stored building , where there is fire in the building . Humans does not aware of what there is in front of them , when he/she is in the forest . There may be a chance of wild animals present in front of them. Human can't fly and see what happening on the earth from the top. So many people are dying because of not locating them and rescuing quickly.

4.3 Objective

The main aim of the mini drone, where a camera is placed on it. These drones are used in variety of areas. As these are small in size we use to detect and monitor the wild life , humans in the disaster areas . We can easily go to a closest places where we cant want do monitor or research. The camera attached to it , can be used as the monitoring devices . We can get an

pictorial data from the camera , we can access the data from the display or link with our mobile .

Advantages;

- Small in size
- Less cost
- Efficiency is more
- Less noise and very light weight design
- Easy screening of sourroundings

4.4REQUIREMENT ANALYSIS

The required materials for this project are :-

A.Frame with Canopy:

The frame and canopy will protect your drone from rain, snow, dust, and other debris.

Fig 4.4.1 Frame with Canopy

B.Fight Controller Primus V4:

The Primus V4 flight controller is a powerful and versatile tool that can be used for a variety of tasks.

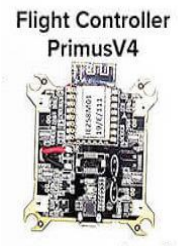

Fig 4.4.2 Fight Controller Primus V4

C.Jumper wires:

With these wires, the connections are given. This make the connection of modules to the Arduino, so that correct functioning of the project or modules takes place.

The whole project is connected using jumper wires.

Male-to-Female jumper wires:

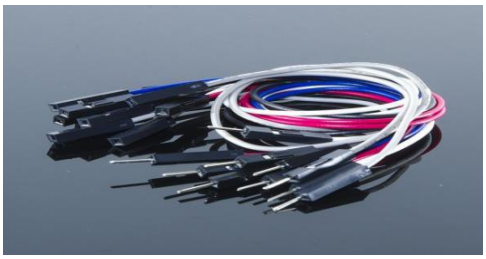

Fig 4.4.3 Jumper wires

D.Propellers:

propellers are used to generate thrust which allows drones to fly.

Fig 4.4.4 Propellers

E.Battery :

3.7V 1800mAh Lipo Battery

Fig 4.4.5 Battery

F.Propellers Gaurds:

Reduces the damage to propellers.

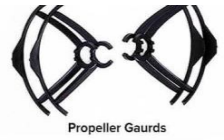

Fig 4.4.6 Propllers Guards

G.Motor:

Drone motors are used to spin the propellers, which create thrust that allows the drone to fly.

Fig 4.4.7 Motor

H.ESP 32 CAM:

The ESP32 Camera is a popular development board that combines the capabilities of the ESP32 microcontroller with a camera module, allowing users to build projects that involve capturing and processing images or video. It is widely used in various applications, such as surveillance systems, robotics, IoT devices, and computer vision projects. Here is an overview of the ESP32 Camera module:.

Fig 4.4.8 ESP32 CAM

I.FTDI module:

The FTDI module refers to a range of USB-to-serial converter modules developed by Future Technology Devices International (FTDI). These modules are widely used for interfacing microcontrollers or other serial devices with a computer via USB. FTDI modules provide a convenient way to enable serial communication between devices and a computer without the need for complex hardware or additional drivers.

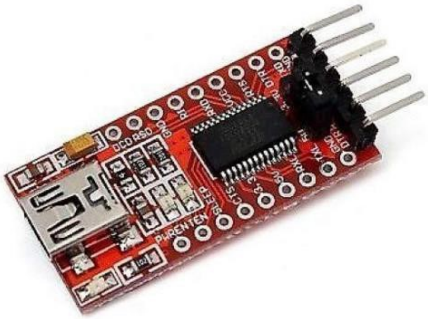

Fig 4.4.9 ftdi module

4.5 METHODOLOGY

This project is completely depends upon the code we write and the sensors we use. In the code, we write that when the sensor senses the property and the type of input it want, it gives information of the object.

When a person wears our proposed device while walking, the sensors in the device senses the object around him/her , and alert the person about the obstacle near them.

CHAPTER-5

5.1 CONCEPTUAL DESIGN

This prototype helps a blind person to know the obstacles in between the way. And, it doesn't require more equipment.

When a blind person wear the band the ultrasonic sensor in the band activates and continuously sense sonic waves to calculate distance and to locate objects nearby the person.when the object is detects by the ultrasonic sensor it sends information to the aurdino and activates its buzzer .

Arduino NANO is used as a micro controller since it can process the input and gives the respective output on the console and it as the base of the project.

5.2 BLOCK DIAGRAM

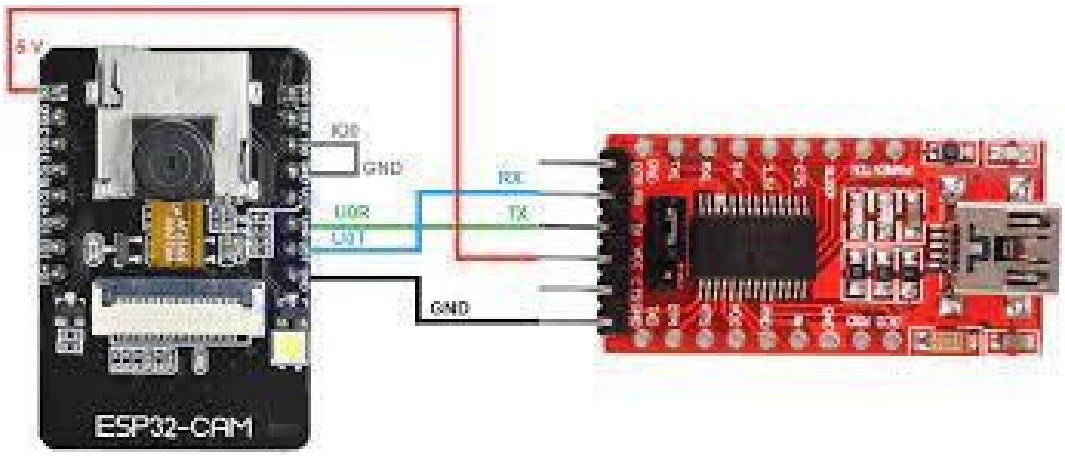

Fig 5.2 block diagram

5.3 DESIGN DESCRIPTION

Design of Mini Surveillance Drone:

1. Frame and Structure:

- Select a lightweight and durable frame material, such as carbon fiber or high-strength plastic, to minimize weight while ensuring structural integrity.

- Choose a compact and aerodynamic frame design for stability and maneuverability during flight.

- Incorporate foldable arms or modular components for easy transportation and storage.

2. Propulsion System:

- Use brushless DC motors for efficient and powerful thrust.

- Select propellers with an appropriate size and pitch for the desired payload capacity and flight characteristics.

- Include electronic speed controllers (ESCs) to regulate the motor speed and provide smooth and responsive control.

3. Flight Controller:

- Integrate a reliable flight controller module, such as the Pixhawk or DJI Naza, for stable and autonomous flight control.

- The flight controller should have built-in sensors like accelerometers, gyroscopes, and a barometer for accurate flight data and altitude control.

- Ensure compatibility with GPS modules for precise navigation and position hold capabilities.

4. Camera System:

- Choose a high-resolution camera module capable of capturing images or videos in real-time.

- Incorporate a gimbal system for stabilized camera movements and vibration isolation.

- Consider adding pan and tilt functionality to provide flexible viewing angles.

- Integrate a video transmitter for real-time video transmission to a ground station or remote control device.

5. Onboard Electronics:

- Include a power distribution board (PDB) to distribute power from the battery to various components.

- Use a flight control telemetry system for data transmission between the drone and ground control station.

- Implement an onboard microcontroller, such as an Arduino or Raspberry Pi, for additional processing and customization.

6. Sensors and Payload:

- Integrate additional sensors for enhanced surveillance capabilities, such as proximity sensors, thermal imaging cameras, or gas sensors.

- Consider including a payload release mechanism for delivering small objects or performing specific tasks.

7. Communication:

- Utilize a reliable and long-range radio control system for piloting the drone.

- Implement a secure and encrypted communication protocol for transmitting video and telemetry data.

- Ensure compatibility with ground control software for monitoring and controlling the drone during surveillance missions.

8. Power System:

- Select a lightweight and high-capacity lithium polymer (LiPo) battery for extended flight time.

- Incorporate a battery monitoring system to ensure safe operation and prevent over-discharge or overcharge.

9. Safety Features:

- Install propeller guards to protect the propellers and enhance safety during indoor or close-quarters operation.

- Implement fail-safe mechanisms, such as return-to-home (RTH) and low battery voltage return, to ensure the drone returns safely in case of signal loss or low battery.

10. Regulatory Compliance:

- Familiarize yourself with local regulations and adhere to guidelines for drone operations, including weight restrictions, airspace regulations, and privacy considerations.

Note: It's essential to consult relevant regulations and guidelines and prioritize safety when designing and operating a surveillance drone.

5.4 ADAVANTAGES

- Small in size
- Less cost
- Efficiency is more
- Less noise and very light weight design
- Easy screening of sourroundings

CHAPTER 6

IMPLEMENTATION

6.1 SOURCE CODE

```
#include "esp_camera.h"

#include <WiFi.h>


//

// WARNING!!! PSRAM IC required for UXGA resolution and high JPEG quality

//           Ensure ESP32 Wrover Module or other board with PSRAM is selected

//           Partial images will be transmitted if image exceeds buffer size

//


// Select camera model

#define CAMERA_MODEL_WROVER_KIT // Has PSRAM

//#define CAMERA_MODEL_ESP_EYE // Has PSRAM

//#define CAMERA_MODEL_M5STACK_PSRAM // Has PSRAM

//#define CAMERA_MODEL_M5STACK_V2_PSRAM // M5Camera version B Has PSRAM

//#define CAMERA_MODEL_M5STACK_WIDE // Has PSRAM

//#define CAMERA_MODEL_M5STACK_ESP32CAM // No PSRAM

//#define CAMERA_MODEL_AI_THINKER // Has PSRAM

//#define CAMERA_MODEL_TTGO_T_JOURNAL // No PSRAM
```

```
#include "camera_pins.h"


const char* ssid = "*********";

const char* password = "*********";


void startCameraServer();


void setup() {

  Serial.begin(115200);

  Serial.setDebugOutput(true);

  Serial.println();


  camera_config_t config;

  config.ledc_channel = LEDC_CHANNEL_0;

  config.ledc_timer = LEDC_TIMER_0;

  config.pin_d0 = Y2_GPIO_NUM;

  config.pin_d1 = Y3_GPIO_NUM;

  config.pin_d2 = Y4_GPIO_NUM;

  config.pin_d3 = Y5_GPIO_NUM;

  config.pin_d4 = Y6_GPIO_NUM;

  config.pin_d5 = Y7_GPIO_NUM;

  config.pin_d6 = Y8_GPIO_NUM;

  config.pin_d7 = Y9_GPIO_NUM;
```

```
  config.pin_xclk = XCLK_GPIO_NUM;
  config.pin_pclk = PCLK_GPIO_NUM;
  config.pin_vsync = VSYNC_GPIO_NUM;
  config.pin_href = HREF_GPIO_NUM;
  config.pin_sscb_sda = SIOD_GPIO_NUM;
  config.pin_sscb_scl = SIOC_GPIO_NUM;
  config.pin_pwdn = PWDN_GPIO_NUM;
  config.pin_reset = RESET_GPIO_NUM;
  config.xclk_freq_hz = 20000000;
  config.pixel_format = PIXFORMAT_JPEG;

  // if PSRAM IC present, init with UXGA resolution and higher JPEG quality
  //                     for larger pre-allocated frame buffer.
  if(psramFound()){
    config.frame_size = FRAMESIZE_UXGA;
    config.jpeg_quality = 10;
    config.fb_count = 2;
  } else {
    config.frame_size = FRAMESIZE_SVGA;
    config.jpeg_quality = 12;
    config.fb_count = 1;
  }
```

```
#if defined(CAMERA_MODEL_ESP_EYE)
  pinMode(13, INPUT_PULLUP);
  pinMode(14, INPUT_PULLUP);
#endif

  // camera init
  esp_err_t err = esp_camera_init(&config);
  if (err != ESP_OK) {
    Serial.printf("Camera init failed with error 0x%x", err);
    return;
  }

  sensor_t * s = esp_camera_sensor_get();
  // initial sensors are flipped vertically and colors are a bit saturated
  if (s->id.PID == OV3660_PID) {
    s->set_vflip(s, 1); // flip it back
    s->set_brightness(s, 1); // up the brightness just a bit
    s->set_saturation(s, -2); // lower the saturation
  }
  // drop down frame size for higher initial frame rate
  s->set_framesize(s, FRAMESIZE_QVGA);
```

```
#if defined(CAMERA_MODEL_M5STACK_WIDE) || defined(CAMERA_MODEL_M5STACK_ESP32CAM)
  s->set_vflip(s, 1);
  s->set_hmirror(s, 1);
#endif

  WiFi.begin(ssid, password);

  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected");

  startCameraServer();

  Serial.print("Camera Ready! Use 'http://");
  Serial.print(WiFi.localIP());
  Serial.println("' to connect");
}

void loop() {
```

```
  // put your main code here, to run repeatedly:

  delay(10000);

}
```

6.2 RESULTS AND DISCUSSION

- Image and Video Quality:
    - Discuss the resolution and quality of images and videos captured by the mini drone surveillance camera.
    - Compare the performance of different camera modules and their suitability for surveillance purposes.
    - Evaluate the impact of environmental factors (e.g., lighting conditions, weather) on image and video quality.
- Flight Performance and Stability:
    - Assess the stability and maneuverability of the mini drone during surveillance operations.
    - Discuss the impact of wind or external factors on the drone's ability to maintain stability.
    - Consider the impact of flight control algorithms and sensor integration on flight performance.
- Surveillance Capabilities:
    - Analyze the effectiveness of the mini drone surveillance camera in capturing relevant information and identifying objects of interest.
    - Discuss the range and field of view of the camera system and its impact on surveillance operations.
    - Evaluate the effectiveness of the gimbal system in providing stabilized camera movements and maintaining image/video quality.
- Autonomy and Navigation:
    - Discuss the level of autonomy in the mini drone surveillance camera, such as automated flight modes, waypoint navigation, or obstacle avoidance.
    - Assess the accuracy and reliability of GPS navigation and its impact on surveillance tasks.
    - Explore the integration of computer vision techniques for object detection, tracking, or behavior analysis.

6.3 CONCLUSION

In conclusion, mini drone surveillance cameras offer compact and agile platforms for aerial surveillance, enabling access to hard-to-reach areas and providing real-time visual information. They offer high-resolution imaging, stabilization mechanisms, and autonomous features, enhancing surveillance capabilities. However, limitations such as flight time, payload capacity, and regulatory compliance need to be addressed. Continued advancements in technology are expected to improve these limitations and further enhance object detection and analysis capabilities. Overall, mini drone surveillance cameras have the potential to revolutionize surveillance operations and provide valuable insights from aerial perspectives

CHAPTER 7

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Centre for Engineering Education Research (CEER)

Social Innovation In Practice (2022-2023)

MINI WINGS OF LIFE

Identification of Problem

Around the world , daily so many people are missing in the forest areas , disaster areas . They all are dying because of not finding them in respective time . Human is the one , who can't go to multi stored building , where there is fire in the building . Humans does not aware of what there is in front of them , when he/she is in the forest . There may be a chance of wild animals present in front of them. Human can't fly and see what happening on the earth from the top. So many people are dying because of not locating them and rescuing quickly.

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Gaps in existing solutions

- They are fundamentally very inefficient and require a lot of energy just to fight gravity and keep them in the air.
- Complex and more expensive.
- They also require a lot of maintenance.
- Training is usually required to operate.
- Heavy weight

Project Objectives

The main aim of the project is to locate and rescue people who are missing in forest area, disaster area and loosing their lives because of not locating and rescuing them quickly

Existing solutions

1.Multi Rotor Drones 2.Single Rotor Drone
3.Fixed Wing Drone
4.Fixed wing Hybrid VTOL

User requirements

1.Frame with canopy 2.Motors 3.Propllers
4.Battery 5.Propellers Gaurds
6.Jumper wires
7.ESP01 wifi camera
8.Wifi module
9.Ardunio Nano
10.Fight Controller Primus V4

Project Coordinators

- 1. Mr.K.Raju,Ast Prof (ECE-CEER)
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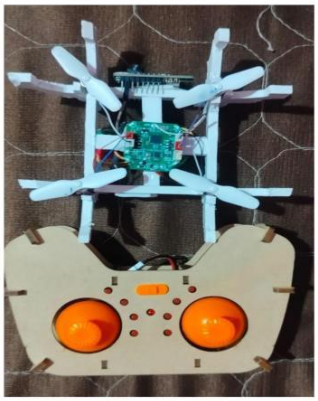
Team Details



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