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The Spy Eagle Warrior

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Abstract- The spy eagle warrior is a robotic bird used for military purposes. During the sudden attacks on the border of the country, many losses are facing by our countries such as the death of soldiers and people, damages of weapons, and more damages. This bird is mainly for spying over a particular area, near the country border. The bird can stream the live video by capture the area where it flies. The Ornithopter mechanism is used for building a bird. An ornithopter is a robotic bird that flies similar to a bird by generating flapping wing motion. By lowering the weight of the bird for easy hovering the performance of the bird is improved and also the clear live video streaming.Our robotic bird is controlled remotely and the live streaming can view from anywhere in the world.

Index Terms- Robotic Bird, Ornithopter, Drone, Spying, Live Streaming

I.INTRODUCTION:

The military is the main security fort of each country. The soldiers sacrifice them for our country. Each life of the army people is important for the country. During the unplanned attacks, the army cannot take the perfect decision without knowing the enemy country's plan. To gather the plan of an enemy country, we need to spy over the area. In the olden days, for spying purposes, the person is sent to collect the information. But this makes the person's life at risk. Nowadays, we sent any robot or a normal drone. They can easily identify them and become alert. Our project proposal is aboutabird robot which is lookinglikea real bird. We can send this robotic bird over the enemy staying area and collect their plan information.Each material used for the bird is selected perfectly based on the quality. The body of our bird is madeup of foam sheets and wings are made from umbrella cloth. We use three motors for all movements such as one brushless DC motor is used for the wing movement and two servo motors used for the tail movement. The live streaming is done using the Raspberry pi 3 model b. We can access video streaming from anywhere in the worldusing Wi-Fi. We create anHTML webpage to view our video. So we can watch the video by using all kinds of monitors which are having browsed windows such as Google Chrome, Firefox, internet explorer, and more. Those who have known the IP address only can watch the live video. So it is a secured method.

II.LITERATURE SURVEY:

Ralph Restituyo listed the use of drones and said about the vulnerabilities that are present in the military surveillance areas. The Drone which is climbing should follow the FAA rules and the Wi-Fi feature technique is used to share the Live Streaming of the drone. The limitation is that a single point of failure occurs [1]. Daniel in the paper described Modeling an Ornithopter to design its attitude control. It presents the mathematical model of the Ornithopter and the forces acting on it to achieve hovering; especially this paper describes the impact of the tail movement, here controlling the movement of the tail is difficult [2]. Ravi Kiran proposed an idea on the Live Streaming from remote locations using Raspberry pi. The kit gets connected with the IP and connected to the antenna, with the help of a VNC server and a command prompt is used to check out the live streaming. Here the problem is that if the signal in an antenna fails, then the total application will get fail [3]. In Woei-Leong Chan's journal, discussion on the material and the arrangement of other hardware components were done to achieve the improved performance. The limitation is that the material used for wings is heavy and costly to have a hovering movement of the drone [4]. Sunil H. McIntosh proposed an idea of the lightweight, compact mechanism for hovering; the Micro Air Vehicle, but the idea was done only based on Theoretical perspective [5].

III. PROPOSED WORK:

Our project proposal can split into two parts such as hardware and software part. Our robotic bird is the integration of both software and hardware.
Our proposed method containscomponents such as,
Software components:
On the transmitter side, (bird)

- Raspberry kit (model 3b)
- Camera module

On the receiver side, (station)

- Laptop or mobile phone (monitor)
- Wi-Fi and VNC viewer

Hardware components:
On the receiver side (bird),

- Foam sheet

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- Plastic spur gears
- Aluminum sheet
- Brushless DC motor
- Electronic Speed Controller
- LiPO battery
- Servomotors
- Umbrella cloth
- Metal sticks
- Flysky receiver
- Connecting materials(skews, nuts, and clamps)

On the transmitter side (station),

- Flysky transmitter

IV. BLOCK DIAGRAM:

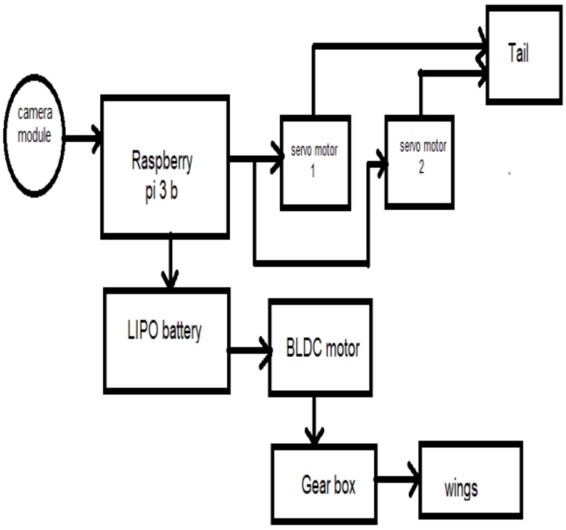

Fig. 1.Transmitter side

The components are arranged in the bird's body in the center of the foam board. The brushless DC motor is must place on the left side of the bird to run the small gear. So, to balance the bird's weight, kept the ESC, Raspberry pi, and the extra wires on the right side of the bird.
The flysky transmitter can control by any person who knows about it. It needs four rechargeable batteries.
The laptop (monitor) must contain a VNC viewer and the perfect internet connection. The video quality depends on the Wi-Fi strength.

Fig. 2.Receiver side

V.COMPONENTS DESCRIPTION:

1.RASPBERRY PI 3b:

Raspberry pi 3 model B is a credit-card sized computer capable of doing just about anything a desktop PC does. This component was chosen because it has an installed memory of 1GB RAM and a Processor Speed of 1.2GHz CPU. Some of the Specification of Raspberry pi 3 model B includes 40 pins extended GPIO, a Full-size HDMI,CSI camera port for connecting the camera module, etc.

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Fig. 3.Raspberry pi 3 b

2.CAMERA MODULE:

Fig. 4.Camera Module

The camera module is connected to the CSI connector of the Raspberry pi 3 kits. Some of the features include 5MP Omni-vision. The resolution of the camera module is 2592 * 1944. The video format supports 1080p @ 30fps, 720p @60 fps. It consists of 15 pins connected in a serial Interface. This camera module was chosen because the weight is low and it is also fully compatible with the Raspberry Pi cases.

3.VNC VIEWER:

Fig. 5.VNC Viewer

The main software module which is used for Live Streaming is Virtual Networking Computing (VNC). It is remote control software. It is capable of controlling another computer over a network connection. It works on the client/server model. VNC is platform-independent and it is compatible with any operating system. It interprets commands coming from the viewer.

4.BODY FRAME:

The body frame is made up of a foam sheet which has a thickness of 0.4 mm. Two layers of foam sheets are pasted one by one usingglue, to make the frame stronger. The foam sheet is robust and less weight so we choose that material for our project.

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Fig.6. Body Frame

5.WING:

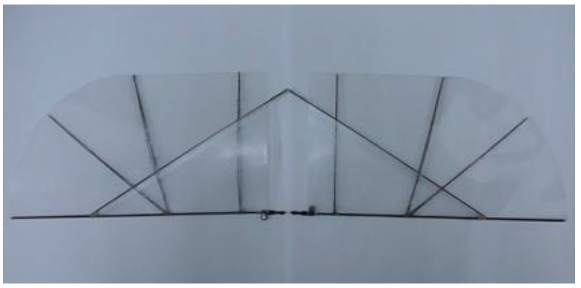


Fig.7. wing model

The wingspan must double the size of the length of the body or more than that. In our project proposal, we choose the body length is 35 cm and the wingspan is 97 cm (in downward movement) and 87 cm (in straight movement).

A. Gear System:

We use three plastic spur gears for wing flapping motion. The aluminum sheet of size 10 x 10 cm was pasted over the 10 x 10 cm foam board. Then make the holes with perfect measurement and connect the gears using the skews on the board.

We use a software called Gear generator to calculate the specifications ad performances of gears.

1.Big gear(2):

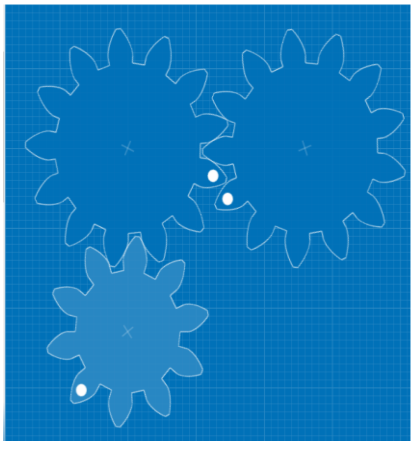
- Outer Diameter: 40mm
- No. of teeth: 36
- Compatible shaft size: 6mm
- Thickness (Teeth Portion): 6.5mm

2.Small gear:

- Outer Diameter: 27mm
- No. of teeth: 24
- Compatible shaft size: 6mm
- Thickness (Teeth Portion): 6.5mm

B.Brushless DC motor:

- Motor KV: 1000
- Current capacity: 12A/60 S
- Max Efficiency current: 4 – 10 A
- Shaft diameter: 3.17mm



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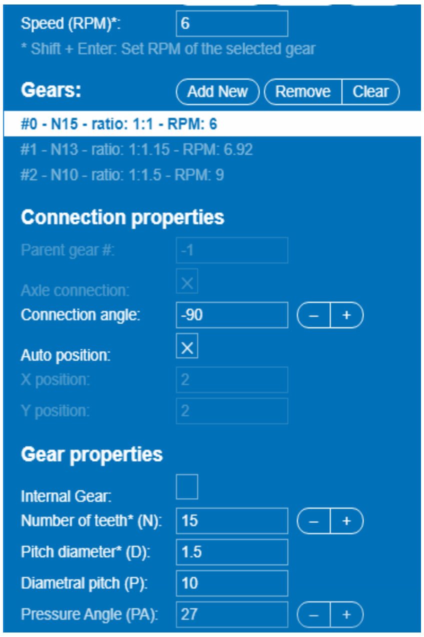

Fig.8. Gear system (software design)

C. ESC:

- BEC : 3A
- LIPO: 3 cell
- Constant current: 30A max 40A <10s

Fig.9. bldc and esc

C. Li PO battery:

Fig.10.Lithium Polymer Battery Pack

Three cell Li-PO Battery is selected as the voltage is 11.1V and also the current provided is 8000mAh.This Batter is chosen as it has the matched resistance, good temperature control, and also the weight is minimized. It also has a maximum charge rate of 5C. The Battery is supplied to the whole module for the hovering motion of the drone bird.

5.TAIL:

Fig.11. servo motor

Servo motor: (MG 90)

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- Operating speed: 0.12second/ 60degree
- Stall Torque (4.8V): 17.5Oz /in
- Operating voltage: 3.0V~7.2V
- Temperature range: -30 to +60
- Dead band width: 7usec

Two servo motors are used for tail movement. One is used for up and down movement and another one is used for left and right movement.

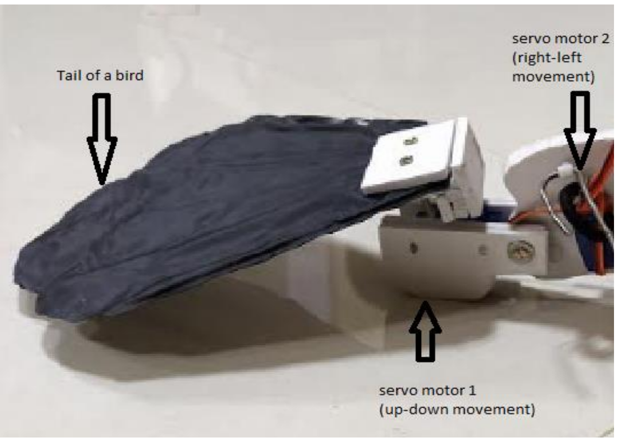

Fig. 12. The tail of a robotic bird

5.FLYSKY CONTROLLER:

The transmitter is controlled from the ground station. The transmitter has an antenna that is used to transmit the control signal to the receiver which is fixed on the bird.

The flysky transmitter contains many options to control the receiver. But we use two sticks only. The left side stick is used tocontrolling the bldc motor (wing). Right side sick is used to control the servo motors (tail).

The Receiver has six channels. We use only three channels such as,

- First channel – servo motor 1
- Second channel – servo motor 2
- Third channel – brushless DC motor

Fig.13. flysky transmitter and receiver

VI.WEIGHT LIST:

ITEM NAME	QUANTITY	WEIGHT
Raspberry pi3 b	1	44 gm
Camera module	1	23 gm
Plastic Spur gear (big)	2	50 gm
Plastic Spur gear (small)	1	25 gm
Brushless DC motor	1	64 gm
ESC	1	23 gm

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LIPO battery	1	85 gm
Receiver (flysky)	1	14.9 gm
Servo motor	2	18 gm
Other spare parts		100 gm
TOTAL		446.9 gm

VII. PROPOSED WORK:

Arrange all the components in the foam board and fixed tightly using slews, bolds, nuts, and glue. Then check the performance of our bird.

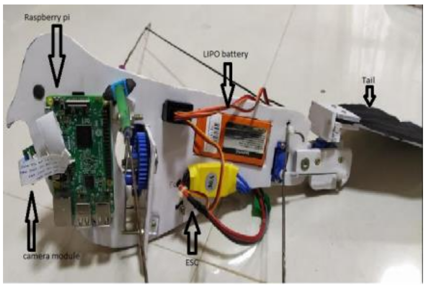

Fig.14. left side view of the bird

To balance the weight of bldc motor on the right side, the Raspberry pi and ECS were completely fixed on the left side of the bird.

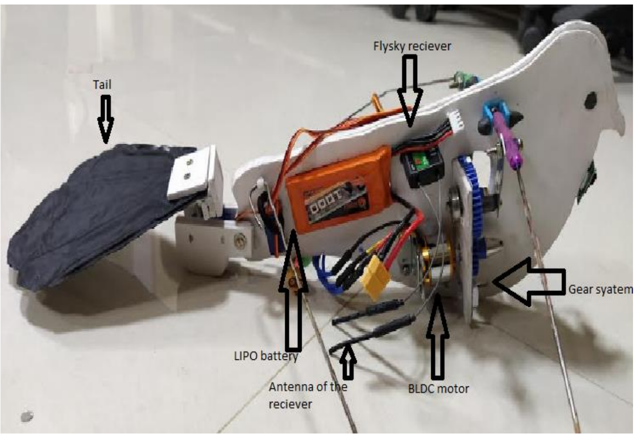

Fig. 15.right side view of the bird

The weighted bldc motor was kept on the right side of the bird.

Fig. 15.topview of the bird

Live video streaming:

We usetheraspberry pi 3 kit and the camera module for live streaming. To view the video we develop an HTML-based web page with a particular IP address and port number. We can change the IP address by changing the IP address in the program. Type the IP address in the VNC viewer window to connect the raspberry pi with the monitor (remote desktop connection).

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Fig.16.VNC window

Enter the IP address in the VNC window to connect the Raspberry pi remotely with the monitor. For this connection, we need an internet connection. The IP address is assigned in the program initially when it was developed.

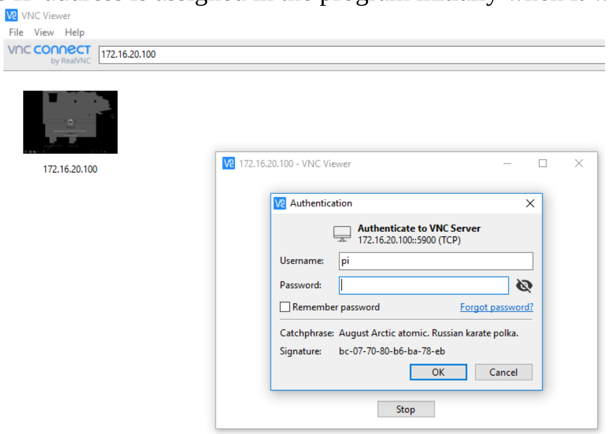

Fig.17.Password

After connecting the Raspberry pi, we need to enter the password. The default user name is pi and the password is raspberry. For our security purpose, we can change our password.

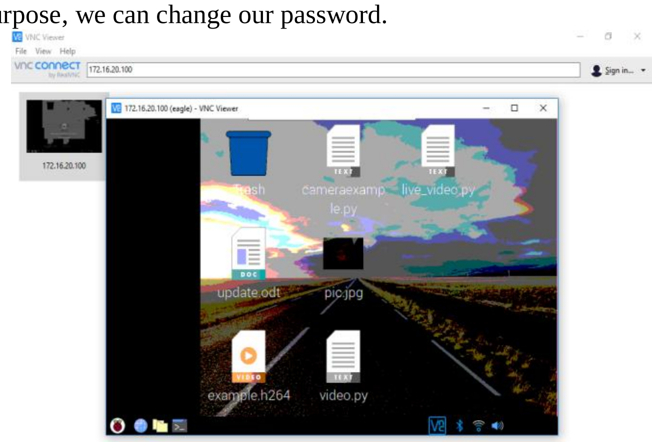

Fig.18.Remote Desktop of a Raspberry pi

After entering the password, the remote desktop was opened. We should set the time initially. Then connect the system with the internet.

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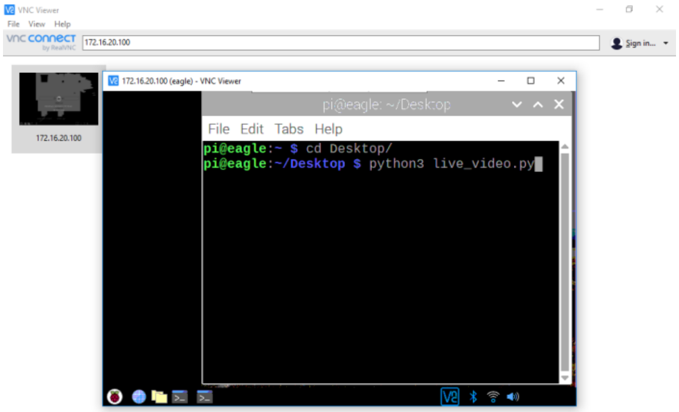

Fig.19. Terminal window

The terminal window contains the name of our Raspberry pi, which was set initially through the program. Then create a directory and a file to type the program and save it.

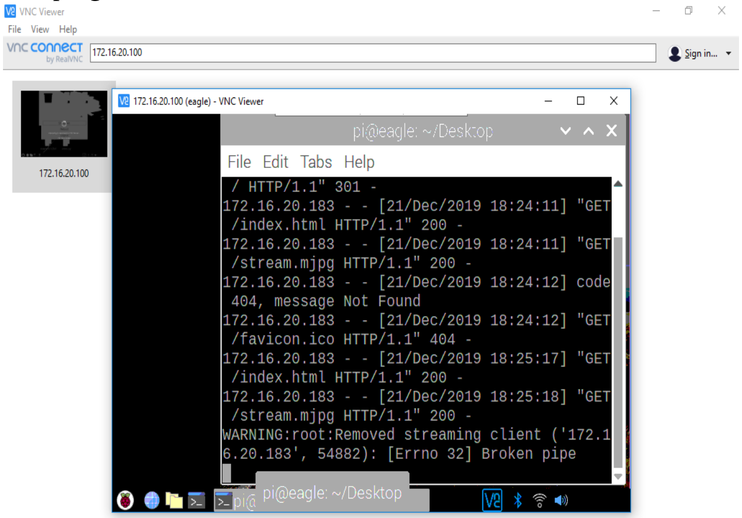

Fig.20. while running the program

While running the program use ".py". Becauseofour project we use python code for live streaming.

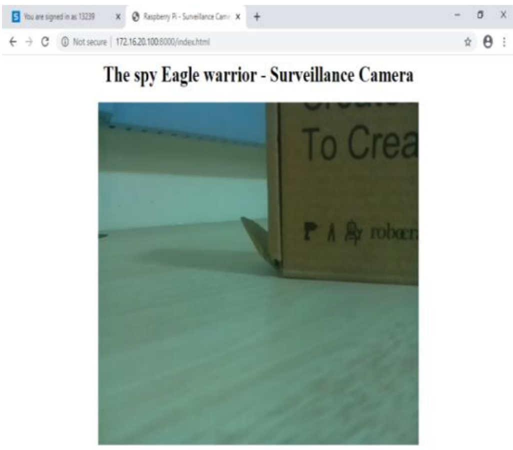

Fig.21. live streaming video

When we type the IP address along with the port number (format: IP address: port number) in the browsing window, we can watch the live video using the Wi-Fi connection.

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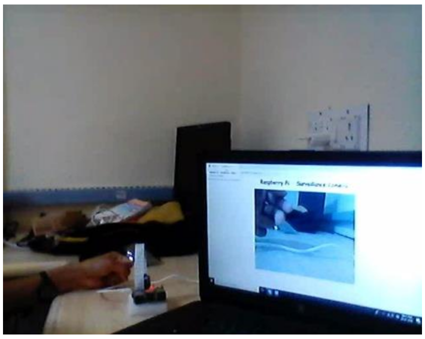

Fig.22.Live Streaming Output

BIRD’S FLAPPING MOVEMENT:

When we connect the LIPO battery with the ESC all the motors and the flysky receiver get power. ThenswitchON the power button onflysky transmitter to activate the receiver.

Now we can control the bird’s wings and tail using the flysky transmitter.

VIII. CONCLUSION:

This paper introduces the overall design ofthe drone bird which is used for military application. Our project proposal improves the performance of the ornithopter mechanism by minimizing the weight by using selective materials. We replace the weighted materials used for the wing and body with umbrella cloth and foam board.The main application includes spying on the area of the enemies and to safeguard the people who are attacked by the terrorists.

IX.FUTURE WORK:

The live streaming is based on Wi-Fi only. So the Wi-Fi strength affects live streaming more. If the Wi-Fi strengthbecomes less, the live video gets disturbed. We can also include the bomb-dropping mechanism in our drone bird.

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