

# Secured Data Transmission from UAV Using Steganography

Saha Subhanjan<sup>1</sup>, Maiti Krishna Kanta<sup>2</sup>

Student, Maharaja Manindra Chandra College, Shyambazar, CU, West Bengal, India<sup>1</sup>

Assistant Professor, Modern Institute of Engineering and Technology, Bande, West Bengal, India<sup>2</sup>

**ABSTRACT:** UAV is a pilotless, pre-programmed robot. It is primarily used for surveillance. On-board camera captures the target and transmits the data through radio frequency. With the prior knowledge of frequency one can understand the data is being transmitted. Before transmitting the captured image, a modified steganography algorithm has been applied for security enrichment.

## I. INTRODUCTION

An **unmanned aerial vehicle (UAV)**, commonly known as “*drone*” is the supervised, autonomous robot. The vehicle either controlled by pilots from the ground or autonomously following a pre-programmed mission. Images capture by the UAV is send to the control station using radio frequency. But during transmission it may be hacked by third party.

One method to increase the security is Steganography. The advantage of steganography over cryptography alone is that the intended secret message does not attract attention to itself, as an object of scrutiny. In digital steganography, electronic communications may include steganographic coding inside of a transport layer, such as a document file, image file, program or protocol and the control station export the images from the file.

## II. TYPES OF UAV

UAVs can be classified by a broad number of performance and characteristics. Aspects such as weight, endurance, range, speed and wing loading are important specifications that distinguish different types of UAVs and give rise to useful classification systems. Important (Performance Characteristics/ aspects) are Weight, Endurance and Range, Maximum Altitude, Wing Loading, Engine Type, Power/Thrust Loading. There are a wide variety of UAV shapes, sizes, configurations, and characteristics. But in respect to their application it is fall into two categories: **a)** Used for reconnaissance and surveillance purposes and **b)** Armed with missiles and bombs for military purpose.

## III. WORKING PRINCIPAL OF UAV

Objects that fly using wings get their lift by taking advantage of Bernoulli's principle. In fluid dynamics, **Bernoulli's principle** [1][5][6] states that for an in viscid flow, an increase in the speed of the fluid occurs simultaneously with a decrease in pressure or a decrease in the fluid's potential energy. Bernoulli's principle is named after the Swiss scientist Daniel Bernoulli who published his principle in his book *Hydrodynamica* in 1738.

Airplanes and birds have an airfoil shape to each of their wings to produce lift. The airfoil shape produces unequal lengths across the top and bottom of the wing. Air splitting at the front of the wing must rejoin at the back of the wing so as not to create a vacuum. Since the top surface is curved upward and is longer it forces the air to move faster across the top than the bottom. Faster moving fluids create less pressure, so the bottom of the wing creates greater pressure producing lift [7].

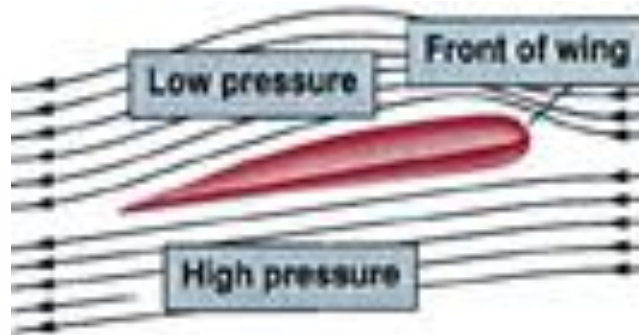


Fig 1: Effect of Bernoulli's Theorem

Mainly, there are four major forces involved in flight to fly [8][9][10]:

- i. **Lift:** In order to fly an object must be able to generate enough lift to overcome its weight. To accomplish this, air must be moving across the wing. This can be done by pushing the wing through the air such as with a jet engine or by moving the air across the wing such as with wind. The opposing force of lift is gravity.
- ii. **Weight:** Weight is the force of gravity. It is a continuous downward forces that flying objects must constantly overcome to stay aloft. Objects can glide for a very long period of time but will eventually fall back to earth if they don't generate enough lift to overcome gravity. The opposing force of gravity is lift.
- iii. **Thrust:** Thrust is the force that moves the object forward. This is generated by a jet engine, propeller or the backward push of a bird wing. To move forward the flying object must overcome drag. To reduce drag, airplanes are streamlined and most bird shapes have evolved to be streamlined. The opposing force to thrust is drag.
- iv. **Drag:** Drag is actually friction between the moving object and the air. It is also referred to as air resistance. The opposite force of drag is thrust.

#### IV. STEGANOGRAPHY

Steganography basically uses large file like audio, image, video, document etc for data hiding. Here we have considered image file for this process. Here in our first program the sensitive message is being covered in the image file and create a new image file with hidden message without hampering the visual content. Only intended recipient would know the existence of the message. Using reverse methodology i.e., decryption, secret message is recovered from the steganographic image with hidden message. Without the particular algorithm, it is not possible to decrypt the secure message from the message [2][3][4].

#### V. IMAGE TRANSMITTING PROCESS

Our Remote Controlled aircraft embedded with on-board camera and Audio-video transmitter. The plane is transmitting the image to ground station, (generally called FPV-first person view).



Fig 2: Control Station

## VI. PROPOSED IMAGE TRANSMITTING METHOD

We have proposed a methodology to encrypt the image using the steganography before sending to the control station or server station. In this process, each image taken by the aircraft's on-board camera is sent through steganography to the ground station so that transmitted image get can't be intercepted as raw data or even traces the actual footage of the camera.

We are storing the secret image in to 8 pre-stored images, every pixel of the secret image is divided and stored into following 8 images in such a way, that the pre-stored images look like same and the file size remain constant (properties of the steganography), so no-one can imagine or attracted to the encoded images. After that each image securely and wirelessly transmitted to the ground station by a particular secret frequency. After getting the 8 encoded images, the ground station starts the decoding process to reconstruct the actual image.

## VII. ALGORITHM

### Encoding algorithm:

**Input:** Pre-stored Eight images  $inp\_img[8]$  and  $secre\_img$

**Output:** Eight output image or stegoed image  $out\_img[8]$ .

- Step.1 Initialize i.
- Step.2 Shuffle the Eight input image.
- Step.3 Read and Extract pixel from the  $secre\_img$ .
- Step.4 Loop: For  $i=1$  to 8
- Step.5 Apply LSB steganography on  $inp\_img[i]$  and Write it to  $out\_img[i]$ .
- Step.6 End For Loop.
- Step.7 Repeat Step.3 until end of  $secre\_img$  Pixel.
- Step.8 End.

### Decoding algorithm:

**Input:** Received Eight stegoed images  $rcv\_inp\_img[8]$  and  $secre\_img$

**Output:** Original image  $rcv\_org\_img$ .

- Step.1 Initialize: i,  $rcv\_inp\_img[8]$ ,  $rcv\_org\_img$ ,  $N=1$ ,  $pix\_arr[9]$ .
- Step.2 Loop: For  $i=1$  to 8
- Step.3 Read and Extract pixel from the  $rcv\_inp\_img[i]$ .
- Step.4 Extract LSB from  $rcv\_inp\_img[i]$  and store in  $pix\_arr[i]$ .
- Step.5 If  $(N < 9)$  then Increment Else Write  $pix\_arr[]$  to  $rcv\_org\_img$  file and  $N=1$ .
- Step.6 End For Loop.

## International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization, Volume3, Special Issue 6, February 2014

National Conference on Emerging Technology and Applied Sciences-2014 (NCETAS 2014)

On 15<sup>th</sup> to 16<sup>th</sup> February, Organized by

Modern Institute of Engineering and Technology, Bandel, Hooghly 712123, West Bengal, India.

- Step.7 Repeat Step.3 until end of Pixel read.  
Step.8 End.

### VII.CONCLUSIONS

Radio control works on 2.4Ghz frequency and this frequency only works in Line of Sight in long distance, so any obstacles comes in the connection path may lead to a discontinuation of signal or may signal lost. Other devices like wifi router and many other home electronics also works on 2.4 Ghz frequency, so there may be some interference appear. Image Encoding and Decoding process i.e., steganography is successfully tested. But due to limited resources, we did not able to apply it in onboard camera. Whole Eight image have to be transferred to get a single image, if any signal lost lead image could not be transferred.

### ACKNOWLEDGEMENTS

The authors acknowledge the support provided by Maharaja Manindra Chandra College, C.U.

### REFERENCES

- [1] Daniel Bernoulli, SOAR™: Science in Ohio through Aerospace Resources, Volume I-III. Dayton, Ohio: The National Museum of the United States Air Force and The Air Force Museum Foundation, Inc. 1997-1999.
- [2] James C. Judge, Steganography: Past, Present, Future, GSEC Version 1.2f
- [3] R.J. Anderson and F.A.P. Petitcolas, "On the Limits of Steganography" J. Selected Areas in Comm., vol. 16, no. 4, 1998, pp. 474-481
- [4] J. Fridrich and M. Goljan, "Practical Steganalysis—State of the Art" Proc. SPIE Photonics Imaging 2002, Security and Watermarking of Multimedia Contents, vol. 4675, SPIE Press, 2002, pp. 1-13.
- [5] Garcia GA, Keshmiri S. Online artificial neural network model-based nonlinear model predictive controller for the meridian UAS. International Journal of Robust and Nonlinear Control 2013; 23(15):1657-1681.
- [6] Liu C, McAree O, Chen WH. Path-following control for small fixed-wing unmanned aerial vehicles under wind disturbances. International Journal of Robust and Nonlinear Control 2013; 23(15):1682-1698.
- [7] Xia Y, Lu K, Zhu Z, Fu M. Adaptive back-stepping sliding mode attitude control of missile systems. International Journal of Robust and Nonlinear Control 2013; 23(15):1699-1717.
- [8] Zong Q, Wang J, Tao Y. Adaptive high-order dynamic sliding mode control for a flexible air-breathing hypersonic vehicle. International Journal of Robust and Nonlinear Control 2013; 23(15):1718-1736.
- [9] Hu Q, Huo X, Xiao B. Reaction wheel fault tolerant control for spacecraft attitude stabilization with finite-time convergence. International Journal of Robust and Nonlinear Control 2013; 23(15):1737-1752.
- [10] Shen Q, Jiang B, Cocquempot V. Adaptive fault-tolerant backstepping control against actuator gain faults and its applications to an aircraft longitudinal motion dynamics. International Journal of Robust and Nonlinear Control 2013; 23(15):1753-1779.