Design and Construction of a Semiautonomous Ornithopter Combimed with VR Technology

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ABSTRACT: Ornithopter is a robotic mechanism that flies by flapping its wing. VR means virtual reality where we can see 360 degree view of any video. So here we just wanted to combine the technology of VR to control ornithopter. This helps in easy control of ornithopter from beginners to pro's. Here tilting values of VR headset is processed using an microcontroller and resulting command is passed subsequently using an RF transmitter which helps in controlling its navigation. So when we move our head left side ornithopter turns left and so with right side. When we lift our head ornithopter starts increasing its altitude and so with decreasing its altitude. A micro camera helps in displaying image ahead of ornithopter.

KEYWORDS: Flapping, Ornithopter, VR

I.INTRODUCTION

Presently we have a great demand for Micro Air Vehicles as these are Rc vehicles that can be used for fun to performing some classified operations by military. MAV's are of many types based on different requirements. Rc plane, Quadcopter, Ornithopter, Cyclopter etc are some of examples which principle is semiautonomous or autonomous flying. But they vary to large extent in design and its functionality.

Ornithopter is a robotic bird that imitates large birds. Due to its peculiar quality of mixing up with surroundings it is mainly used in Wildlife, military purposes and in future for traffic monitoring. Vr also known as virtual reality is technology which helps us view videos virtually real i.e it helps see videos 36o degrees. This is possible by tilting VR headset.

So here we combine VR technology with Ornithopter for its navigation that is when VR headset is tilted in a specific direction Ornithopter responds to it and navigates accordingly. A camera is fixed at bottom of ornithopter which helps in seeing visual picture ahead of ornithopter . So in other words to say it will be like we will be seated below ornithopter and navigate by moving our head. This makes navigation very convenient as only eyes and are in coordination rather than eyes and hand are in.

Ornithopter Block Diagram
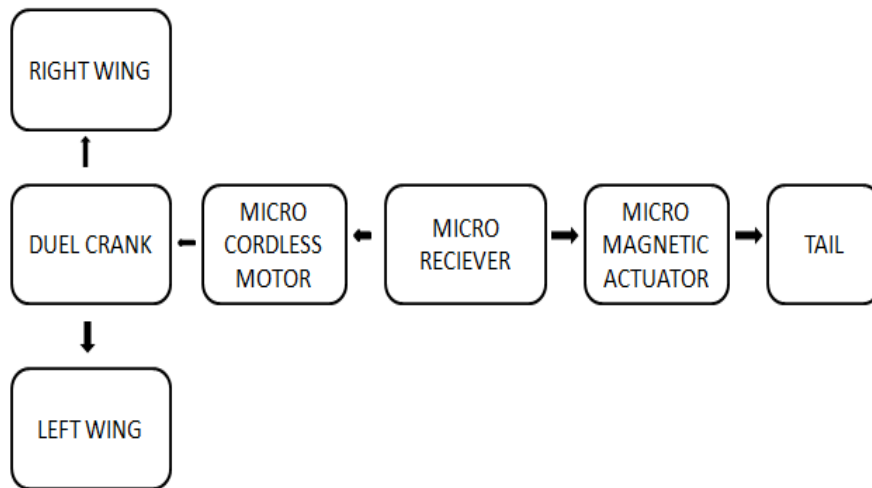
Transmitter Block Diagram
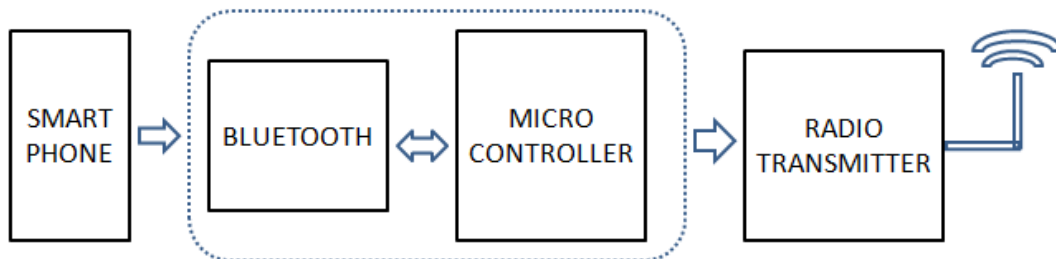
II.LITERATURE SURVEY

Jannick Rolland and Hong Hua explains about Head mounted displays system where missiles are launched by moving head accordingly. They also explain about working of it in real time. So this helps in knowing about controlling head mounted displays, its working and various parts used so that this helps us understand how missiles are launched in particular direction by just moving the head

James E. Melzer explains about usage of head mounted displays in real time applications such as in fields of medicine, military. So head mounted displays are just no only used in military purposes but also used in medical field where for some specific tests where doctor sees inner organs live on monitor, head mounted displays helps in making cam move carefully at specific point with ease

Stanley s. baek discusses about an autonomous flight control of 13 grams ornithopter and discussed about different sensors and hardware interface that could help him achieve accuracy of 85 %. Here he discuss about working mechanism of 13 grams Ornithopter and its flying mechanism. Here we can clearly understand concepts of design, construction, and working of ornithopter   HavocRc explains in his instructable about controlling rc plane by just tilting smartphone. Here he uses a aurdino microcontroller and blutooth module which helps in connecting smartphone to microcontroller for getting values when tilted. After calebrating they are passed through Rf transmitter to help control plane.

III. PROPOSED SYSTEM

Here we designed an ornithopter which can fly and turn by swinging. It is made of Duel crank mechanism which helps ornithopter to give flipping mechanism. Ornithopter is fitted with a micro magnetic actuator which helps in moving tail which helps in giving swing mechanism. It can be controlled using an Radio transmitter and should be fitted with a micro camera which helps in viewing image infront of ornithopter.

At transmitter part we will have a VR headset which have a LCD screen with inbuilt tilt sensors. Easy and economic way of making LCD screen is by placing a smart phone in headset that fulfills all requirements. Now it is connected to microcontroller. Blutooth is preferred medium if we use a smartphone. Output of microcontroller is transmitted through a Rf transmitter. Micro camera fixed to ornithopter transmits data which can be received and displayed on scrren in headset.

Now we see a clear picture of image ahead of ornithopter. Now when we move our head say to left side as per calibration tilted valued are processed through microcontroller and we can see that new image is seen through screen due to tilt or swing made by ornithopter. When we move our head say right side ornithopter tends to move right side. When we lift our head upwards as per calibration and tilted values flapping speed of duel crank mechanism increases which in turn takes to higher altitude and if head is moved down as per tilted values flapping speed of duel crank mechanism decreses which in turn takes ornithopter to lower altitude. All the time we can see image from camera which helps us to choose appropriate direction of travel.

IV. ELECTRONICS

 As far as mechanical part of any project is taken into account electronics doesn't make much impact but when looking for final output electronics makes a major impact for successful output.

In this project we have many electronic components collaborated which helps for wide range of duties to be done.

For Ornithopter

Battery: For ornithopter proposed one is a one cell lithium polymer pack, the standard for high performance machines like helicopters on this scale.

Hardware interface: Here we propose 8.5 mm micro cordless dc motor with 40000 rpm which runs by 3.4 v for duel crank which helps in flapping wings. Tail part of ornithopter is fixed with a micro magnetic actuator for easy movement effectively. For making this ornithopter completely wireless we used a 2.3 GHz transmitter with 2 channel receiver.

Wings: These are of similar construction to a modern kite. The fabric proposed is craft wrapper which provides excellent strength and resistance against tearing for very little weight

Gearbox: A duel crank gearbox is proposed gearbox for this project as this mechanism even weighs little more flipping is more symmetrical

For Headset

Battery: Normally an USB port is given as input power supply which is around 5v. But when we use an headset like Google cardboard where our phone acts as screen module we doesnot anything external

Hardware interface: Normally every VR headset has inbuilt tilt sensors which calibrates direction of movement. And for VR headsets like google cardboard where we fix our smartphone as screen also has a inbuilt tilt sensors. A micro wireless camera is needed which is fixed under Ornithopter and images transmitted can be seen on VR screen which helps in controlling Ornithopter. We need a micro controller and RF transmitter and receiver.

V. SIMULATION AND RESULT

Above is just a sample clip from a video published by HavocRC where he gives instructions in controlling an RC Plane by just tilting the phone. Now taking same idea we can control an Ornithopter by tilting. Then we receive transmitted

signals from cam set beneath Ornithopter to phone or headset screen and switching to VR mode helps in wearing VR headset and controlling Ornithopter by just calibrating headset according to our requirement.

So as soon as Ornithopter is launched into air we can see ahead image as above. When we turn our head we can see.

Source: YouTube

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Below we can see a picture of Ornithopter with an attached cam on it. Controlling Ornithopter with RF transmitter by seeing on screen is a bit difficult as we need to calibrate and train ourselves with is time taking thing and also it is not very easy for beginners to follow this. So controlling Ornithopter with combination of VR technology helps us greatly by just reducing complexity of controlling it and also helps in giving realistic experience simultaneously controlling very easily.

Lets just imagine we wore headset by seeing below picture which will be displayed on screen in headset when we start looking left Ornithopter starts to swing slowly towards left. And moving head towards right helps in swinging Ornithopter towards right. When we rise our head then flapping of wings increases which leads to rise in altitude of Ornithopter. Lowering head decreases the flapping of wings gradually decreasing altitude of Ornithopter.

Source: Google

VI.CONCLUSION

In recent years virtual reality is a rapid growing technology in all means. So when we can apply same principle in controlling RC vehicles it makes a new revolution in designing transmitters as it is very easy to handle which helps seeing surroundings in a lot new way

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