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Design and Fabrication of A Mechanical Bird

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I.INTRODUCTION

1.1 Flying on Flapping Wings Concept of amithapter

An ornithopter (from Greek omanos "bird" and prevon "wing") is an aircraft that flies by flapping its wings. Designers seek to imitate the flapping wing fight of birds, bats and insects though machines may differ in form, they are usually built on the same scale as these flying creatures. Manned omithopters have also been built, and some have been successful. The machines are of two general types: those with engines and those powered by the muscles of the plot.

The research on Micro Aerial Vehicles (MAV) is comparably young, which has emerged over the past few years. The ongoing miniaturization of electric components such as electric motors and the improvements in microelectronics made it possible to build miniature planes and helicopters at relatively low costs. This development also made it
possible to start imitating insect and bird flight, which needs a sophisticated miniaturized actuation chain for their flapping wing motion. The goal of this research is to come up with small aerial vehicles that can operate independently from ground stations, performing certain operations such as surveillance or measurement, especially in environments that are hardly accessible. or even dangerous for people

1.2 Wing Design

Orthopters flapping wings and their motion through the air are designed to maximize the amount of it generated within limits of weight, material strength, and mechanical complexity. A flexible wing material can increase efficiency while keeping the driving mechanism simple in wing designs with the spar sufficiently forward of the airfoil that the aerodynamic center is aft of the elastic axes of the wing, aero elastic deformation causes the wing to move in a manner close to its ideal efficiency (in which pitching angles lag plunging displacements by approximately 90 degrees) Flapping wings increase drag and are not as efficient as propeller-powered aircraft. Some designs achieve increased efficiency by applying more power on the down stroke than on the upstroke.

In order to achieve the desired flexibility and minimum weight, engineers and researchers have experimented with wings that require carbon fiber, plywood, fabric and ribs with a stiff strong trailing edge. Any mass located to the at of the empennage reduces the wing's performance, so lightweight materials and empty spaces are used where possible.

II. LITERATURE REVIEW

Some early manned fight attempts may have been intended to achieve flapping wing flight though probably only a glide was actually achieved. These include the fights of the 11m-century monk Elmer of Malmesbury (recorded in the 12th century) and the 9th century post Abbas ibn Fimas (recorded in the 17th century) Roger Bacon, writing in 1260, was also among the first to consider a technological means of fight. In 1485, Leonardo da Vinci began to study the flight of birds. He grasped that humans are too heavy, and not strong enough to fly using wings simply attached to the arms. Therefore he sketched a device in which the aviator lies down on a pank and works two large, membranous wings using hand levers, foot pedais, and a system of pulleys.

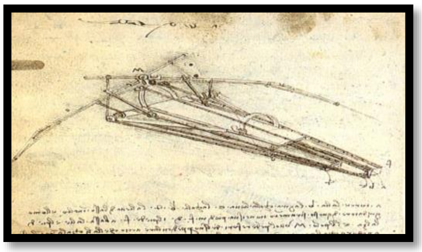


Fig 2.1 Leonardo da vinci'sornothopter design

The first ornithopters capable of flight were constructed in France. Jobert in 1871) used a rubber bend to power a small model bird. Alphonse Penaud, Abel Hureau de Villeneuve and Victor Tatin, also made rubber-powered ornithopters during the 1870s Tatin's omnithopter (now in the US Air & Space Museum) was perhaps the first to use active torsion of the wings, and apparently it served as the basis for a commercial toy attired by Pichancourte 1889. Gustave Trouve was the first to use internal combustion and his 1890 model flew a distance of 70 meters in a demonstration for the French Academy of Sciences The wings were flapped by gunpowder charges activating.

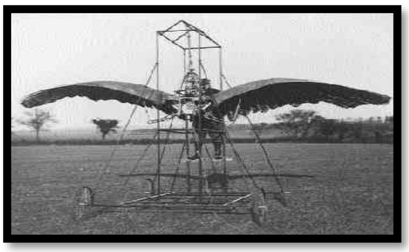


Fig 2.2 E.P Frost's 1902 ornithopter

2.1 OBJECTIVES

- The attempt is made here to design and fabricate new models according to the application can which can be specially used in the field of defense area.

- To study the structure and flying characteristics of a bird and replicating id bird working on mechatronics concept.
- To study bionics and its applications.

III. MATERIALS AND METHODOLOGY

3.1 COMPONENTS DETAILS

The system consists of

1) Brushless motor
2) ESC (30amps)
3) Battery
4) Servos
5) Lights
6) Transmitter and Receiver
7) Light weight plastic
8) Carbon fiber rods (3MM)
9) Foam sheet
10) 4 Spur gears
11) 1 Worm gear

TABLE 3.1 COMPONENTS AND ITS SPECIFICATIONS

1) Type : DC Motor
Speed : 1800rpm

3.4 METHODOLOGY

The mechanism of fluttering of mechanical bird, it is characterized in that, this mechanism of fluttering is mainly by the beating system, torsion system and oscillation system are formed, described beating system comprises support gear motor is formed, motor is by gear engaged transmission is patted motion synchronously through crank rocking bar mechanism and crank rocking bar mechanism driving left and right sides flapping wing; Described torsion system comprises cylindrical holder cylindrical holder the semicircle band of column and ring gear motor is formed, and motor drives the synchronous twisting motion of left and right sides flapping wing through gear ring gear engaged transmission; Described oscillation system comprises pedestal cylinder ring pedestal gear gear support support motor is formed, and motor drives left and right sides flapping wing suitable swing and turns to through gear gear engaged transmission.

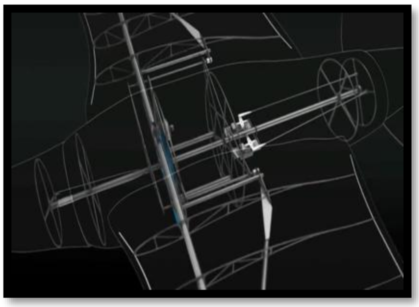
The flapping apparatus of subminiature bionic flapping wing aircraft according to claim 1 is characterized in that, described motor drives left and right sides flapping wing respectively through two messenger chains.

The flapping apparatus of subminiature bionic flapping wing aircraft according to claim it is characterized in that, described motor drives right flapping wing through one in two messenger chains, its messenger chain is through gear engaged transmission, gear is captivated joint with gear through axle , axle links to each other with support (8) by cylindrical pair, gear and gear engaged transmission, gear bearing pin is captivated joint with crank , gear links to each other through cylindrical pair with support by axle , crank links to each other through cylindrical pair with support by axle , bearing pin can slide in chute and drive rocker is patted motion up and down; Described motor is through the left flapping wing of another driving in two messenger chains, its messenger chain is through gear , gear engaged transmission, gear is captivated joint with gear through axle links to each other with support by cylindrical pair, gear and gear engaged transmission, gear , bearing pin is captiveed joint with crank , gear links to each other through cylindrical pair with support by axle , crank links to each other through cylindrical pair with support by axle , bearing pin can slide in chute , and drive rocker is patted motion up and down

The flapping apparatus of subminiature bionic flapping wing aircraft according to claim it is characterized in that, described rocking bar, rocking bar link to each other with the cylindrical pair form with support (, support by axle , gear , gear and gear), gear geargear are positioned at the both sides of support , and motor is fixed on support the support

The flapping apparatus of subminiature bionic flapping wing aircraft according to claim 1, it is characterized in that, described ring gear is captivated joint with the semicircle band of column , support are fixed on above the semicircle band of column , the semicircle band of column links to each other by cylindrical pair with cylindrical holder , cylindrical holder and motor is fixed on the pedestal gear.

The flapping apparatus of subminiature bionic flapping wing aircraft according to claim it is characterized in that, described cylindrical holder cylindrical holder are captivated joint with big gear wheel big gear wheel is connected with cylinder ring cylinder ring links to each other with the cylindrical pair form with pedestal and motor is fixing.



a) Top view

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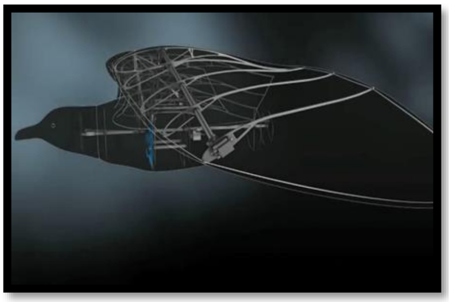
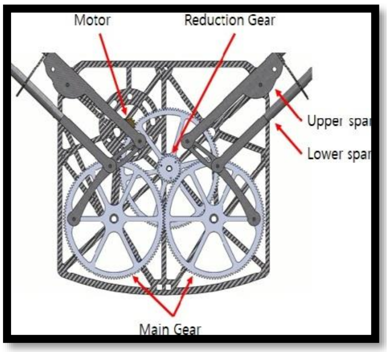
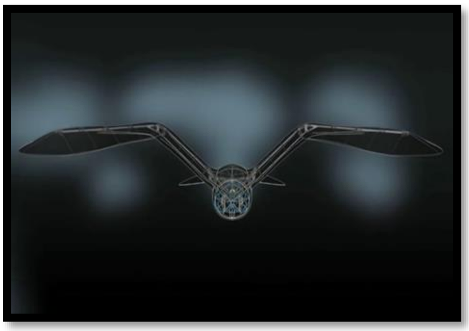


b)Side view



c) Gear meshing



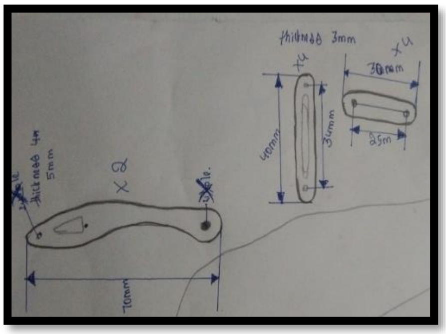
d) Front view

Fig 3.4Wing Mechanism

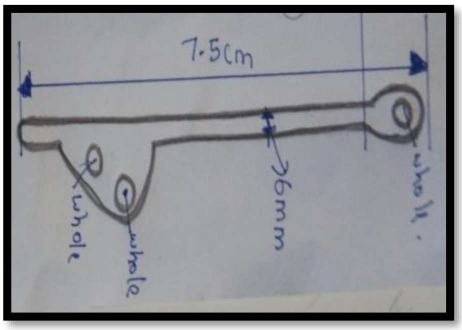
3.5 Advantages

Flapping wings after potential advantages in maneuverability and energy savings compared with fixed-wing aircraft, as well as potentially vertical take-off and landing. It has been suggested that these advantages are greatest at small sizes and low flying speeds Unlike airplanes and helicopters, the driving airfoils of the amthopter have a flapping or oscillating motion, instead of rotary. As with helicopters, the wings usually have a combined function of providing both in and thrust. Theoretically, the flapping wingcan be set to zero angle of attack on the upstroke, so it passes easily through the air.
Since typically the flapping airfoils produce both it and thrust, drag-inducing
structures are minimized. These two advantages potentially allow a high degree of efficiency.

IV. DESIGN PARAMETERS



a] link 1



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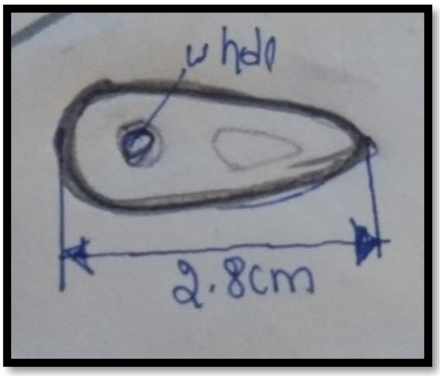
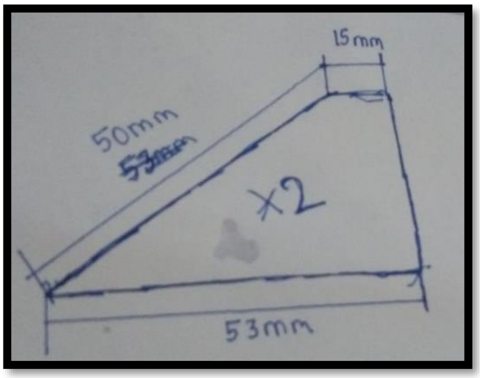


c] link 3



d] link 4

Fig 4.1 Design parameters

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V. CONCLUSION

Artificial mechanical bird will cease to be "exotic", imaginary, unreal aircraft and start to service for humans as a junior member of aircraft family. Necessary high aviation technology already exists. Designers and engineers will be forced to solve not only, for example, wing design problem, but all problems peculiar to any safe and reliable aircraft of any type. Pants of them, such as stability, controllability, durability etc. are inherent to all aircraft with no exemption. The second part specific mechanical bird new problems, unknown before, which will appear at the first time; flapping wing design problem is only one of them.

From the point views of mechanism and bionics, this paper designs and simulates the mechanism of bird. The most significant advantage of this mechanism is store precise and convenient wing deformation with adjustable parameters by using active driving mechanism so as to provide basis and references for designing large-scale birds' flapping-wing bionic machete.

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