

DESIGN AND ANALYZES OF PAVO CRISTATUS AEROFOIL

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Abstract - Nature has its own miracle and own solutions . As human we are going to determine the way of utilization. In the world there are approximately 9000 to 10000 bird species existing . These flying species make humans to dream their own way for flying . In the year 1903 by brothers the dream of century came true , still exists and evolving . Every structure and every body can generate lift but efficiency of the bodies differentiate them . That's why we stepped forward to analyze the wing structure and design coordinates of peacock (Pavo Cristatus) . By this we can learn the dimensions of the wing structure . And then we decid to compare the obtained values with the existing NACA series . After that with the help of CATIA software bring those coordinates into virtual model of airfoil , then by using the ANSYS software we can analyze the airfoil structure of pavo Cristatus. These bring us a better vision for conclusion .

1.INTRODUCTION

Believe over nature that can solve more problems which make us to stay down . Made us to study the nature and to learn the science of nature . The following literature survey keenly concentrated over the bio mimic research works . The literature can teach the methods what the authors jumped over to achieve their final results . The results may satisfy authors or not but those results can provide a way to young researching fellows to know what they going to face . Bio mimic is a way to achieve our goal with help of nature . While bio mimic made so many history's to remember us . Right brothers flight can be a good example for bio mimic. Hydrophobic layers which resembles leaves of Lotus . In architectural field termites opens a new way . Like wise aeronautics is nothing without bio inspiration . Aeronautics is whole about bio mimic . So bio mimic is not a new term for aeronautics. Here these literature works were taken to begin the design and analysis of pavo Cristatus's wing structure .

1.1 LITERATURE SURVEY

TITLE: DESIGNING A BIOMIMETIC ORNITHOPTER CAPABLE OF SUSTAINED AND CONTROLLED FLIGHT

AUTHR: JOON HYUK, KWNG-JOON YOON

CONTENT: The research paper focused on built the ornithopter which consist of flapping wings . The authors analyzing the nature and they decided to inspire the nature . The nature has itself so miracles and science in it . The authors study the airfoil of cicada and they analyze the function of the airfoil and they construct an ornithopter. The estimated of ornithopter is 5g to 45g. At the topic (WING DESIGN AND FABRICATION) the author mentioned that the only flapping is not helping the insect to fly but they clearly mentioned that by mimic the airfoil can increase the efficiency of aircraft.

TITLE: A BIOMIMETIC FLPPING - WING MICRO AIR VEHICLE

AUTHOR: WENQING YANG , LIGUANG WANG AND BIFENG SONG

CONTENT: This research paper give us the evidence about how the mimic is being successful . The authors give us several evidence over airfoil mimic content . The concept of mimic is over Bionic appearance and flight capability enhancement. From this paper methods and analyzing pf wing structure was came to known.

TITLE : DRAG REDUCTION USING BIOMIMETIC SHARK SKIN DENTICLES

AUTHOR : DINESH BATIA , DEVINDER YADAV , YING XUE ZHAO , JIAN WANG

CONTENT : The respective research paper done at the view of reducing the drag by using the shark skin denticles . The authors got their idea from Michal Phelps , who 8 time gold medal winning swimmer at Olympics . The swim suit was reported that the sharkskin inspired speedo - swimsuit .

This suit helps Michal to reduce the drag and increase the swimming efficiency . The authors got inspired over this concept and they interested to research over the denticles whether these denticles can helps in aerodynamics to increase the lift . Authors used micro CT scan to scan the shark skin denticles . And used ANSYS software for analyze the fluid dynamics over the denticle design . At last the paper concluded with a valid points . Such as the shark skin denticles reduces the drag of 3% at 0degree of Angle of attack and 1.5% of drag reduction at the 4° of Angle of attack .

TITLE : BIOMIMICRY : LEARNING FROM NATURE

AUTHOR : DR PUSHRAJ SINGH

CONTENT : This paper can be consider as a bunch of answers because the author research over the bio mimic contents and he exposed their usage . Author mentioned twenty two bio mimic products and their concepts and usage . Author also never forget to mention the airplanes . The topic “birds and flight “ and “shark skin coat”. Author told that the biomimicry exists over the year of 1450’s and he mentioned about Leonardo da Vinci and he mentioned the ornithopter as example . The shark skin denticles also mentioned by author . At finally author gives his thought that the bio mimic is a concept which going to modify the nature to human habitats.

TOPIC : AERODYNAMICS AND EXPERIMENTAL ANALYSYS OF BIO-MIMIC CORRUGATED DRAGON FLY

AUTHORS : Md Akthar , Chimaya PADHY

CONTENT : By the topic authors says everything about their projects. As mentioned in the topic authors give a very deep study and analysis over the aero foil structure of dragonfly . The authors subjected the aero foil structure under 15000 to 75000 Reynolds number and also at different angle of attack from 0° to 8° . The given research paper discusses the authors brief analysis . The CFD analysis were carried on the 2-Dimensional BIOMIMETIC forewing of dragon fly . The process of analysis was done with the help of ANSYS -19 ICEM CFD and FLUENT software . Authors printed their software model into 3D model by using 3D printer . And then the 3d model subjected to the wind tunnel testing . By authors conclusion they said that the corrugated wing is more suitable for low Reynolds number at lower angle of attack.

TOPIC : BIOMIMETIC FLIGHT AND FLOW CONTROL LEARNING FROM THE BIRDS

AUTHOR : Dr. Rajavepa

CONTENT : The author of this paper consider the various methods of lift employed by birds . Author focused on three

particular aspects , namely the method that a bird’s employs to compensate the transport lag , the rapid lift generation and finally the angle of attack at which a bird’s flies to generate maximum lift . The large aspect ratio wings is to configure their flying feathers or remiges as a variable camber aero foil such that the effective angle of attack is always constant . The authors said that the dragon flies over come the transport la by rapid increase in the angle of attack by high frequency beating. Author conclude that the concept of aero elastic tailoring is employed So the flexibility effects can contribute positively . So as to maintain lift of the wings .

TOPIC : AERODYNAMIC WING DESIGN WITH BIOMIMETIC APPROACH AND A PRACTICE

AUTHOR : Muhammet Tahir DEMIR

CONTENT : The research paper made us to think there are so many ways to save the fuel . The author chose the BIOMIMETIC concept to apply in the wheel . He hopes that this change can minimize the swept air resistance . By this reduction can save fuel and also the surface quality of wheel can improvised . Author inspired his design from birds and construct them in the shape of rain drop . The design works were carried out in solid works program . Author mentioned that in the year 1999 the hyper road software system were developed by researchers . And they tested the Ferrari F550 . CFD software analysis data down to 1.8% . As a conclusion author get 68.4% of gain in the friction force of the wheel rim designed by author by taking the wing shape from the birds and the cross-section surface of the rain drop .

TOPIC : BIO INSPIRED AEROFOIL FOR SMALL WIND TURBINE

AUTHOR : R.Mulligan

CONTENT : This research paper discusses the effectiveness of modifying the design of wind turbine blades . The author decided to design the wing structure into spanwise corrugated which was inspired from dragon fly’s wing structure . Author considered two bio – inspired minimize the performance of small wind turbine . The taken aero foils subjected to wind tunnel test . The dimension of wind tunnel was 450×450mm , with a design

wind velocity of wind tunnel up to 12m/s . This results in covering the test range of Reynolds number from around 40000 to 52000 . The corrugated aero foils gave the advantage of delaying stall . Authors research prove that the corrugated skin are better option for wind turbine blades , because it had similar lift to drag of characteristics to the smooth aero foil.

TITLE : BIO INSPIRED CORRUGATED AIRFOIL LOW REYNOLDS NUMBER**AUTHOR : HuiHu , Mastaoshi Tamai**

CONTENT : The taken paper discuss about the flow behavior around a bioinspired corrugated air foil compared with a traditional stream lined air foil . Author used three aero foil for this research work . They are a stream lined air foil GA(W)-1 air foil , a flat – plate airfoil , a bioinspired corrugated air foil . In these air foils the stream lined air foil was specially designed for low speed aviation applications with a large leading edge radius to flatten the peak in the pressure coefficient profile near the air foil nose to discourage flow separation . Stream lined aero foil has 17% of maximum thickness of the chord length . The flat plate and bioinspired corrugated aero foil are made up of wooden plates with a thickness of 4mm . The circulation bubble near the leading edge would then burst to cause aero foil stall . These experiments was calculated in a wind tunnel with practical image velocimetry to make detailed flow measurements . The author try to explore the non traditional air foil for MAV . In conclusion author mentioned that they conduct this research to understand the fundamental physics of dragon fly flight aerodynamics.

TITLE : PARAMETRIC STUDY OF AN OSCILLATING AIRFOIL IN POWER EXTRACTION REGIME**AUTHOR : T.kinsey and G. Dumas**

CONTENT : This research paper deals with reducing the consumption of fuel by using oscillating airfoil . Unsteady aerodynamics basics of the oscillating airfoils are first exposed with the scription of operating regimes . This paper consists of motion related parameters such as heaving amplitude and frequency , have the strongest affects on airfoil performance while geometry and viscous parameters turn out to play a secondary role . Author noticed that an oscillating symmetric airfoil can operate in two different regimes , namely propulsion and power extraction . An aerodynamics of moving bodies is for more difficult that it's steady counter part. The high resolution two dimensional unsteady computations have been performed in this steady at Reynolds numbers from 500 to

10000 . A second order accurate backward implicit scheme is used to discretize time . It is clear that increasing v_y leads to increased aerodynamics forces. This ultimately has a detrimental effect past a certain level . As conclusion the both pitching an heaving can reach efficiencies as high as above 35% .

CONCLUSIONS

By all these research papers we got some idea related how to conduct our research works . Got lots of procedure related ideas over biomimetic research work . The authors of BIO INSPIRED CORRUGATED AIRFOIL LOW REYNOLDS NUMBER inspired us to climb up the non traditional aero foils so we interested to study the design structure of pavo Cristatus . With the help of these valuable knowledge we can succeed our project in better way.

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