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DESIGN AND ANALYSIS OF DUAL AXIS SOLAR TRACKING SYSTEM

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ABSTRACT

This project presents the hardware design and implementation of Multi Axis Solar Tracking System that ensures a perpendicular profile of the solar panel with the sun in order to extract maximum energy falling on it. The LDRs sense the change in the position of the sun which is dealt by the respective change in the solar panel's position by switching on and off the motor. With the implementation of the proposed system the additional energy generated is greater than conventional system.

Keywords: LDR, Vibration analysis, Modeling.

I. INTRODUCTION

The solar panel which is gaining wide usage nowadays have serious problem of efficiency due to change in position of sun. To tackle this problem the automatic solar tracking systems are present in market. This paper deals with Design and analysis of Dual axis solar tracker. This dual axis solar tracker system works by changing the position of solar panel with the help of motor so that solar rays strike on the solar panel with as low angle of incidence as posible so as to generate maximum energy from sunrise to sunset.

II. METHODOLOGY

Step 1: - Work of the project was started with literature survey. We gathered many research papers which are relevant to this topic. After going through these papers, we learnt about solar trackers .

Step2: - After that the components which are required for our project are decided.

Step 3: - After deciding the components, the 3 D Model and drafting will be done with the help of software.

Step 4: - The system will be anlysed

Step 5: - The testing will be carried out and then the result and conclusion will be drawn.

Working

Sensor consists of one LDR is connected to microcontroller. Resistance of LDR is inversely proportional to the intensity of incident light. Output voltage is also proportional to intensity of incident light. Depending upon the sun position intensity of light changes on both the LDR pairs, thus output voltage changes. The microcontroller compare these four voltages & send signal to motor driver to rotate the sensor in such a manner the output voltage become equal or within reasonable limit.

III. MODELING AND ANALYSIS

Design

The design has been made using Catia V5 R20 software. Initially the dimension taken are standard dimensions and parts are designed according to those dimensions with the scale of 1 :2.

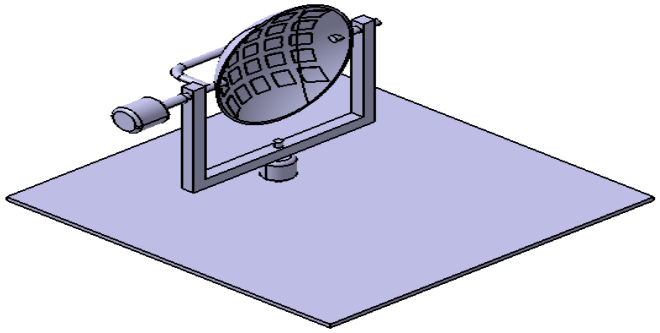

Figure 1: 3D Model of solar tracker.

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Vibration Analysis

Vibration analysis of the prepared design has been performed using Ansys software to calculate the natural frequency of the system in 6 degrees of freedom so as to asses the stability of system in natural conditions.

Following are steps

Geometry
Discretisation (Meshing)
Boundary condition
Solution
Interpretation of results

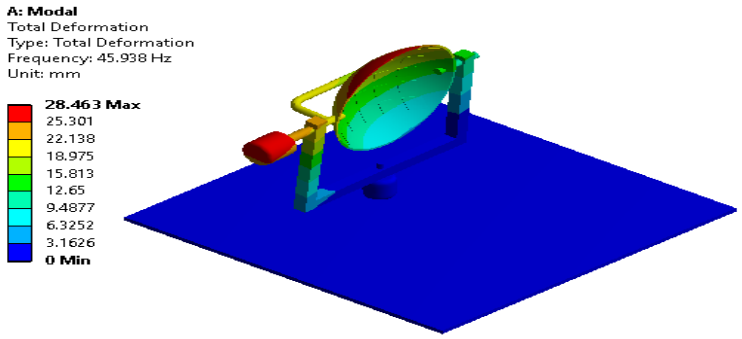

Figure 2: Mode shape 1

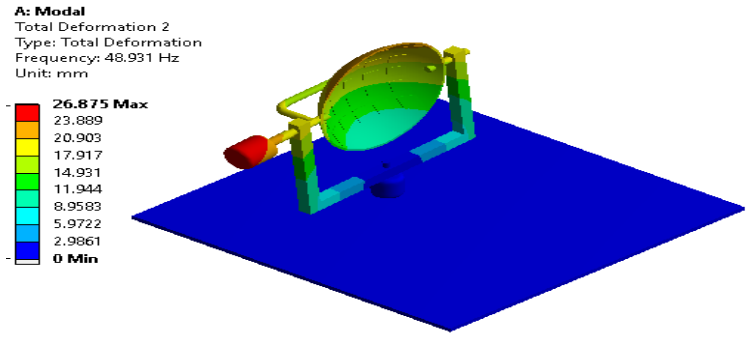

Figure 3 Mode shape 2

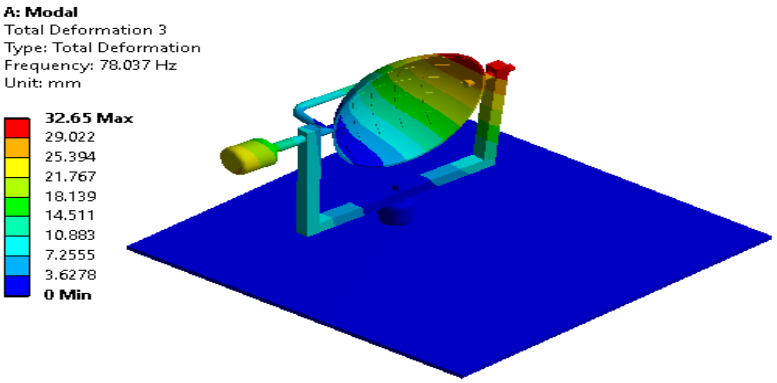

Figure 4 Mode shape 3

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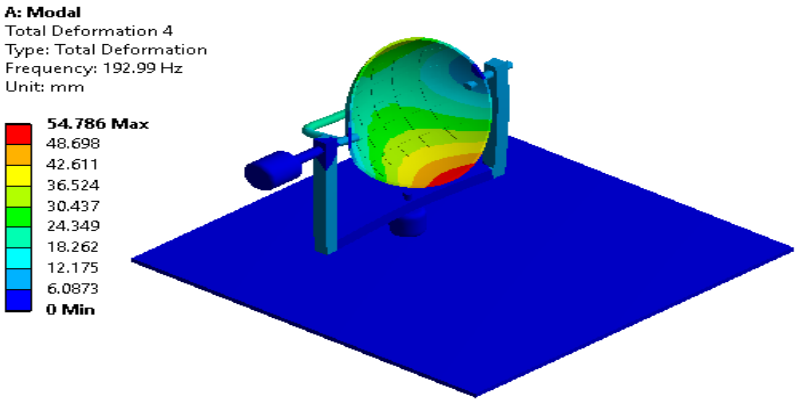

Figure 5 Mode shape 4

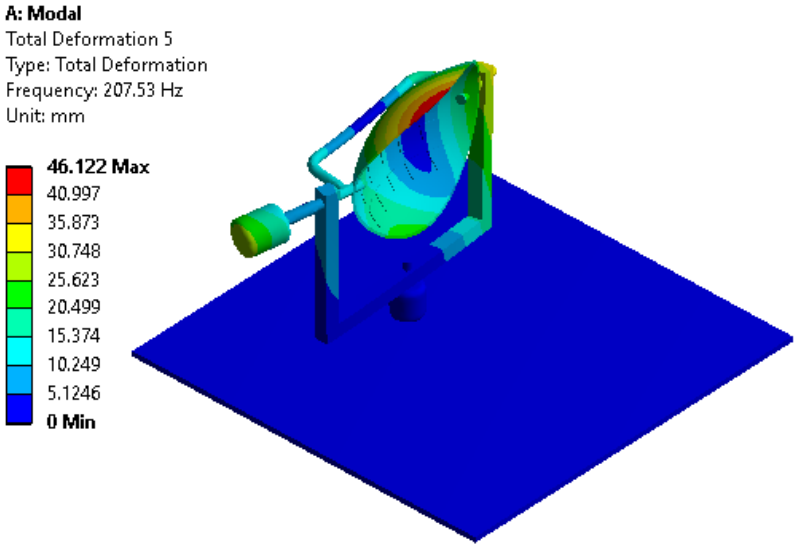

Figure 6 Mode shape 5

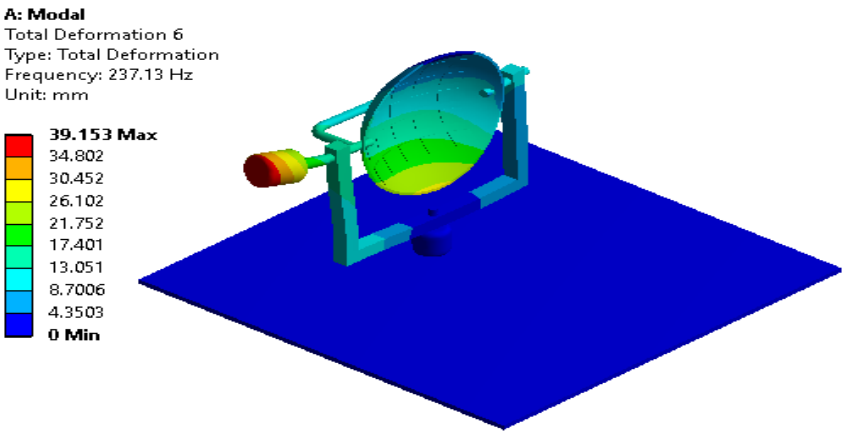

Figure 7 Mode shape 6

The 6 natural frequency has been calculated in 6 degrees of freedom.

IV. RESULTS AND DISCUSSION

1 The calculations were performed.

2 The model of system was prepared using CATIA software.

3.Vibration analysis of system was performed.

4.The values of natural frequency of system were calculated.

Table 1 Value of natural frequencies

SN.	Mode	Frequency [Hz]
1	1	45.93
2	2	48.95
3	3	78.03
4	4	192.99
5	5	207.53
6	6	237.13

The above values of natural frequencies show that System is stable to perform its operation in natural Conditions Frequency values are satisfactory in natural conditions. The analysis shows that system is considerably stable in resisting vibration of winds and also mild earthquakes.

V. CONCLUSION

The given project was based on the efficient use of solar energy with the help of durable ,cheap and movable system. The calculation , model and analysis of the system denote that the system is stable in its working in natural conditions with Good vibration resistance ,good corrosion resistance and minimum usage of battery. This system can play important role for producing electricity at places where there are no sources of electricity like village areas. This energy source is renewable and continuous.

VI. REFERENCES

[1] Adrian Catarius ,M Christiner, "Azimuth-Altitude Dual Axis Solar Tracker" Worcester Polytechnic Institute vol1 No2, pp13 (2010).

[2] .Kamala J, Alex Joseph , "Solar Tracking for Maximum and Economic Energy Harvesting" International Journal of Engineering and Technology (IJET) Vol 5 No 6 .ISSN : 0975-4024 (2001).

[3] Amit Chakraborty Chhoton, Narayan Ranjan Chakraborty"Dual Axis Solar Tracking System-A Comprehensive Study: Bangladesh Context", International Conference on Advances in Electrical Engineering (ICAEE).

[4] Nader Barsoum,R Nizam "Fabrication of Dual-Axis Solar Tracking Controller Project" University of Sabah, Kota Kinabalu Malaysia , vol 1,pg (2015).

[5] .Salih Fadil, Ahmat Can , "Two Axis Solar Tracker Design and Implementation" .IEEE Power and Energy Magazine, vol. 1, no. 1, pp. 30-37(1999)..

[6] Sujata Shivashimpiger, Sri Lakshmi C.S. "A Combined approach Towards the Efficiency Improvement of Solar Photovoltaic Panel ",NMIT, Bengaluru, IndiaISSN (Online): 2278 – 8875. (2017).

[7] Vikash Kumara, Sanjeev Kumar Raghuwanshi "Design and Development of Dual Axis Solar Panel Tracking System for Normalized Performance Enhancement of Solar Panel" International Conference on Sustainable Computing in Science, Technology & Management (SUSCOM-2019).

[8] Shyngys Almakhanovich Sadyrbayev, Amangeldi Bekbaevich Bekbayev, Seitzhan Orynbayev and Zhanibek Zhanatovich Kaliyev " Design and Research of Dual-Axis Solar Tracking System in Condition of Town Almaty" Middle East Journal of Scientific Research December (2013).

[9] Rashid Ahammed Ferdaus,1 Mahir Asif Mohammed,1 Sanzidur Rahman,1 Sayedus Salehin,2 and Mohammad Abdul Mannan " Energy Efficient Hybrid Dual Axis Solar Tracking System" Hindawi Publishing Corporation Journal of Renewable Energy Volume 2 Article ID 629717, 12 pages (2014).