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Design of Autonomous Protection Scheme based on Laser Mesh for Road Crossing & Agriculture Farm Crossing Transmission Line

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Abstract: ***From earlier days to now for electric current transmission heavy voltage lines are commonly used but as number of residential people, societies, are increasing day by day so the installing and maintenance of that wiring system is tough task. This may cause many accidents in residential areas as well as roads, farms etc. and this may also cause death of persons. So to overcome from this situation Laser Based Technology is introduced and it looks like great advantage from last many decades. This technology used in several parts like Medical Sciences, Military, Industries and many more. The idea is to provide a laser based smart system to detect such conditions and send failure & alert signal to control station. The system consists, LASER and LDR based sensor array to check minimum clearance for overhead conductor. In any uncertain condition or accidental condition signal will sent by radio frequency. Complete system is based on Solar and it can be easily mount on electric towers.***
Keywords: High Voltage, Live Conductor, LASER, LDR, Sensor Array, GSM Communication System, Radio Frequency Communication System

I. INTRODUCTION

Power transmission is main part of grid system and to generate power the power plants are located near easily available resources and mainly away from residence areas and this generated power transferred via transmission lines. As, these lines are operated at 440V to 1200KV which is very high and their towers are placed in between roads, highways, agriculture. In any case if breakdown occurs sometimes the mounted conductors which are very heavy and dangerous can fall anywhere downside, as it is dangerous it may cause heavy damage like death or any accident, so to avoid this and detect this fault at any instant proper guarding system is required for saving lives and accidents. The project is based on protection scheme for such problems using laser technology. Laser technology has observed great scientific developments and engineering improvements that make it usable for various commercial, industrial, medical and scientific applications. The lasers have already brought great benefits in photography, spectroscopy, holography, and data Storage, surgery and much more. It uses the phenomenon of stimulated emission to generate a coherent optical beam that offers a wide variety of functionalities for various applications. There are variety of lasers available in the market today with different wavelengths, spectral bandwidth, power levels, operating efficiencies and temporal characteristics. This increasing maturity of lasers and compact optical systems have enhanced their capabilities for power operations.

A. Existing System

Traditional system uses protection schemes based on current, voltage and impedance measurement of online HOT transmission line if any abnormality is observed by the protection relays the system is tripped. In case of mechanical Failure of conductor in certain conditions it is observed that response to failure is sluggish and time consuming which creates dangerous conditions in nearby area surrounding live conductor. Also, these traditional systems are used for lines which are operating at very high voltage and power levels due to cost & complexity reasons.

B. Proposed System

Above discussed issues regarding breakdown of power transmission system can rectified by use of LASER based guard system forming a dense mesh of light array below the live conductor at minimum clearance level. Whenever the cable will either sag or breakdown below clearance level it will interrupt the laser continuity between two towers, then sensors & CPU will note abnormal condition and in result signal will be sent to the control station. There can be different type of communication system which can be used depending upon distance between respective tower and control room which are GSM/Radio Frequency/Bluetooth etc. The system is completely autonomous, solar powered, and Universal to mount on any type of towers or poles.

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II. DESIGN AND HARDWARE

A. *Hardware Used*

1) Iron Rods (Tower Fabrication)
2) Solar panel 50Watts
3) Aluminum (Sheet 1mm)
4) Temperature Sensor
5) ADC Voltage Sensor
6) Microcontroller Based Development Board
7) 6mW LASER Emitter Diodes
8) LDR Sensors
9) Lead Acid Battery
10) Circuit BOX & Housing Components 11.GSM Module/HC05 Bluetooth/RF Module
11) 4 Channel Relay Module
12) Buck Converters

B. *Design*

The desing of project is mainly for protection of transmission lines. In this we will create a laser mesh structure between the two tower Distancing about 200 meters from each other. The mesh will be created with the help of laser of & LDR
The power of the whole structure will be given by the solar panel which include micro-controller power switching board which are placed in the box mounted on tower
The LDR and laser sensor are mounted below the conductor about the ground clearance level so that if the conductor disturb the Continuity of laser than the signal will be sent to the microcontroller

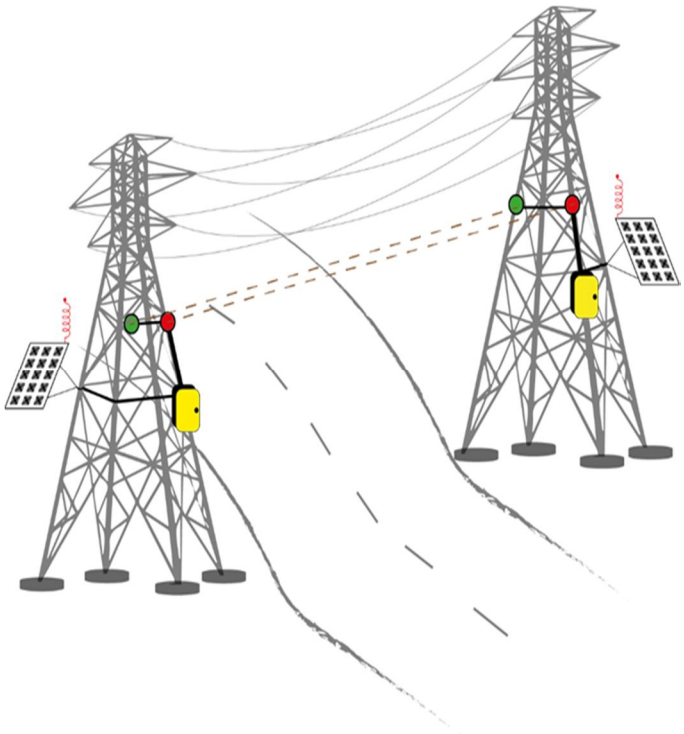

Fig 1: Design of protection scheme

The given below is the top view of the design of the protection scheme it show how the structure look alike The solar panel is connected to the microcontroller development board

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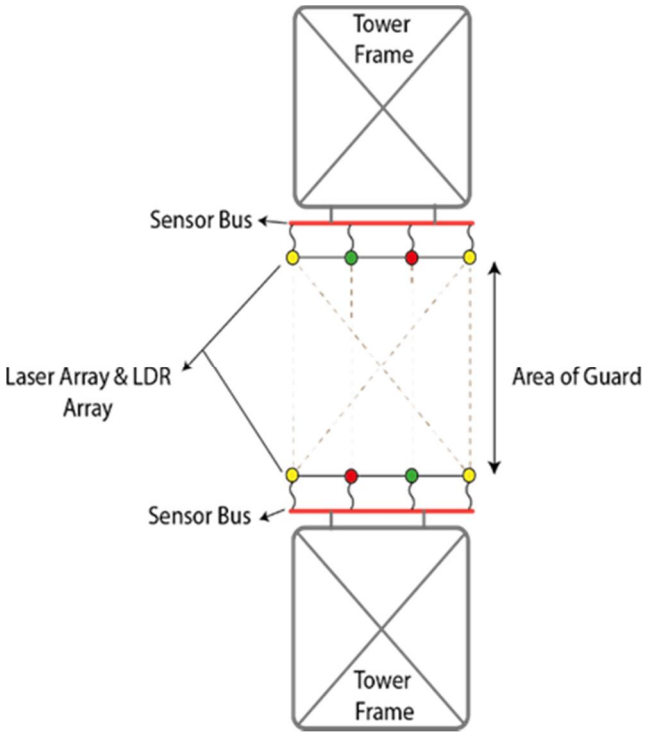

Fig 2: Top view of design of protection scheme

As It will synchronize with the help of better bank And charging The circuit or supply the power of the system through microcontroller

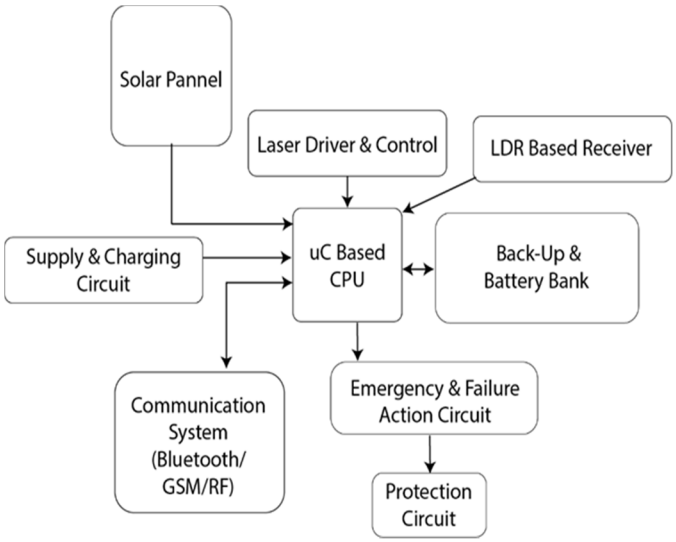

Fig 3: Block diagram

Here is the block diagram the protection system which place on the tower . Solar panel change the battery and you supply to the system Power supply to the laser is controlled by laser driver as the laser continuity Interrupt due to mechanical breakdown of conductor then the laser driver emitter send a signal to the microcontroller an emergency message will be triggered to nearest control center with the help of communication system .

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III. METHODOLOGY

A. Material selection and design Scaled model of Transmission Tower (4-5feet).
B. Design & Fabrication of tower & universal mount bracket for sensor array.
C. Design & Fabrication of Omni-Directional Laser Adjust Mount.
D. Design & Fabrication of LASER & LDR array circuit
E. Design of main circuit with GSM/Bluetooth/RF Communication system.
F. Design & Fitting of solar panel and power supply circuit.
G. Programming complete system.
H. Assembly of circuit and battery in main box & mounting to tower.
I. Complete assembly and the testing of LASER Protection Scheme.
J. Rectifying errors if any & finding areas of improvement.

IV. CONCLUSION

The aim of our project is design of autonomous protection scheme using LASER mesh for transmission line crossing road and agricultural farms is to design this system in such manner that it can protect human being and vehicles passing through transmission line as well as this all will help to complete our final aim i.e. to protection due to sagging of conductor.

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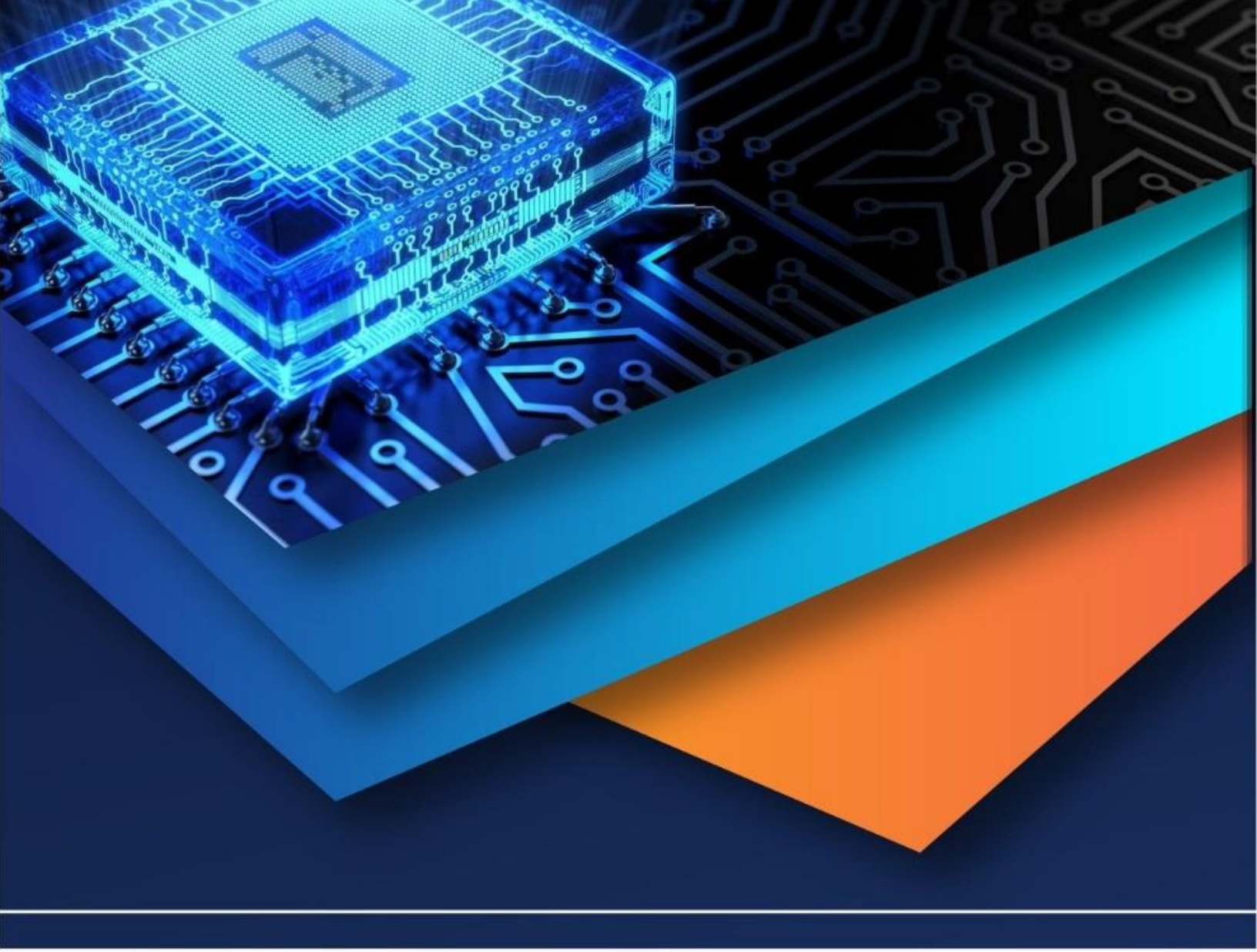

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