Fault Detection & Maintenance Of Transmission Line Using Robot Technology

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ABSTRACT

This paper gives information about the transmission line monitoring. The power system in our country is very difficult to understand & the most difficult task is to continuously monitoring and maintenance of power transmission line, tower, insulator etc.is very costly & it is very dangerous for inspection & difficult to finding damage of cable. Overhead Ground Wire fault is detected by helicopter, skill workers and telescope from ground etc. The transmission line is located all over the world with a remote & rugged area. The inspection of a transmission line and calculation of parameter is very difficult to obtain a accurate result. Therefore we are using a robot technology for alternative to the human activity. The robot monitoring is reduces cost for maintenance, increasing the reliability as well as human safety, reduces man power. The robot senses the real time monitoring operation & parameter of transmission line. The robot determines various parameters of a transmission line such as voltage, current, obstacles & failure of insulation. These parameters are sensed by the sensor then microcontroller collects all this data from the sensor & sends this data to the control room through transmitter & receiver. Camera is installed on robot for image capturing. When fault occurs on the transmission line robot capture the image of faulty section by camera and send data to the control room. Control room is located at ground station. The sending of data between the robot and control room is wirelessly through RF technology.

Keywords: Power transmission line, Robotic inspection, Microcontroller, RF communication, DC Motor.

I. INTRODUCTION

In order to monitoring the real time condition and giving the high output voltage with high efficiency in order to achieve the continuous monitoring of the real time data to reduces the losses and faulty condition of the transmission line is done with robot technology. The purpose of the PTL is to continuously observe of the running condition and find out the faulty and destructive location of the power system. For the inspection of the transmission line it is carried by the manually worker’s using various techniques for period of the inspection workers with a telescope, sometimes the workers climb on the tower. But practically, it is very dangerous and difficult for the human safety. It will sometimes give inaccurate result the manual inspection taking so much time, cost, risk of life. Therefore this disadvantage can be minimizing by using the robot technology. The robotic technology is invented in the last few year to overcome all this disadvantages.

The robot can be overcome all the satisfaction and advantages of the system robot in reducing cost, increasing efficiency and most important advantage is increasing the human safety. The act as an alternative to the human technologies. The robot is movement over the conductor with the help of roller wheel mechanism and travels along the conductor wire.
For inspection of PTL lines there are different types of communication technology in robot but we are using RF technology in this paper. The transmission line is very complex in nature. The robot consist of the current coil, voltage coil, thermal image sensor, DC motor, wheel assembly, transmitter, receiver, RF module, microcontroller, power supply, and battery such as digital parameter use. The current coil is used to determine the magnitude of current through the transmission line. If any fault and unbalance occurs the magnitude of current changes it is detected by the current coil. The voltage coil is use to determine the magnitude of the voltage. The voltage coil is also give the information of the voltage of sending and receiving and of the voltage. Thermal image sensor is used to find out the location of the fault of the system. Such as insulation failure of the transmission line this location can be found by the thermal image sensor. Thermal image camera is used to measure the temperature of the component and this data is to identify the component rating of there is normal or faulty condition this sensor can send the image to the ground control station and identify the faulty location. It can send the image of that portion where the insulation is failure, corrosion occurs, chemical reaction take place etc. Plastic frame are used for the robot body.

II. PROPOSED SYSTEM

For controlling the real time monitoring is do through voltage and current sensor. The voltage sensor are sense the line voltage of 230 V and the current of 5 A. The voltage senor output is given to the PIC microcontroller 89C51 because micro controller is reprogramming of 1000 times. An 89C51 has advances technology.

Output of voltage and current sensor is gives to the port P0 of the microcontroller. The monitoring result is send to ground station control system through the RF technology of the receiver at 433 KHz of frequency.

If magnitude of voltage and current are in predetermine condition then the LCD display the line “transmission line ok”. The increasing and decreasing magnitude of current and voltage is changing the load on the transmission line. The resistive load is connected to the transmission line if the load is increases than predetermine value the magnitude of current are increases. Increasing value of current and predetermine value is calculate by the microcontroller and gives signal to the microtransmitter and then micro receiver. The continuous monitoring is done from the ground station through the camera.

III. COMMUNICATION SYSTEM

The position of the robot obtained from the monitored parameters of the transmission lines are given to the controller which in turn encodes the data and transmits it through RF module through an encoder. This RF module send the data at 433 KHz to the control room via several repeaters on the transmission towers placed at strategic positions. At the control room RF module will receive the data and decode it through controller. The control room RF module can also be used to send commands to the robot for its movement via similar communication method.
IV. CONTROL SYSTEM

The control system of the robot is located on the ground base station. The control system handles robot running control, camera control, wireless data and image transmission. Robot weight reliability and processing capability are considered to choose the embedded computer for control system. Camera use for real time monitoring of transmission line. The signal transmitted through transmitter and receiver at ground station by couple of wireless data modem. Ground base station is consists of embedded computer, microwave receiver, data modem and monitor. The main work for ground base computer station is remotely control the inspection robot. The dada transmission channel are used for voltage and current data transmission and image transmission channel are used for the camera monitoring are separated for each other. The movement of robot such as forward, backward, stop and control is done through the ground base control station via human interface computer.

V. OBJECTIVE

1. Running on the overhead ground wire (OGW)
2. Transmitting the line inspection image, video of the PTL the robot to the ground base station.
3. Controlling the remotely the robot on the ground.
4. Monitoring the real time monitoring.
5. Maintenance easy.

VI. PERFORMANCES PARAMETER

<table>
<thead>
<tr>
<th>Sr no.</th>
<th>Parameter of robot</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Voltage of power transmission line</td>
<td>230 Volt</td>
</tr>
<tr>
<td>2</td>
<td>Current of power transmission line</td>
<td>5amp</td>
</tr>
<tr>
<td>3</td>
<td>Speed</td>
<td>30 RPM</td>
</tr>
<tr>
<td>4</td>
<td>Weight</td>
<td>1.5 Kg</td>
</tr>
<tr>
<td>5</td>
<td>Distance of video wireless transmission</td>
<td>15 km</td>
</tr>
<tr>
<td>6</td>
<td>Load of power transmission line</td>
<td>80 Watt &amp; 100Watt</td>
</tr>
</tbody>
</table>

VII. FEATURE OF PROPOSED SYSTEM

1) In future we have a GPS attached to it that would exactly send location in terms of longitude and latitude.
2) We can charge the battery of robot when it is running on transmission line with AC system and other by solar PV system.

VIII. CONCLUSION

- In this project, a robot for the inspection of transmission lines, which reduces the cost and the requirement of manpower, while enhancing safety and improving reliability was proposed.
- This robot can be used as basis for future developments and thus can be used to create a more efficient system for servicing of transmission lines.

REFERENCES