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IOT BASED HV TRANSMISSION LINE INSPECTION ROBOT

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ABSTRACT

This project is designed to inspect high voltage transmission lines or overhead transmission wires. This project consists of an inspection robot which is equipped with various sensors for parameter sensing, after sensing the parameters and conditions of the parallel transmission lines, robot moves forward from starting point till the ending point of the parallel line.

This proposed system is an inspection robot and it eliminates the need or intervention of human operator. Thus, any human error is ruled out. In this project microcontroller family (atemega328) has been used as CPU. Whenever the robot starts inspecting on the transmission line it senses three main parameters as current, voltage and temperature and it displays them on a LCD display which is mounted on the inspection robot itself. After sensing the parameters of the transmission line it moves further on to the line and hence inspect the total length of the parallel line for any defects and deviations in them. The line inspector then sends all of these parameters to a station which is nothing but a personal computer situated at stations side using transceivers. The station side operator is operating the robot and also receiving parameters as well as video and images of the transmission line. The station side operator would be using a small visual basic based interface in which two operating button with commands like forward and reverse are present and this interface would also be containing space where the parameter readings shall be displayed. The robot is also equipped with a wireless camera device, which captures the whole transmission line inspection process.

Further the project can be enhanced by making this system more advanced by adding more parameter sensor and replacing the wheels of the robot with more grip. Also the robot can be modified by adding propeller to the inspection robot hence increasing flexibility of its travelling process.

Keywords : RF –Radio Frequency, HV – High Voltage, RPM – Rotation Per Minute

II SYSTEM APPROACH

Ideally, a literature survey should be done in a systematic manner. A well-defined search method would yield a number of articles as result. The abstracts from these articles would be read, and the resulting articles (after discarding irrelevant material) would form the core of the survey. Such an approach would be reminiscent of the systematic review process. The systematic review was developed for the life sciences, but has recently been adapted to other branches of science such as computer science . An ad hoc initial search on IEEE Xplore yielded five articlesconsidered highly relevant. Table 3 Index terms for relevant articles. Browsing the table with the index terms, it is obvious that only two index terms are of use to us; mobile robot and power transmission line, and they are only relevant together. All other index terms are either too wide (e.g. ground wire) or too narrow (e.g. power system robotic 24 monitoring) to be of use. Performing a literature search using only one search term is assumed to not yield good results. It is concluded that a systematic approach based on index terms of articles would not suffice, and that therefore another method has to be used. The initial ad hoc search for articles that yielded the five articles forming the basis for the study of index terms had obviously produced valid results. That search was performed by entering random words thought to be in titles of relevant articles.

III MOBILE ROBOTIC SYSTEM

Generally speaking, the mobile monitoring of power systems involves the following issues: SENSOR FUSION: The aging of power cables begins long before the cable actually fails. There are several external phenomena indicating ongoing aging problems including partial discharges, hot spots, mechanical cracks and changes of insulation dielectric properties. These phenomena can be used to locate the position of the deteriorating cables and estimate the remaining lifetime of these cables. If incipient failures can be detected, or the aging process can be predicted accurately, possible outages and following economical losses can be avoided In the robotic platform, non-destructive miniature sensors capable of determining the status of power cable systems are developed and integrated into a monitoring system including a video sensor for visual inspection, an infrared thermal sensor for detection of hot spots, an acoustic sensor for identifying partial discharge activities and a fringing electric field sensor for determining aging status of electrical insulation. Among failure phenomena, the most important one is the partial discharge activity.

3.1 The Technology

This robot is going to move through out transmission line to inspect it. The Robot is having manual control over substation. So while moving forward it will inspect the line voltage current & temperature. All this collected data is send to substation though wireless RF link. At same time while inspecting substation will also get video by the wireless camera which is fitted on the robot. So here we have used RF link to communicate wirelessly between substation and robot.

3.2 Basic Block Diagram of System

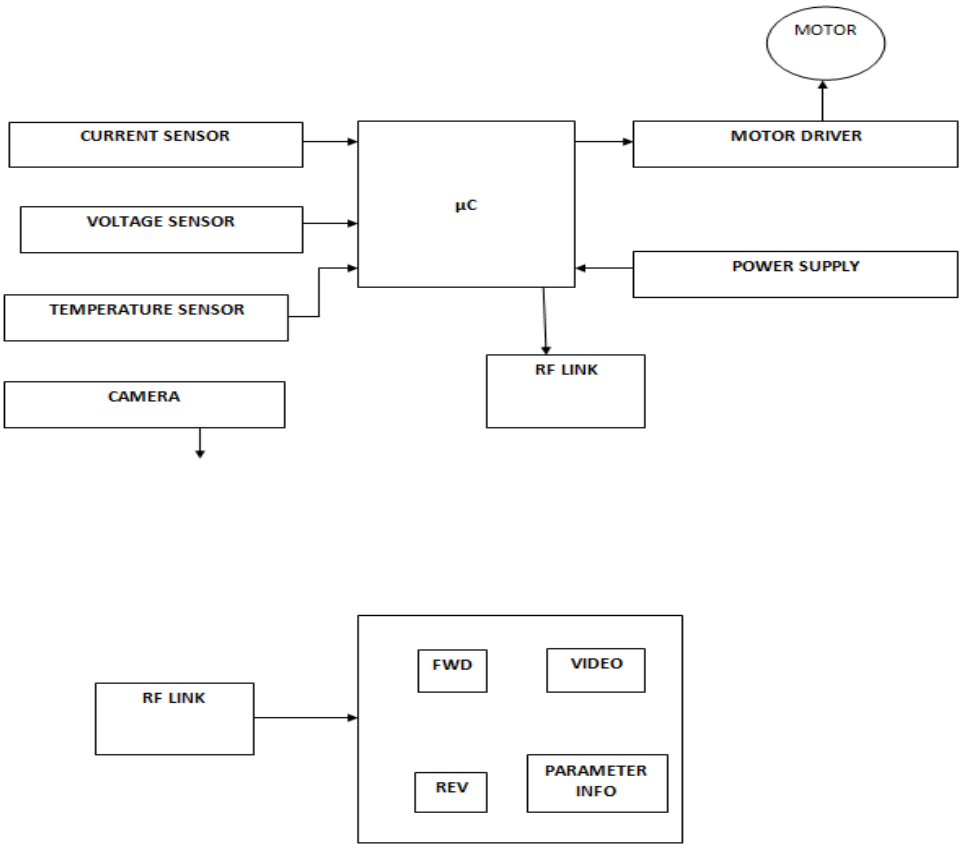

Figure:- Basic Block Diagram of System

3.3 DESCRIPTION OF EACH OF BLOCK

3.3.1 Battery

An electrical battery is a combination of one or more electrochemical cells, used to convert stored chemical energy into electrical energy. The battery has become a common power source for many household and industrial applications.

Batteries may be used once and discarded, or recharged for years as in standby power applications. Miniature cells are used to power devices such as hearing aids and wristwatches; larger batteries provide standby power for telephone exchanges or computer data centers.

3.3.2 Bridge Rectifier

The bridge rectifier is used for the A **diode bridge** is an arrangement of four (or more) Diodes in a bridge circuit configuration that provides the same polarity of output for either polarity of input. When used in its most common application, for conversion of an alternating current (AC)input into a direct current (DC) output, it is known as a **bridge rectifier**. A bridge rectifier provides full-wave rectification from a two-wire AC input,

resulting in lower cost and weight as compared to a rectifier with a 3-wire input from a transformer with a centre tapped secondary winding. The essential feature of a diode bridge is that the polarity.

3.3.3 Voltage Regulator IC7805

The input coil is called the primary and the output coil is called the secondary. There is no electrical connection between the two coils; instead they are linked by an alternating magnetic field created in the soft-iron core of the transformer. The two lines in the middle of the circuit symbol represent the core. Transformers waste very little power so the power out is (almost) equal to the power in. Note that as voltage is stepped down and current is stepped up. Voltage regulator is a circuit that supplies a constant voltage regardless of changes in load current The regulator used in our project is IC7805, which is a three terminal voltage regulator .A heat sink is used, so that the heat produced by the regulator dissipating power has a larger area from which to radiate the heat into the air by holding the case temperature to a much lower value than would result without the heat sink. IC 7805 has an internal thermal overload protection and the internal short circuit current limiting device.

3.3.4 Microcontroller ATMEGA328

Features

The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughputs approaching 1 MIPS per Mhz.

3.3.5 DC Motor

The direct current (DC) motor is one of the first machines devised to convert electrical power into mechanical power. Permanent magnet (PM) direct current converts electrical energy into mechanical energy through the interaction of two magnetic fields. One field is produced by a permanent magnet assembly, the other field is produced by an electrical current flowing in the motor windings. These two fields result in a torque which tends to rotate the rotor. As the rotor turns, the current in the windings is commutated to produce a continuous torque output. That output is given to ADC which will farther generate the signal The stationary electromagnetic field of the motor can also be wire-wound like the armature (called a wound-field motor) or can be made up of permanent magnets (called a permanent magnet motor). In either style (wound-field or permanent magnet) the commutator acts as half of a mechanical switch and rotates with the

armature as it turns. The commutator is composed of conductive segments (called bars), usually made of copper, which represent the termination of individual coils of wire distributed around the armature. The second half of the mechanical switch is completed by the brushes. These brushes typically remain stationary with the motor's housing but ride (or brush) on the rotating commutator. As electrical energy is passed through the brushes and consequently through the armature a tensional force is generated as a reaction between the motor's field and the armature causing the motor's armature to turn. As the armature turns, the brushes switch to adjacent bars on the commutator. This switching action transfers the electrical energy to an adjacent winding on the armature which in turn perpetuates the tensional motion of the armature.

3.3.6 Crystal Oscillator

An electronic circuit that is used to generate an electrical signal of precise frequency by utilizing the vibrating crystal's mechanical resonance made of piezoelectric material. There are different types of piezoelectric resonators, but typically, quartz crystal is used in these types of oscillators. Hence, the oscillator electronic circuits are named as crystal oscillators.

3.3.7 LCD Display

The electronics industry has used liquid crystal display (LCD) technology for years, in many products ranging from calculators to laptop screens. Now, LCD monitors or **flat-panel displays**, are quickly replacing traditional cathode ray tube (CRT) computer monitors. LCDs use less space than traditional monitors.

What is LCD?

LCD creates images on a flat surface by shining light through a combination of liquid crystals and polarized glass. The technology differs from CRT because a CRT uses a beam of electrons projected through a large glass tube to create images.

3.3.8 Arduino Platform

Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer.

It's an open-source physical computing platform based on a simple microcontroller board, and a development environment for writing software for the board.

3.3.9 IOT

The Internet of things (stylised Internet of Things or IoT) is the internetworking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items—embedded with electronics, software, sensors, actuators, and network connectivity that enable these

objects to collect and exchange data. In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as "the infrastructure of the information society."The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure,creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IoT will consist of almost 50 billion objects by 2020

3.3.10 Temperature Sensor

Temperature sensors are devices used to measure the temperature of a medium. LM35 is a three terminal device. Linear output voltage w.r.t temperature. Optimized for range of 20’C -110’C.

IV ADVANTAGES

- Risk of HV lines inspection will get reduce
- Cost of inspection will get reduce
- Less time required for inspection

V APPLICATIONS

- It is used to detect faults in high voltage transmission wires
- It can be used for reducing the human work
- It is used for sensing current, temperature and voltage of the HV transmission lines.

VI CONCLUSION

This project aims at reducing the complexity underlying in inspection of the overhead high voltage transmission lines by inspecting the main parameters of the parallel transmission lines by balancing the forward and reverse moving robot.

The main aim of the is project is to make an account of the various parameters timely and then report it to the server or system which is a computer, it sends the parameters and its values through RF links through transceivers, as there would be two transceivers, one on the robot and another on the personal computer which is affixed to a USB connector which can be inserted into the computer therefore sending the parameters successfully.

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VII RESULT

This transmission line inspection robot would be eliminating the requirement of human power and thus providing efficiency and accuracy. This project will give current , temperature and voltage readings. It will help to manage the robot to move forward after sensing the parameters and also record and capture images and videos of the transmission lines.

This project will also assure the safety of human operators by balancing its own machine body totally on the parallel wires and it would not result in any harm to the environment and surroundings.

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