LOW COST HIGH VOLTAGE POWER LINE BREAKS ALERT SYSTEM

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Abstract :

Broken and hanging live power lines are hazards for human as well as animal's lives. This paper describes the design of power line break alert system. The system alerts the power distribution company through the SMS so that they can shut down the line power, which helps to avoid electrical hazards.

Keywords : Arduino, SMS, GSM, power line break alert.

INTRODUCTION

Accidents involving high voltages power line can result in harsh injuries as well as death. When an electric current passes through the body, it generates heat and can extensively damage internal organs (Kouwenhoven, W. B. 1949). In some cases, the entry and exit wounds are so harsh that a foot or hand has to be permanently damaged (William C. 2016). The electric current can also stop the heart. Electricity tries to find shortest path to the ground. That path might include a tree, mobile equipment, or the human body. This article describes demonstration of high voltage power line break alert system. The system continuously monitor the power line using high voltage sensors.

SYSTEM DESIGN AND CONSTRUCTION

Fig. 1 shows simplified diagram for the system. The system can be installed at regular interval on high voltage power line. In case high voltage power line breaks the installed system send SMS to power distributor with unique id for where power line is break. This helps the power distributer to shut down the power. The system also turns on the alarm and hazed lamp to make local people alert. The system monitors any physical breakage in the power line by using current sensor. Fig. 2 shows block diagram of high voltage power line break alert system that is installed to power line.

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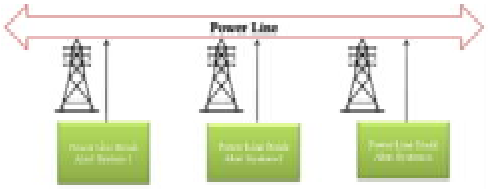

Figure 1. Simplified block diagram of high voltage power line break alert system

Voltage sensor:

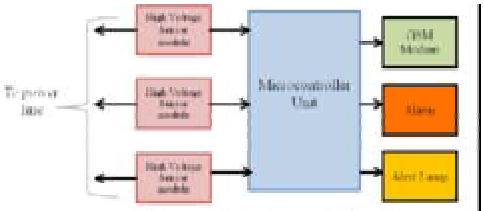

Figure 2. Block diagram of high voltage power line break alert system

Voltage sensor used is zmpt101b which is single phase voltage transformer (Khoa N. M. 2019). These sensors are used for each phase of power line. The output of voltage sensor is provided to microcontroller unit that process it for line break condition.

Microcontroller unit:

Microcontroller is the main processing unit of the system. We are used Arduino Uno with atmega328 8-bit MCU on board. The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc . The board is equipped with sets of digital and analog input/output (I/O) pins that suitable to design the present system hardware which include different interfaced modules and other circuits. That has low power consumption and relative high processing capacity. MCU receive the voltage signal form voltage sensor. This signal is processed by MCU for further decision.

SMS and GSM Module:

We are using Small SIM800L GSM Module. The module can support Quad-band which helps in rural areas where normally 2G network is available. This module has TTL Serial Port with the antenna so it can directly interface to MCU without any additional circuitry which makes affordable hardware. When MCU detects that any of power line is breaks it send SMS to power distributor for that it uses AT commands. SMS can be sent even though weak network is available as compared to GPRS-web based notification which required continuous internet connectivity.

Software algorithm of the system

Fig. 3 shows the software algorithm of high voltage power line break alert system. The system first initializes the different module such as timers, I/O ports, GSM etc. Then it continuously monitors the power line using high voltage sensor, as soon as power line is breaks the voltage sensor provide low voltage signal to MCU, MCU then immediately turn on the alarm and hazed lamp. The embedded C language is used to program the microcontroller (Fiore J. M. 2019).

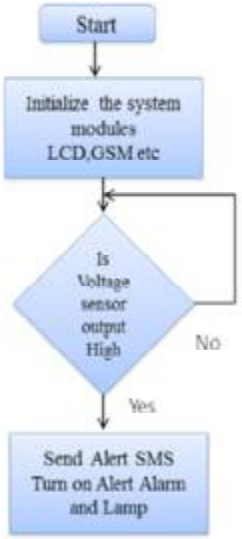

Figure 3. Software algorithm of the system

CONCLUSION

The proposed system provides an efficient technique to avoid accidents due to the breakage of power line over the humans and animals. This system provides an instantaneous warning to the power distributer about breakage of power line which helps them to cut-off the power line. The designed system is easy to install on existing power line without any major modification this makes it cost effective solution to avoid accidents due to the breakage of power line

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