E-Nose Conceptual Robot For Underground Transmission Line

HEMA PRIYA.K
UG student, EEE Department
Dhaanish Ahmed College of Engineering,Chennai.
Hema02kumar@gmail.com

NIKITHA CHANDRAN
UG student, EEE Department
Dhaanish Ahmed College of Engineering,Chennai.
nikithac44@gmail.com

A.SARAVANAN
HOD,EEE Department
Dhaanish Ahmed College of Engineering,Chennai.
saran2006@ymail.com

***Abstract*-- As power had influenced in all means and modes of day today life. Each and every second of a human is connected with electricity. As transmission lines are used for carrying power to the required ends. They are sometimes unsecure and face problems in the distribution of electricity properly. It is required to give proper grounding for phase lines. If there is no proper grounding or earthing then it will cause major damage to transmission lines. In real time, the process of identifying the fault in the underground earth line takes up to 8 days or more. To reduce this time period, we are designing a robot which Identifies the fault place based on the odour that spreads in the soil. Even though the line is under the surface of the earth, it spreads a very high fumes to the top of the soil. Hence, based on sensing the gas without excavating the surface , fault can be easily identified.**

Keywords: Gas sensor, acoustic signal, carbonization ,LT Cables, Earth return .

I. INTRODUCTION

Power line inspection and maintenance already benefit from developments in mobile robotics. The objective is to develop the robot to develop more cost effective diagnostic techniques for determination the fault of power transmission line. Transmission line faults (both transient and permanent) are a major cause of concern, particularly to those electricity customers who make use of continuous process plants. An underground cable essentially consists of one or more conductors covered with suitable insulation and surrounded by a protecting cover. Our objective is to implement a robot for finding the fault in this route. It's fixed with the gas sensor for detecting the carbonized smell. The measured gas concentration level is compared with already stored values if the measured value exceeds the level then it alerts the alarm that the fault exists pinpointing the location**.**

II. PROPOSED SYSTEM

The proposed system configures a mobile robot that is remote controlled to pin – point the faulted point without excavating the surface.

III. Transmitter section

A.Power supply

We supply power to the system through battery. So we use a Li-on battery. A lithium-ion battery is a rechargeable battery in which lithium ions move from the negative electrode to the positive electrode during discharge and back when charging. Li-ion batteries use an intercalated lithium compound as the electrode material. They are one of the most popular types of rechargeable battery for portable electronics, with one of the best energy densities, no memory effect, and only a slow loss of charge when not in use. Li-on battery is energy density, durability, and intrinsic safety.

B.Microcontroller

The micro controller, which we are using here is PIC 16F877. It consists of 5 ports, ADC, CLK & MCLR. It is PIC16F877 has 5 basic input/output ports. They are usually denoted by PORT A (R A), PORT B (RB), PORT C (RC), PORT D (RD), and PORT E (RE). It consists of internal flash memory and is re-writable.

Table1. Ports of PIC 16F877

PORT-A	RA-0 to RA-5	6 bit wide
PORT-B	RB-0 to RB-7	8 bit wide
PORT-C	RC-0 to RC-7	8 bit wide
PORT-D	RD-0 to RD-7	8 bit wide
PORT-E	RE-0 to RE-2	3 bit wide

All these ports are bi-directional. The direction of the port is controlled by using TRIS(X) registers (TRIS A used to

set the direction of PORT-A, TRIS B used to set the direction for PORT-B, etc.). Setting a TRIS(X) bit '1' will set the corresponding PORT(X) bit as input. Clearing a TRIS(X) bit '0' will set the corresponding PORT(X) bit as output.

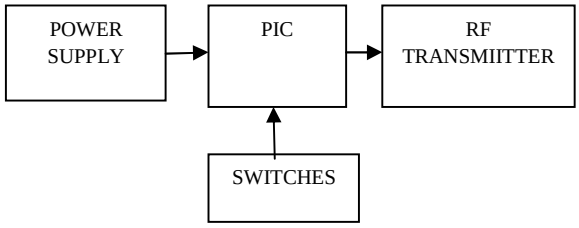

Fig.1. Block diagram of transmitter system

A.RF Communication

The RF Transmitter allows users to easily send serial data, robot control, or other information wirelessly. When paired with the matched RF Receiver, reliable wireless communication is as effortless as sending serial data. The power-down (PDN) pin may be used to place the module into a low power state (active low), or left floating (it is tied high internally).In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK).

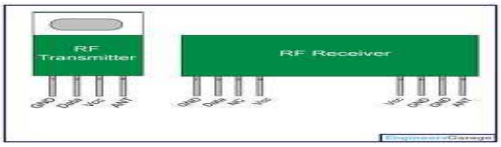

Fig.2. RF circuit

IV. Receiver system

A.RF receiver

The RF signals transmitted by the RF transmitter can be obtained perfectly only by a matched RF receiver.

B.Buzzer

Buzzer is an electrical device, which is similar to a bell that makes a buzzing noise and is used for signaling. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke. A piezoelectric element may be driven by an oscillating electronic circuit or other audio signal source, driven with a piezoelectric audio amplifier. Sounds commonly used to indicate that a button has been pressed are a click, a ring or a beep. When the input port pin from microcontroller is changed, the sound wave is changed in Buzzer.

C.Signal conditioner

A signal conditioner is a device that converts one type of electronic signal into a another type of signal. Its primary use is to convert a signal that may be difficult to read by conventional instrumentation into a more easily read format. In performing this conversion a number of functions may take place.

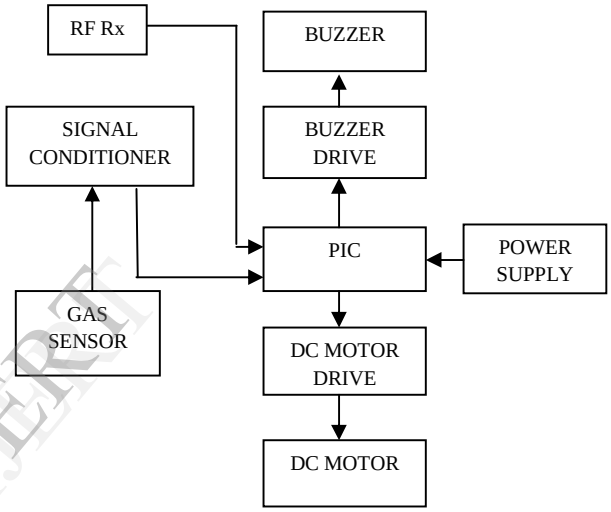

Fig.3. Block Diagram Receiver section

D.Gas sensor

A gas detector is a device which detects the presence of various gases within an area. This type of equipment is used to detect a gas leak and interface with a control system so a process can be automatically shut down. A gas detector can also sound an alarm to operators in the leaking area. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals.

Gas detectors can be used to detect combustible, flammable and toxic gases, and oxygen depletion.

Gas detectors are usually battery operated. They transmit warnings via a series of audible and visible signals such as alarms and flashing lights, when dangerous levels of gas vapours are detected. As detectors measure a gas concentration, the sensor responds to a calibration gas, which serves as the reference point or scale. As a sensor's detection exceeds a preset alarm level, the alarm or signal will be activated. As units, gas detectors are produced as portable or stationary devices. Originally, detectors were produced to detect a single gas, but modern units may detect several toxic or combustible gases, or even a combination of both types.

The relationship between sensor resistance and the concentration of deoxidizing gas can be expressed by the following equation over certain range of gas concentration:

$$Rs = A[C]^{-\alpha} \qquad (1)$$

Where
Rs =electrical resistance of the sensor,
A = constant,
C = gas concentration,
α=slope of *Rs* curve.

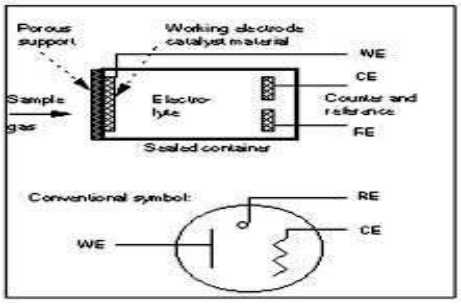

Fig 4.sensor circuit

C.DC motor

DC motors are non-polarized. Typical DC motors are rated from about 6V-12V. The larger ones are often 24V or more. But for the purposes of a robot, you probably will stay in the 6V-12V range, voltage is directly related to motor torque. More voltage, higher the torque. A DC motor is rated at the voltage it is most efficient at running. If you apply too much of voltage, it will overheat and the coils will melt. So run near rated voltage. There is a special case for DC motors that change directions. To reverse the direction of the motor, you must also reverse the voltage. However the motor has a built up inductance and momentum which resists this voltage change. So for the short period of time it takes for the motor to reverse direction, there is a large power spike. The voltage will spike double the operating voltage. The current will go to around stall current.

Fig 5. DC motor

V. Hardware implementation

Fig 6. Receiver Kit

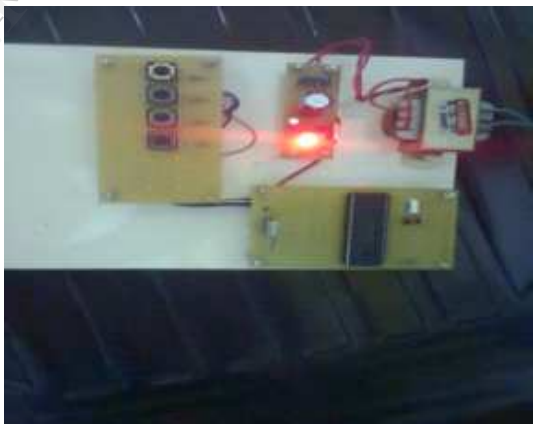

Fig.7. Transmitter kit

Fig 8. Gas sensor

D.Evaluation

Table 2. Comparison

Parameters	Existing model	Proposed design
Time consumed	High	less
No. of workers	More	Less
Efficiency	less	high

CONCLUSION

At the end of a research we have designed a mobile robot with a gas sensor that acts as an E-nose in pin-pointing the fault location in the low voltage(LT) underground cables with an ease n less time consumption. This method enhances the efficiency of the staffs of TNEB in finding the faults and also works towards a greater vision of automation even in small sector of TNEB yielding a high profit to the sector involving a minimum installation cost. The future work of the system includes the design and addition of filter circuit that eliminate the noise and other disturbances that occur in RF communication.

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AUTHORS BIOGRAPHY

K. Hema Priya was born in tamilnadu in 1992. At present, she is pursuing her Bachelor's degree in the department of Electrical and Electronics Engineering in Dhaanish Ahmed College of Engineering, padappai, tamil nadu. Her areas of interest are robotics and power quality maintenance and control.

Nikitha Chandran was born in tamilnadu in 1992. At present, she is pursuing her Bachelor's degree in the department of Electrical and Electronics Engineering in Dhaanish Ahmed College of Engineering, padappai, tamil nadu. Her areas of interest are power electronics.