IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

Analysis of Automatic Aircraft Landing Using GSM Transmitter and Receiver

M. Pradhibha[*1], Dr. T.V.U. Kiran Kumar,P. Thamarai[2]

[*1,2] Department of Electronics and Communication Engineering, Bharath University, Selaiyur, Chennai, India

pradhibham@yahoo.co.in

Abstract

Correct aircraft operation, depends upon the proper functioning of airport lighting circuits. The failure of even a single lamp, may well imply, the loss of the visual aid for the pilot and it can result in sabotages while landing. This project deals with the individual detection of any open circuit between two successive fittings. This is achieved by placing a simple non contact AC voltage detector over the insulated 5kV line and transmitting the output logic to the control room through GSM technology. The voltage detector picks up the hum of AC voltage, which is sufficient to clock CMOS decade counter. During open circuit, absence of line voltage makes the last count to be stable, which is picked up by a microcontroller, which in turn activates GSM transmitter to transmit the desired message to the control room GSM receiver. This system has a major advantage that it needs no extra under lying of cables near runway and GSM frequency which doesn't affect RADAR and other communication frequencies and also independent of distance. Also it requires no physical connection between CCR and also to high voltage cables. And over all, it is the most cost efficient system introduced so far.

Keywords: GSM Transmitter and Receiver .

Introduction

Healthiness of an airport mainly depends on its runway and its lighting. Runway lighting is to provide sufficient illumination along the path of aircraft during landing or take off. The major importance of runway lighting system is to provide the exact azimuth angle and banking of runway especially during night hours and also in foggy weather conditions. Different regulations specified by the ICAO regarding runway lighting are followed in most of the countries.

This project is based on the design and implementation followed by the Airports Authority of India at the Chennai International Airport, Meenambakkam, Chennai, Tamil Nadu, India. This airport follows CAT II system i.e., lighting for foggy runways.

Open circuit faults are quite common in runway lighting cables as they carry a voltage of 5kV and are buried underground. Due to high tension and ageing of cables, they are prone to puncture. This results in weakening of cable at different points leading to breakage or opening of the line in due course of time. At present, during any open circuit fault, crew members are sent to the field to locate the fault point. As the breaker trips after the fault, a 220V supply is given, and the crew members locate it for open circuit manually. During failure, the entire lighting circuit is given a backup; meanwhile, the fault must be rectified in a short period of time. This is a tedious process at night hours and also when the movement of flight is frequent.

In developed countries, and in some of the busiest airports in the world, voltage sensors are placed in every node which constantly monitor the voltage levels of the line and indicates during the fault. This system is possible only whenever airports are newly commissioned as it requires a separate data transmission cable running parallel to the main line. This system is expensive at installation and also for maintenance.

Hence, a cheaper monitoring system, compatible with the present day airports, avoiding new installation of underground cables, with a simpler methodology for fault detection, location and its transmission in an efficient manner has to be developed.

Block Diagram

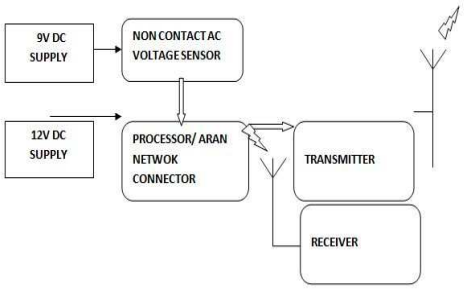
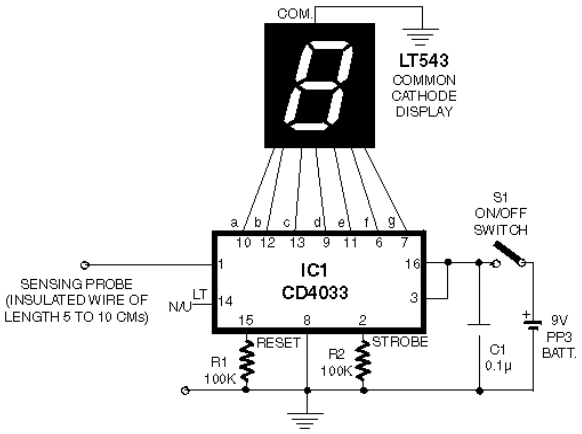


Fig3.2.System block diagram

The above figure shows the basic block diagram of the entire project. This consist of 12V supply for MICRO CONTROLLER PIC 16F877 and GSM transmitter and a 9V supply for Non-Contact AC voltage detector. The voltage detector picks up the hum of AC voltage, which is sufficient to clock CMOS decade counter. During open circuit, absence of line voltage makes the last count to be stable, which is picked up by a microcontroller, which in turn activates GSM transmitter to transmit the desired message to the control room GSM receiver.

Voltage Sensor



This non contact AC voltage detector a CMOS IC (CD4033) based circuit which can be used to detect presence of mains AC voltage without any electrical contact with the conductor carrying AC current/voltage. Thus it can be used to detect mains AC voltage without removing the insulation from the conductor. Just take it in the vicinity of the conductor and it would detect presence of AC voltage. If AC voltage is not present, the display would randomly show any digit (0 through 9) permanently. If mains supply is available in the conductor, the electric field would be induced into the sensing probe. Since IC used is CMOS type, its input impedance is extremely high and thus the induced voltage is sufficient to clock the counter IC. Thus display count advances rapidly from 0 to 9 and then repeats itself. This is the indication for presence of mains supply. Display stops advancing when the unit is taken away from the mains carrying conductor. For compactness, a 9-volt PP3 battery may be used as supply to the gadget.

The above technique can be used in normal 220V perfectly. Under 5kV, the repetition of digits is faster. Hence the sensor must be placed in a considerable distance from the main line corresponding to the delay coded in to the micro controller. Among the seven segments, any one to four of randomly selected segments is taken into the micro controller for sensing. Power supply to the sensor is provided by permanently placing a battery at the site. A battery of higher ampere hour is provided, such that replacement of batteries can be made on yearly basis along with the line maintenance.

The advantage of this sensor is that it is more cost efficient. It is highly inert to external radio/mobile frequencies. A water tight metal enclosure may be provided as a protection against moisture and also for its efficient operation.

Work Done

The proposed system is more cost efficient and simple to install. Installation and maintenance is simpler when compared with other techniques. This system can be further extended by providing a micro controller at the receiver side to filter the first message sent by the voltage processors, to distinguish the voltage sensor which first indicates the fault. The circuit can be sealed and kept inside the man holes, with the GSM antenna projecting over the surface.

Hence, the circuit makes no change in the external appearance of runway and also no electromagnetic interactions with the instrument landing systems. In developed countries, voltage sensors are placed in every node which constantly monitor the voltage levels of the line and indicates during the fault. This system is possible only whenever airports are newly commissioned as it requires a separate data transmission cable running parallel to the main line. This system is expensive at installation and also for maintenance. This proposed project proved to be cheaper, having less circuit complexity.

Thus this project provides reliable operation of fault detection and also location in runway lighting circuit, guaranteeing maximum security of operation of airplanes.

Conclusion

The proposed system is more cost efficient and simple to install. Installation and maintenance is simpler when compared with other techniques. This system can be further extended by providing a micro controller at the receiver side to filter the first message sent by the voltage processors, to distinguish the voltage sensor which first indicates the fault. The circuit can be sealed and kept inside the man holes, with the GSM antenna projecting over the surface.

Hence, the circuit makes no change in the external appearance of runway and also no electromagnetic interactions with the instrument landing systems. In developed countries, voltage sensors are placed in every node which constantly monitor the voltage levels of the line and indicates during the fault. This system is possible only whenever airports are newly commissioned as it requires a separate data transmission cable running parallel to the main line. This system is expensive at installation and also for maintenance. This proposed project proved to be cheaper, having less circuit complexity.

Thus this project provides reliable operation of fault detection and also location in runway lighting circuit, guaranteeing maximum security of operation of airplanes.

References

[1] H. Izadi,M. Pakmehr, and N. Sadati, “Optimal neuro-controller in longitudinal autolanding of a commercial jet transport,” in *Proc. IEEE Int.Conf. Control Applications*, 2003, pp. 1–6.

[2] D. K. Chaturvedi, R. Chauhan, and P. K. Kalra, “Application of generalized neural network for aircraft landing control system,” *SoftComput.*, vol. 6, p. 441-118, 2002.

[3] Y. Iiguni, H. Akiyoshi, and N. Adachi, “An intelligent landing system based on human skill model,” *IEEE Trans. Aerosp. Electron. Syst.*, vol.34, pp. 877–882, 1998.

[4] S. Ionita and E. Sofron, “The fuzzy model for aircraft landing control,”in *Proc. AFSS Int. Conf. Fuzzy Systems*, 2002, pp. 47–54.

[5] K. Nho and R. K. Agarwal, “Automatic landing system design usingfuzzy logic,” *J. Guid., Control, Dynam.*, vol. 23, pp. 298–304, 2000.

[6] C. C. Jorgensen and C. Schley, “A neural network baseline problem for control of aircraft flare and touchdown,” *Neural Netw. Control*, pp.403–425, 1991.