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ACCIDENT AVOIDING SYSTEM IN POWER LINE TRANSMISSION USING MICROCONTROLLER

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Abstract:

The increased growth in the railway sector has resulted in an increase in the train traffic density across the world. This has resulted in the increase in the number of accidents involving trains. In this paper, the proposed system includes several features which prevent train accidents. It includes automatic speed controlling in curves, collision detection, fire detection, detaching of couch automatically when fire is detected in it, automatic railway gate control and track continuity. This system makes use of IR sensors, fire sensor, zigBee and other embedded systems.

Keywords: Train control block, track control block, zigbee, IR sensors.

1. INTRODUCTION

The Indian Railways has the world's fourth largest railway network in the world, after that of the United States, Russia and China [3]. The railways traverse the length and breadth of the country and carry over 20 million passengers and 2 million tons of freight daily. It is one of the world's largest commercial or utility employers, with more than 1.6 million employees. About 15000 trains work every day. Unfortunately there have been many accidents involved in the railways.The Railways has the most intricate and involved inter- dependencies. Safety on the Railways is the end product of the cohesive fusion of its myriad parts. A single flaw in the 64,600 route kms of track that criss-cross the country, a defect in over 9,500 locos, 55,000 coaches and 2.39 lakhs wagons that haul about 23 million passengers and nearly 2.7 million tons of freight every day, an incorrect indication on one of the thousands of signals that dot the rail landscape, a mistake or an act of negligence by one of its staff directly associated with train running, even a rash act by one of the millions of road users who daily negotiate around odd level crossing gates spread across the system, an irresponsible act of carrying inflammable goods – any one of these multiple possibilities has the potential to cause a major tragedy. Added to these are the acts of sabotage by misguided elements spanning the whole country, Thus utmost vigil is safety in operations and also security of the traveling public.

2. COMPONENTS IN PREVENTION SYSTEM

A. AT89S52 Microcontroller

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel‟s high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 instruction set and pinout. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-

level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. 32 I/O lines can be used to output data and order other devices to do certain work, or to read the state of a sensor, or a switch. Most of the ports of the 89S52 have „dual function meaning that they can be used for two different functions.

B. IR Sensors

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation. It is also capable of measuring heat of an object and detecting motion. Infrared waves are not visible to the human eye.A typical system for detecting infrared radiation using infrared sensors includes the infrared source such as blackbody radiators, tungsten lamps, and silicon carbide. In case of active IR sensors, the sources are infrared lasers and LEDs of specific IR wavelengths. Next is the transmission medium used for infrared transmission, which includes vacuum, the atmosphere, optical fibers. Finally, the infrared detector completes the system for detecting infrared radiation. The output from the detector is usually very small, hence pre amplifiers coupled with circuitry are added to further process the received signals.

C. Zigbee

Device ZigBee standard is managed by the Zigbee Alliance, a global consortium of more than 50 companies (OEMs, IC vendors & tech companies). ZigBee is a short-range, low- data-rate wireless network technology, which is based on the IEEE 802.15.4 wireless personal area network standard. And the ZigBee‟s data rate is between l0 Kbit/s and 250 Kbit/s, so it is suitable for low-rate wireless transmission applications. But ZigBee can build up to a few tens of thousands of wireless transmission module consisting of wireless-data transmission network platform through the network node, which is very similar to the existed CDMA mobile communications network or GSM Network. And each network node can extend the distance from the standard 75 meters to several hundred meters, and even a few kilometers. And ZigBee network primarily for the automatic control and the establishment of data transmission but the mobile communications network for voice communications is established, which is the difference between ZigBee network and the mobile communications network. ZigBee technology has low data rate and the characteristics of the smaller range of communication, which also determines the ZigBee technology is suitable for carrying data traffic smaller business. ZigBee which is based on the 802.15.4 protocol stack standards possess a powerful networking capability.

3. HARDWARE IMPLEMENTATION

ATMEGA 16 Brain of this project is Atmega16 micro- controller. It is a 8 bit Micro controller with RISC architecture. Its speed is up to 16MIPS throughput at 16MHz. It has 16K bytes of flash and 512 bytes EEPROM. Operating voltage 2.7v -5.5v, in active mode it consumes only 1.1mA & in sleep mode it consumes less than 1uA current which made it a perfect choice for his project Implementation In reference to figure 4, the transmitting and receiving side can be described as follows: a) Transmitting Side Heart of the project is the microcontroller ATMEGA 16. In general the normal distribution phase voltage is 220 V, in this project we used a step down transformer 220/12 V for converting the phase voltage from 220 V to 12 V. Then, a bridge rectifier has been used for converting the 12 V ac to 12 V dc; after that, applied voltage divider converts the 12 V to 5 V because the microcontroller works at maximum 5 V. By this

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process the three distribution phase is connected into three microcontroller pins and the power transformer is connected by a narrow wire between 2 pins of the microcontroller. At cases, when the distribution side is in load shedding protection of transformer must be ensured, which is why the microcontroller power is given from an external power source (5 V battery) backup and also the GSM module power is given from

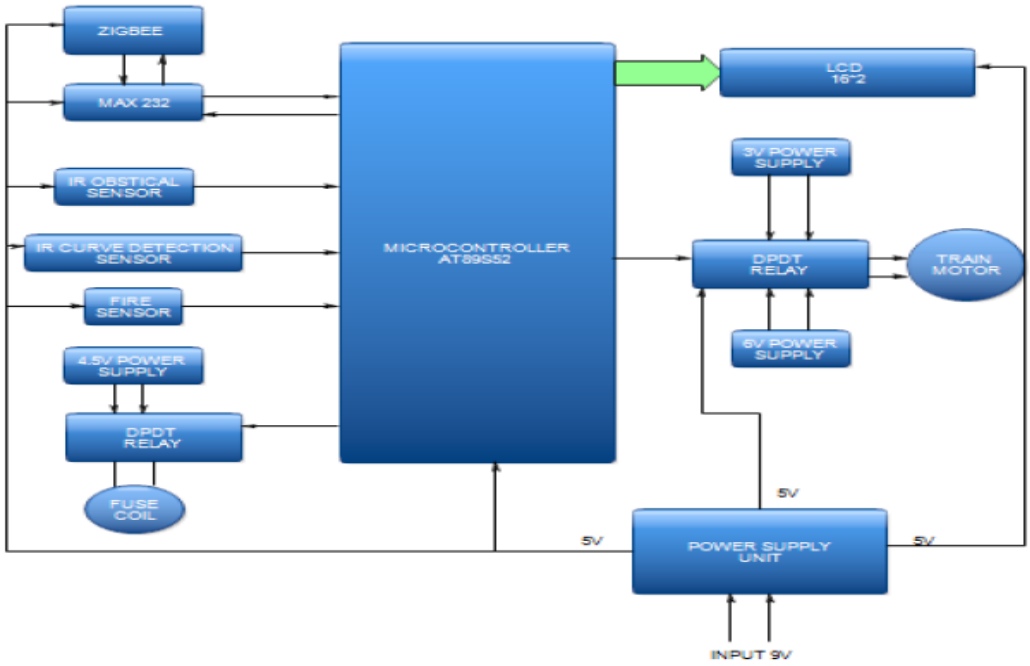

Fig.1.Railway tracking system

external power source(9V battery) because GSM module consumes lots of power. GSM module communicates with atmeg16 through UART. RXD of Receiving Side In receiver circuit another GSM Modem is connected with PC via USB-To-Serial converter. The GUI in MATLAB software has been is used such that it will read the message and the data will save it in an excel file and it will show a graph according to the data by using the interface. If any fault occurs, it is also capable to generate an alarm and a fault message box according to the fault. The communication protocol is UART and baud rate is 9600.

4. WORKING ANALYSIS

The main function of this block is to check for track continuity and control railway gate operation. First it checks for track for any kind of discontinuity using track continuity circuit. Upon receiving appropriate signal it sends signal to train control system throw zigbee to start or stop the train. It has a manual start and stop switch too which can start/stop train remotely from track control block with the help of track continuity circuit.Second, it controls the railway gate in the train-road junction. Once the first IR object sensor connected to microcontroller detects train approaching it sends signal to controller when then closes the gate using relay and DC motor. When the second IR object sensor detects train leaving it sends signal to controller when then opens the gate using same replay and DC motor. The two sensors are placed at appropriate distance to perform required operation. The messages related to all the operations that occur in both train and track control system are displayed on LCD screen connected to the microcontroller. This

system performs four major functions curve detection, obstacle detection, fire detection and speed control of train. We have two IR sensors, one fitted in front of train which acts as obstacle sensor and other fitted to left side of train to behave as curve detecting sensor. These two sensors are connected to train control block placed on train. We have placed objects near curves to help curve detection functionality. With the appropriate signals received from tack control block train starts. The IR obstacle sensor fitted in front of train continually senses the track in line of sight, if an obstacle of large size which may derail train is detected then signals is sent to control block which immediately stops train using DPDT relay. When train approach a curve the object placed near the curve behaves as an obstacle to the sensor in line of sight and sends signal back to the controller. As a response to this signal controller reduces the speed of the train in curve.

CONCLUSION

This paper introduced a low cost, low-power embedded system for railway accidents control system. In this paper, we discuss the design of proposed safety system for railway, using AT89S52 Microcontroller of Atmel as hardware platform, and combines with ZigBee as a communications platform of wireless area network, which can transmit, receive and display the track, train information. Introduced ZigBee wireless communication will assemble Ad-hoc network among stations and trains and work in phase with each other. ZigBee is designed for low cost and low power consumption. The result shows that this new innovative technology will increase the reliability of safety systems in railway transport. . By implementing these features in real time application railways can avoid accidents upto approximately 70%.

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