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REALIZATION AND FORESTALLING OF FLAWS AND RUINING IN RAILWAY NETWORK BY MCEC

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Abstract— The Indian Railways is one of the largest networks in the world. There are some problems yet to be solved that include train clashing when the operation of train exceeds out of control and time delay in the signals and displacement of train compartments due to presence of some large strange objects on the path of the train with some abnormalities in track. In this proposed system we have implemented our theoretical knowledge on Multi core Embedded System to overcome this existing problem. By implementing this system train automation can be done easily without any error and also develops the Multi core Embedded System along with the wireless technology which will reduce the human error to avoid train accidents up to 99% with absolute accuracy. The efficiency of the train operating unit can be controlled and maintained by the aid of this system. In this system the sensors are one of the most valuable unit along with MCEC to enhance the monitoring and controlling units of the train, hence the percentage of accuracy will be certainly higher. The necessary software has been used to monitor the flaws to prevent train accidents.

Keywords— MCEC (Multi Core Embedded Controller), IR Sensor, Light Dependent Resistor, Visual Basic Peripheral Interface Controller.

I. INTRODUCTION

Indian railways are nationalized in 1951. However the accident, lines derailment, fire etc. which is getting increased day by day. Indian railways using signal system to control the traffic and paves the gate for the train to move freely without any problem. In spite of using signal the wireless operation (sensors) can be used. They have long range communication so it sends the clear information at any distance without any distraction [1][2].

This sensor system consists of sensing system connected across the local transmitter and base station to obtain the various transmitting information from various places. A computer is placed along with this powerful software for making proper decisions. The technology used in this system is Advance Embedded Controller Interfaced with the PC. To bring out this system we have made some surveys which are given below.

The railway department got developed in the year of 1963 were Electrical signaling reverser and lever lock circuit controller were manufactured in workshop. At this stage luminous indicator, token exchanger, thermostat constant is produced.

In the year of 1967-1971 the railway department got the major development. The introduction of signaling products with non-Vital plug in type relay and token with fewer blocks is proposed in this year. The regular production of Q-relay implemented in the 1974-1975 on small scale.

In the year 1976 the driver alertness and alarm devices are manufactured. Electronic axles counter mark-I was highly developed in 1977. In 1980 electrically operated lifting barrier gate was identified. It was implemented and manufactured in the year of 1986.

In 1990 axle counter mark II was started manufacturing. In 1991 code receiving relay QB3 was highly developed. In 1993-1994 IPS rotary type locking high thrust point machine is designed and started manufacturing at the year of 1995-1996. In 1993 universal axle counter was developed and manufactured in the same year. In the 1996-1997 bulk production of token less block instrument with Q-relay QBA1, manufactured [3][4].

The existing devices get develops the railway network. But the proposed device has peculiar character of transmitting the signals without wires. This device is well developed and completely different from other device.

II. METHODOLOGY

The train monitoring unit consists of two different types of sensor Fig.1. That is LDR and thermistor which is connected with MCEC. When fire or smoke is fall in LDR or thermistor then it sends the signal to MCEC .Further this signal is passed into two regions. One of the signals is passed to station PC to

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show warning message and another signal passed to ignition controlled to stop to DC MOTOR.

In the track monitoring unit IR is used to detect the crack in the rails. If any flaws in the track is detected by IR then it send signal to MCEC. From the MCEC the signal is passed into two regions. One of the signals is passed into the station PC to show warning message and another signal is passed to ignition control system to stop the DC motor [5].

In the train control unit train has been controlled by using the Ignition control system. Whenever the abnormality occurs the MCEC will pass the signal to ignition control system. When it receives the signal suddenly the supply to the DC motor breaks and train has been stopped [6].

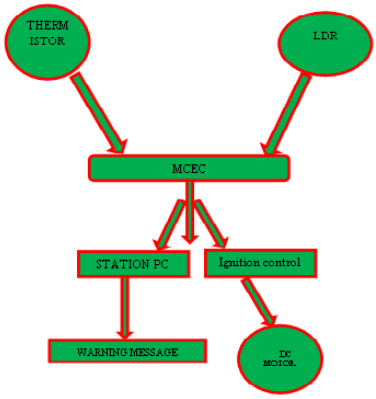

Fig 1 : System functional Block diagram

System Description

2.1 Train Surveillance Region

In the train surveillance region fire sensor LDR is fixed to detect the fire in train .The resistance of the LDR depends on the amount of light falling on it .When the available of light is low then the resistance of the LDR is high. When more amount of light is fall on the LDR then the resistance of the LDR falls which result in large current flow into it to stop the D.C motor. The Thermistor is also coupled with LDR. When LDR loses its capability to identify the smoke or fire, then Thermistor will identify it. The Thermistor detects the heat level (temperature) of the compartment. When thermistor or LDR detects the fire or smoke in the compartment then the circuit becomes closed for passing the signal to MCEC. It further stops the movement of D.C motor with the help of ignition control system suddenly after receiving the signals from LDR or Thermistor. This process revealed by Fig.2.

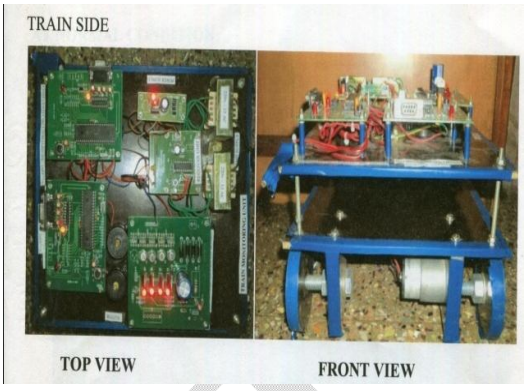

Fig 2 : Experimental Setup for Train Surveillance unit

2.2 Track Surveillance Region

IR sensors are placed in the sides of the rails at the particular region. This IR sensor detects the fault in the rails by comparing with the reference and the information is passed to MCEC. If the fault is identified by IR sensor and it has to satisfy the condition of MCEC. If it is satisfied then it sends the signal to both station and train. The signal passed through the antenna and the receiver block receives the warning message, which further stops the D.C motor with the help of ignition control system. Suppose if there is no fault then IR sensor continuous its process. This process revealed by Fig.3.

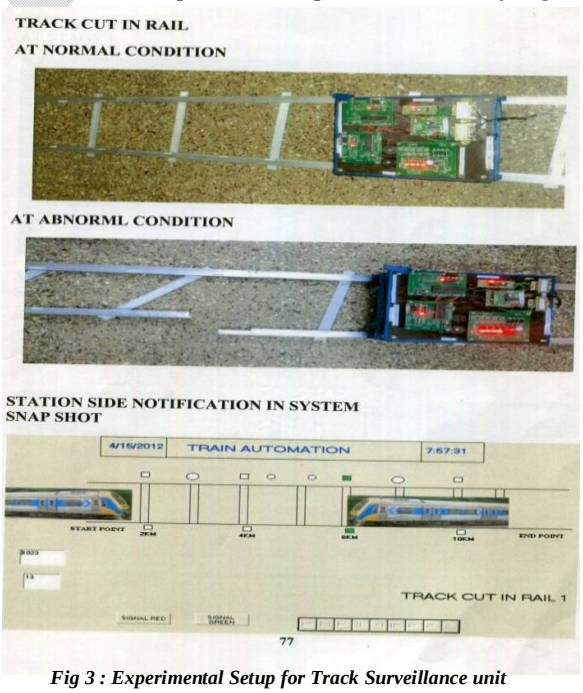

Fig 3 : Experimental Setup for Track Surveillance unit

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2.3 Station Surveillance Region

From Fig.4 and Fig.5 the transmitter is connected to the relay unit in the station. The power of 5V is given to the relay unit as well as MCEC. The transmitter transmits the signal whenever the problem occurs in the track side. This signal is fed to the MCEC. Here it is connected with desktop through serial port communication RS232. By using the Visual basics 6.0 software installed in computer which shows the surveillance result in monitor [7].

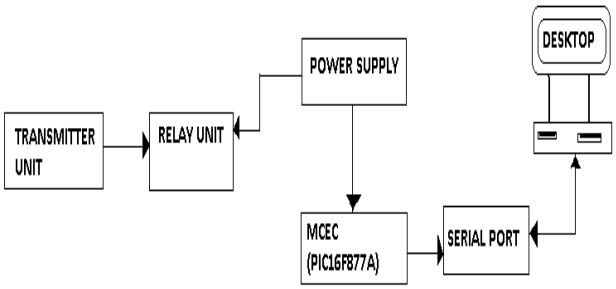

Fig 4 : Station Surveillance Block Diagram

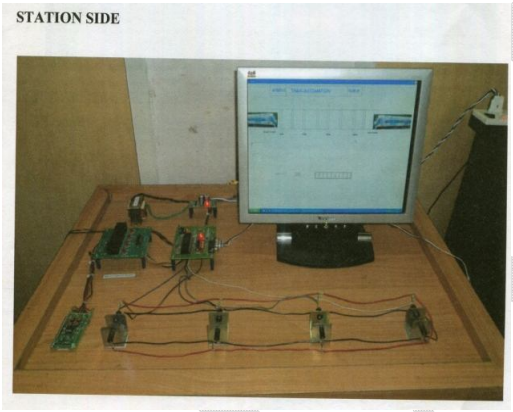

Fig 5: Experimental Setup for Station Surveillance

2.4 Control Unit

Ignition Control

The MCEC is connected with the receiver block which receives the signals from the transmitter. The signal received by the receiver is further send to the MCEC which is connected with the pre-amplifier. Here pre-amplifier used is TIP122 (NPN) .Very large signal required for starting the amplifier. Hence Driver Circuit is used to boost up the current level. The pre-amplifier is connected to the power amplifier.

The power amplifier amplifies 50mA current into 2A. This current is used to stop the D.C motor. Whenever the MCEC receives the signal during abnormality it suddenly stops the power flows to the D.C motor and stop the train.

Power Supply

From Fig.6 the 220V AC main supply is fed to step down transformer which reduces the 220V into 12V Ac supply. By using the bridge rectifier Ac supply is converted into DC supply. This DC supply is passed into the positive charge capacitor, which stores the 12V and discharges it. To maintain the constant Voltage, Voltage regulator is used. Here IC7805 used as Voltage regulator, which passes the supply of 12V or 5V constantly from the positive charge capacitor to Low pass filter. Low pass filter is used to reduce the noise in the Voltage regulator. Thus the 5V supply is passes to PIC16F877A.

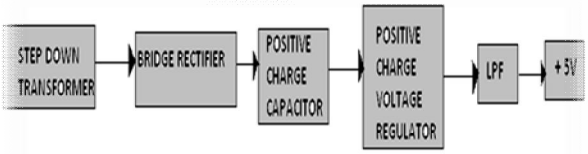

Fig 6: Power Supply for MECE

2.5 MCEC

MCEC is the multiple cores Embedded Controller is the advance development of micro controller along with industrial function. PHERIPHERAL INTERFACE CONTROLLER (PIC) is the enhanced version of micro controller.PIC is the one of the embedded controller. This PIC micro controller has several families. It has been mainly used for communication purpose. The version of micro controller used in this system is 16F877A. It takes less time computation. It is easy to detect the failure by using this IC and this PIC easily interface with PC. Fig.11 shows this controller module [8].

III. RESULT AND DISCUSSION

This proposed system plays vital role in monitoring and controlling the operation of Railway network using multi core embedded controller. These systems will safe guard the life of the people from train accidents. Train automation is successfully carried out by IR sensors, LDR, Thermistor, etc. Since life of the humans is much important, this system will prevent accident in better accuracy with operation done in fastest way.

3.1 Measure of Train Accident

Consequential train accidents include train accidents having serious repercussion in terms of loss of human life, human injury, and loss to railway property or interruption to railway traffic. Collision, fire in train, trains running into road traffic at level crossings, derailment, and accidents of miscellaneous nature are included in consequential train accidents. This figure no.7 shows the survey of train accident during last ten

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years. Thus by implementing this project will definitely reduce the accident rate up to 99%.

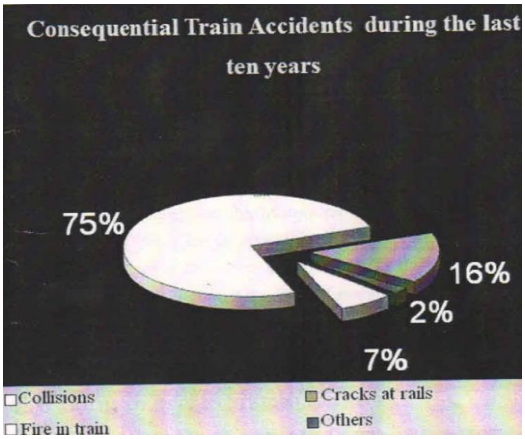

Fig 7 : Survey of Train Accidents

3.2 New Way of Detecting Abnormality in Train & Tracks

Based on the study of train accidents and abnormalities in track and train region, it is found that the major reason for derailment and train collision happened due to uncontrollable condition of engine at particular speed. This proposed system can be used to resolve such problems with the aid of MCEC. It has a capability to control the train engine at any speed. By implementing this system will increase the reliability and quality of the railway property.

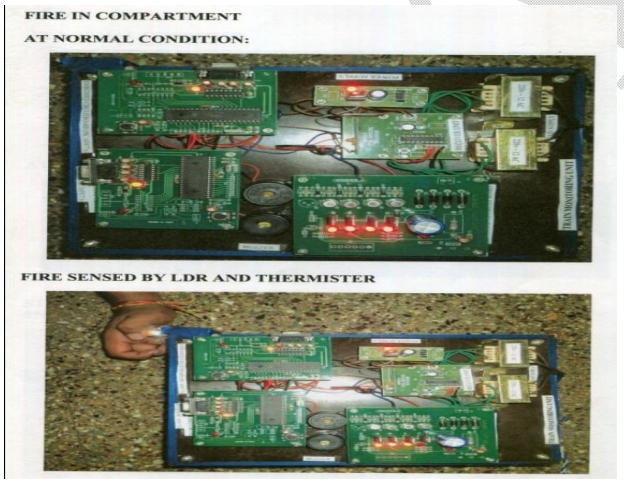

Fig 8 : Normal & Abnormal Condition of Fire Sensor

From Fig.8 reveals if any fire accident occurs in the train or its compartment immediately sensed by the sensor and given warning message to the Driver and station.

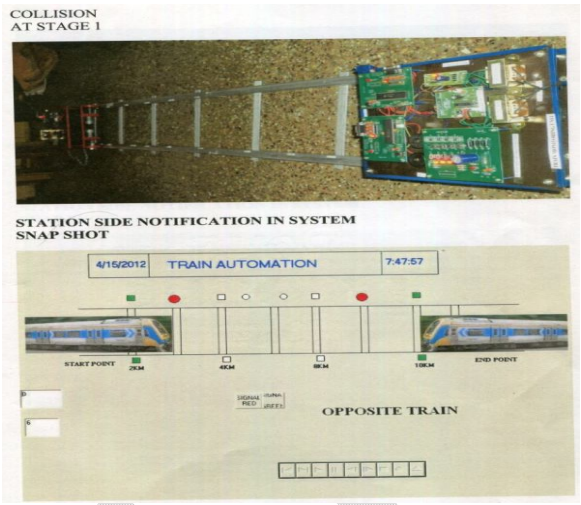

Fig 9 : Two Trains in Same Track at Stage-1

From Fig.9 and Fig.10 Unexpectedly if any two trains in the same track in opposite directions that will be identified based on the track surveillance unit and prevent the accident. The track surveillance unit continuously tracking the distance between the two trains by the sensors and if the distance between the two train is minimum for example 4km, the track surveillance unit give the warning message and will be indicated by glowing the Red LED in the station as well as train Engine and also trip the power supply of the Motor by Ignition control unit.

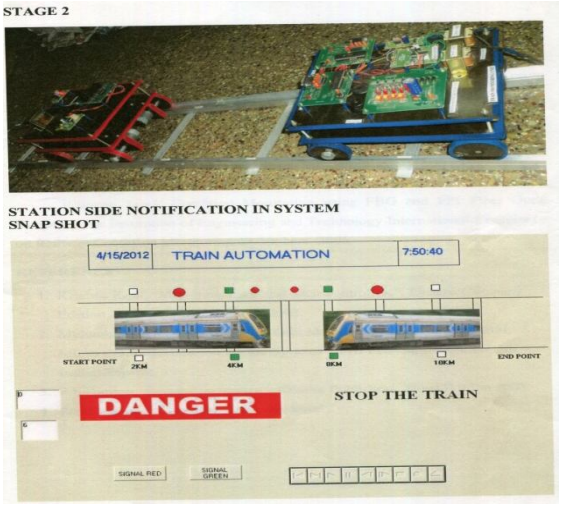

Fig 10 : Collision between the trains discarded by the MECE (Stage-2)

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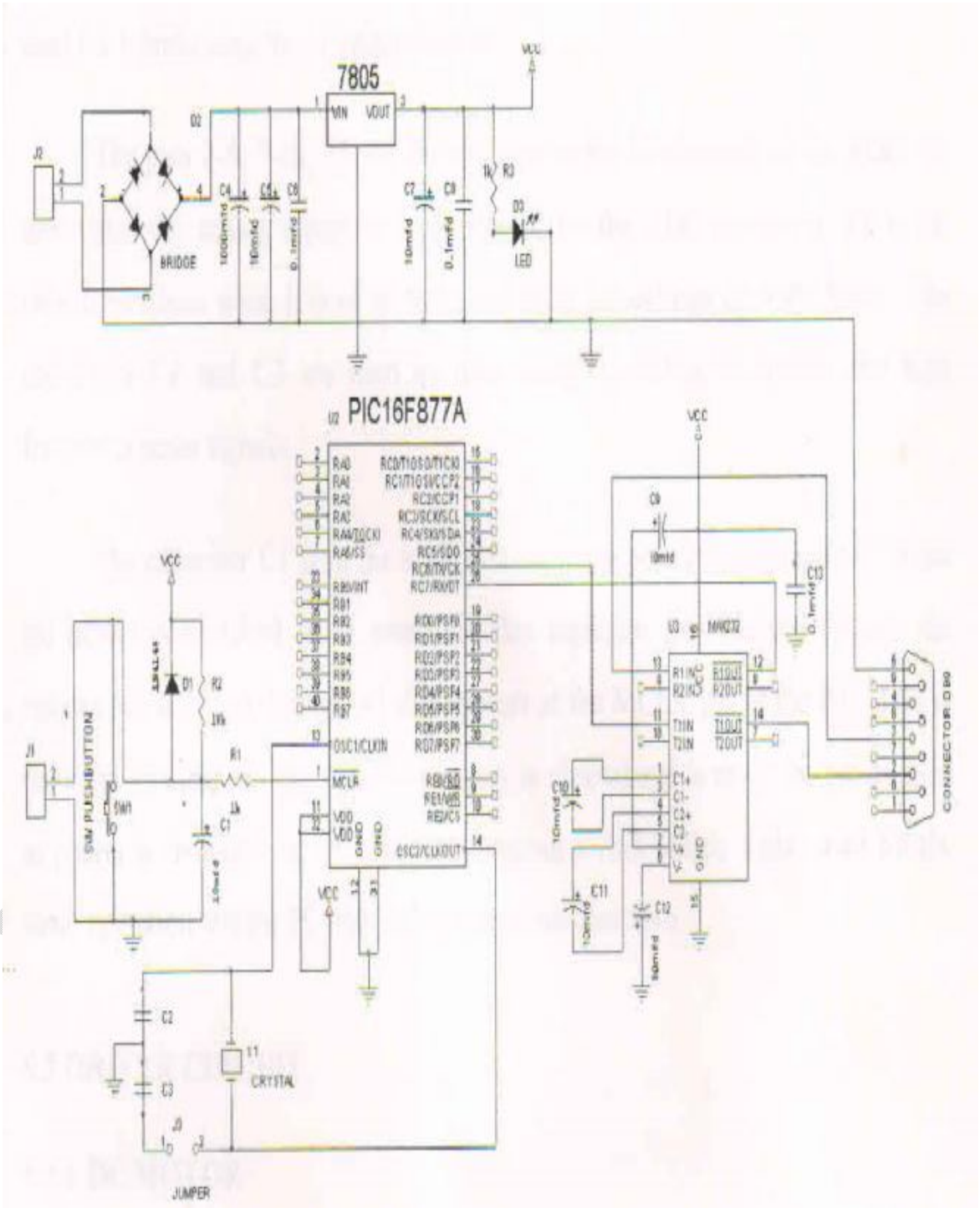

Fig 11 : Multiple Core Embedded Controller

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IV. CONCLUSION

Indian railway system is modernized by implementing such projects like Anti-collision device, Tunnel radio communication system, GSM technology in metro railway. Instead of this project the introduction of MCEC will cause big development in railway network. Train Automation will be done using multi embedded controllers, wireless sensor nodes and IR based sensors etc. In the point of view of reducing human errors, Multi core embedded controllers are dispensable part to design an embedded system with more reliable and less power consumption for train control operations.

Synchronizes Mimic panel can be expanded such that all on-going trains can be monitored from the centralized control department. This proposal gives better accuracy, very fastest operation in real-time where the human life is very important. This proposal will induce the safe travel if implemented for both train as well as the passengers.

Therefore future work will focus on design optimization for cost reduction and functional improvements of the system with the help of advanced sensor systems and power harvester.

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