Advanced Security System in trains using RF Module

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Abstract— **This paper proposes a method to alert the guards in trains in case any passenger is subjected to danger midst his journey and requires an immediate help.**

Though the guards are on surveillance, it is not always possible to acquire their help as they may not be available in the near sight. In this project we are proposing a system where, in any case of mishaps, a passenger can seek help by accessing an "Emergency Lever". The Emergency Lever is situated in every coupe of a coach in the train. If the lever is triggered, AVR microcontroller routes the pre-fed information about the position of the coupe and the particular coach to the guard in the train, through his Walkie-Talkie. A camera is also interfaced to the Microcontroller which gets activated when the Lever is triggered. The recorded video is displayed at the control room which will be a source for later investigation purpose. For providing enhanced security, the Micro-controller is pre-fed with certain video clips of a situation that portrays mishaps. The camera monitors every coupe and in case any clips matches the pre-fed videos, the alert is sent in the same method as when the lever is triggered, thus initiating the automated mode.

Index Terms— **AVR Microcontroller, Camera module, Emergency lever, RF module, SD card module.**

I. INTRODUCTION

India being a developing and one of the most populated countries in the world, is subjected to a lot of menace such as theft, sexual harassment of women, murder cases etc. Population explosion in the long run leads to unemployment. This is because being unemployed even after many trials, people end up indulging into antisocial or criminal activities, an illegal method to earn money. Thus, crime rates have multiplied, and has made the world an insecure place to live in. Among all, the menace seems to be more virulent in the trains. The number of brutal crimes on trains has risen alarmingly over the years and is observed to be more spiteful in the metropolitan areas. The main reason behind this is that the train travelers have no efficient source for help during an emergency situation. Our paper proposes a solution to this problem with the excellence of technology.

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II. OBJECTIVE

Our proposed project looks forward in fulfilling the following as listed below

- To reduce the crime rate in trains through the proposed comprehensive system.
- To reduce the severity of brutal incidents by providing immediate help and security to the passengers.
- To bring every crime under the light of law and to provide a valid evidence for investigation purpose.
- To improve the existing system of security that includes the unnecessary halt of the train, which in-turn causes delay at destination.

III. SURVEY

Across various districts in Tamil Nadu, we conducted a survey in order to understand the difficulties faced by the public. The survey stood upon passengers using trains as their medium of transport at various train routes. The survey included an attempt to understand the need and practicability of our proposed system. Also, this effort was a realization to comprehend the expectations of the people regarding safety in Indian Railways. Through the survey, it was concluded that the existing system of security in trains has certain drawbacks as listed below.

- Though pulling the chain leads to bringing the train to stop, the criminal may escape due to the delay in the guard reaching the spot.
- Railway officials say pulling- chain has become a nuisance for them as the train loses 25-30 minutes of journey period every time a chain is pulled.
- Chain-pulling not only affects the travel time of the particular train, but also has a cascading effect on the journey time of other trains.

IV. TECHNICAL APPROACH

A. Algorithm

TABLE I: STEPWISE OPERATION

Step 1:	Start the process
Step 2:	AVR Microcontroller senses triggering of the Emergency Lever.
Step 3:	The AVR Microcontroller interfaced enables the RF transmitter to transmit the signal.

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Step 4:	The RF Receiver of the Walkie-Talkie with the guard receives the incoming signal.
Step 5:	The guard receives alert signal with the position of the coach and coupe from where emergency help is requested.
Step 6:	The camera interfaced with the AVR Microcontroller fixed inside each coupe begins to record.
Step 7:	The recorded video is displayed at the control room of the guards.
Step 8:	If Emergency Lever cannot be accessed manually, an automated system is provided in which input can be obtained by the controller by comparing with the pre-fed reference video clips.
Step 9:	In case live clip matches the pre-fed clips, repeat steps 3, 4, 5, 6 and 7.
Step10	End of Process.

B. Block Diagram

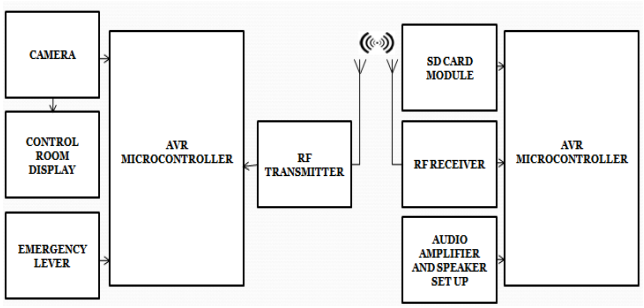

Fig.1: The figure represents the block diagram showing the transmitter and the receiver unit interfaced with the microcontroller.

C. Flow Chart

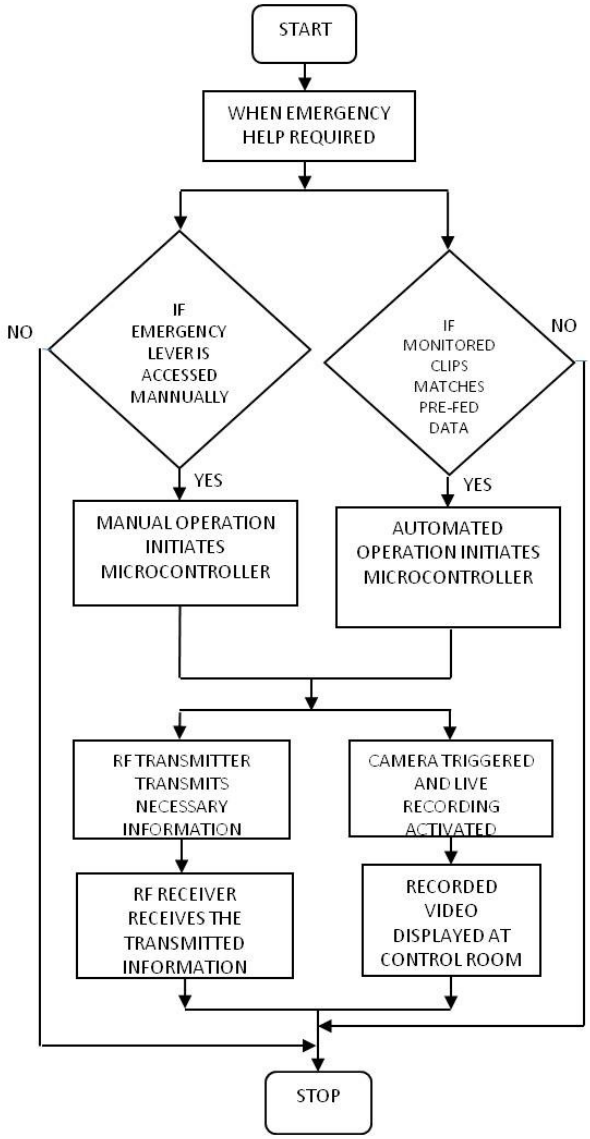

Fig.2: Flowchart representing the automated and manual operations

V. METHODOLOGY

The emergency lever is triggered manually. The AVR microcontroller interfaced with the emergency lever gets activated and it induces the RF transmitter to transmit the signal at a particular frequency. This frequency is acknowledged by the RF receiver of the walkie-talkie with the guard, thus notifying him the position of the coach and the respective coupe from where the emergency help has been requested. The information about the position of coaches and coupes are loaded in the microcontroller, which provides the location details to the guard at the time when necessity arises. On the other hand, the camera installed (one for two coupes) at the coupes will be initiated which in turn begins to record the incident during the emergency situation. This video will be displayed on the display screen at the control room allotted for the guards on train.

The recorded video will remain as an evidence for the incident taken place on the train. In case, the victim is in a situation where he is unable to access the Emergency lever, the automated operation will commence. The pre-fed videos

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that are stored in the database are compared with the live camera clips and if there is a match, then the operation of the Microcontroller is automatically triggered. Henceforth, the above explained operation will be repeated again during the automated mode.

VI. Details Of Modules Used

A. AVR Microcontroller

A High performance ATMEGA16 Microcontroller is used in this project which possesses high non-volatile memory technology. Through SPI serial interface, the program memory can be reprogrammed in system using the on-chip ISP flash. The Compilation becomes easier as ATMEGA16 is supported with the full suite of program including C compilers and program debuggers and simulators. The Microcontroller takes over and controls the operation of the modules like camera, RF Transmitter and Receiver. The database is fed to the memory of the microcontroller which includes the pre-fed data of necessary details.

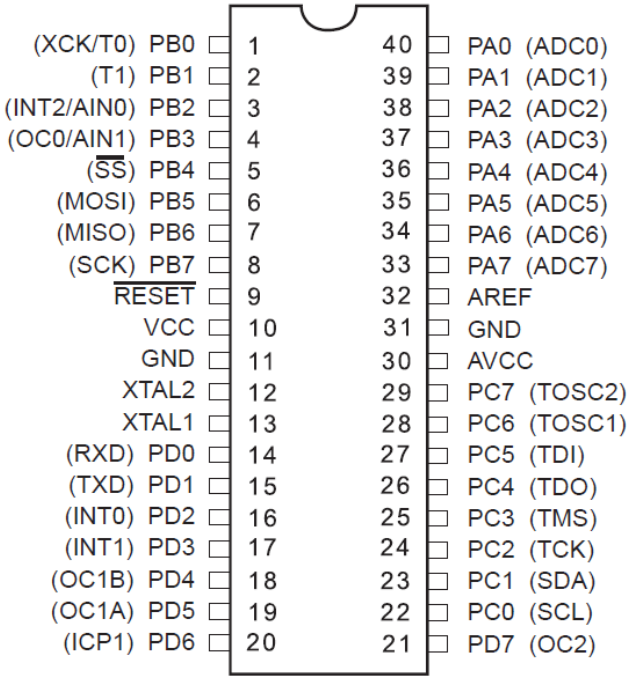

Fig.3: Pin diagram of an AVR microcontroller (ATMEGA16)

B. RF Module

RF Transmitter:

An RF transmitter module is a small PCB sub-assembly capable of transmitting a modulating radio wave that carries data. The RF transmitter module is interfaced with the microcontroller which will provide the signal to the module needed to be transmitted. In this project the RF module is tuned to particular frequency in which the emergency alert will be transmitted.

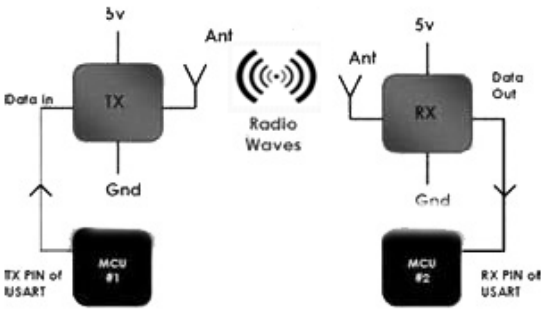

Fig.4: RF module Interface with AVR Microcontroller

RF Receiver:

An RF Receiver module which is tuned to the particular frequency as that of the transmitter, receives the modulated RF signal, and demodulates it. The RF Receiver module triggers the microcontroller to provide the needed alert along with coach & coupe details through the walkie-talkie of the guard.

The figures of the RF transmitter and receiver units used for the interfacing with the microcontroller are described below with the pin diagram.

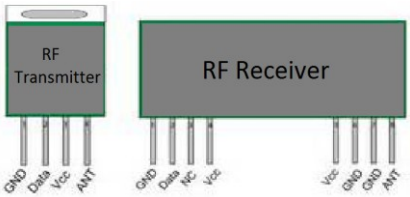

Fig.5: RF module

C. Camera Module

A camera module is a mountable section with a fixed-focus camera which has vivid ranges of color. This module supports pixel ranges as 1080p30, 720p60 and VGA90 video modes as well as still pictures. It has characteristic features as image sensing, high quality of optics, integration with control electronics, low-voltage differential signaling and creation of varied image effects.

The Camera module that is interfaced with the AVR Microcontroller provides a telecast of the incident to the guards. The camera used in this project is activated at two cases. First, the camera starts to record the happenings inside the coupe only when the emergency lever is activated. On the other hand, the camera is self-activated if the pre-fed video clips matches with the movements inside the coupe. Thus, the camera module helps in providing an enhanced security system.

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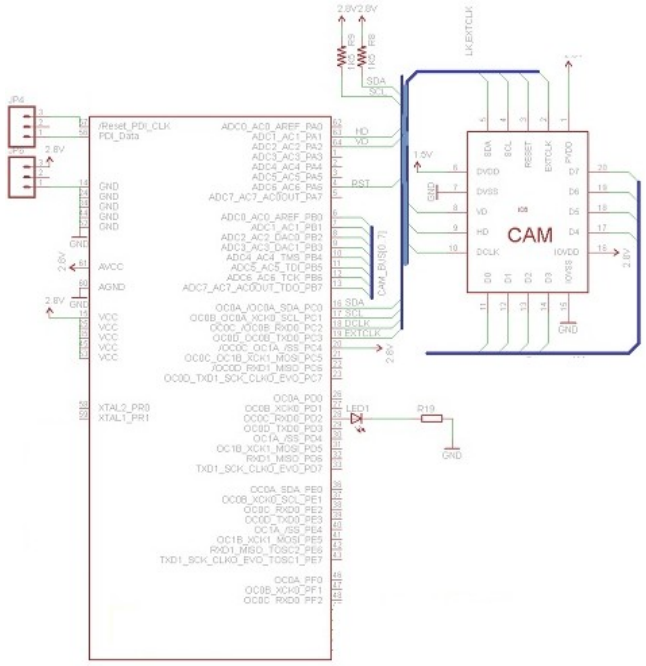

Fig.6: Camera module Interface with AVR Microcontroller

D. SD Card Module

A SD card module is an external memory unit used to perform mass storage and data logging task for a system. The pin out provided in the module is directly compatible with AVR microcontroller, but can also be used with other microcontrollers. This module is utilized for transferring data to and from a standard SD card of various capabilities and also has an additional switch to select the flash card slot. The SD Card Shield interfaced here with the AVR microcontroller is loaded with the detailed information about the coaches and its respective coupes. It is also fed with the IVR, with which the intimation is been sent to the guards about the emergency help requirement.

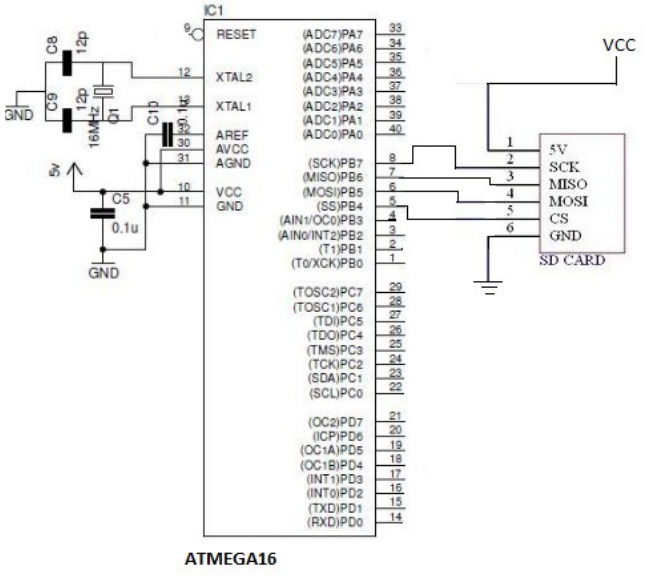

Fig.7: SD Card module interface with the AVR Microcontroller

VII. Hardware And Software Specifications

TABLE II: DETAILS OF HARDWARES AND SOFTWARES USED

HARDWARE SPECIFICATIONS	
Microcontroller	AVR, ATMEGA16
RF module	434Mhz
Web camera module	720MP CMOS/CCD
Display	
Audio amplifier circuit	LM 386
SD card module	
SOFTWARE SPECIFICATIONS	
Microcontroller	AVR Studio 6.1
Camera interfacing	MATLAB

VIII. Future Enhancement

- Using Artificial Intelligence, the false alerts that may occur in the proposed system, though not harmful, can be avoided in future.
- Using advanced Digital Image Processing, the system can be made to detect suspects whose images are already available in the database.
- A provision can be provided for the coach to get locked when the emergency lever is triggered, thus avoiding the criminal to escape.

IX. Conclusion

The proposed system ensures advanced security for the passengers in trains which is achieved by providing immediate help and security at the time of need. Also by implementing this system, the requirement to stop the train as in the existing is eliminated, as the issue can be solved on board in the proposed system and thus ensures avoiding delay of train.

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