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Vehicle Remote Control System Based on RF Using ARM7(LPC2148)

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***Abstract*—This paper presents the remote-controlled vehicle using RF, implementation of smart logic and control system based on embedded systems using a microcontroller, the vehicle is controlled by the RF based remote control, in which user interface is developed to give instructions to vehicle for movements. Few instructions are added to enable or disable the functionality on robot side. Vehicle consists of obstacle sensor, temperature sensor & light sensor, vehicle moves with the help of asynchronous H-bridge, the vehicle is interfaced with the intellectual device called microcontroller. Microcontroller controls the movement of the robot by decoding the signals received from the RF based remote controller, and performs the programmed tasks as per received signal. In this project, we implemented a password authentication so that the vehicle can't be used by wrong persons for wrong purposes. Based on the commands given by user at the RF remote side vehicle takes it direction, in its path if it finds any obstacle or if temperature exceed the range 85 to 110 degrees centigrade or if any light falls on its path the vehicle gives alert to user, so that the user can controls the vehicle successfully. This RF based vehicle is used for military security purpose such as spy robot, in industrial security.**

***Index Terms*—RF vehicle, remote controlled, sensors, microcontroller, password authentication.**

1.INTRODUCTION

Remote control device is used to operate wirelessly, away from the end devices. It is defined as mobile device such as sensor device, it controls the vehicle subsystems, devices and accessories without restriction of motion. Remote controlled vehicle is controlled by manually. The controller performs security related functions such as password authentication, voice identification. Remote control vehicle requires two microcontrollers one for control the robot, sends RF commands to another microcontroller in remote device.HT12D decoder is interfaced with microcontroller AT89S52 and ARM7 LPC2148 receives the commands with the help of motor device, operates the vehicle movement. A battery is used for power source.

Now-a-days RF is used in many applications and it has many advantages. The basic block diagram of RF remote control vehicle is shown in figure 1, it consists of RF transmitter and RF receiver. The transmitter transmit the RF signals to control the robot. The encoded information from the transmitter section is transmitted wirelessly to the receiver section through the above RF modules. Now the received decoded signals are fed to the microcontroller. According to the

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designer's specifications, required ports of the controller gets activated depending upon the received signal.

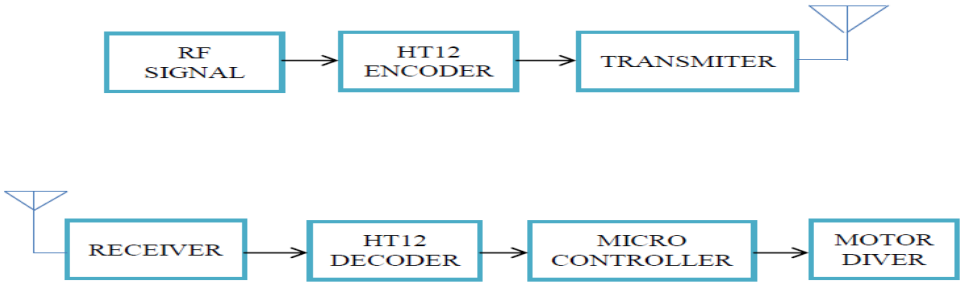

Figure 1. Basic Block Diagram of RF

2. LITERATURE SURVEY

The human personality dependably needs to control frameworks of his/her decision. In the period of electronic frameworks, it is critical to have the capacity to control and obtain data from all over the place. Albeit numerous strategies to remotely control frameworks have been conceived, the techniques have the issues, for example, the requirement for exceptional gadgets and programming to control the framework [1]. The remote-control advances have been utilized as a part of the fields such as industrial facility mechanization, space investigation, in places where human access is troublesome. As this has been accomplished in the household frameworks somewhat, numerous enterprises and labs are examining the techniques which empower human to control and screen effectively and effortlessly in the house or outside [2]. Controlling the household framework paying little respect to time and space is an imperative test. As the cell phone empowers us to interface with the outside gadgets through portable correspondence organize paying little mind to time and space, the cell phone is a reasonable gadget to control residential framework [3].

Robots have their authentic past however they came into presences just in 1961 when Unimation Inc, USA presented the principal servo-controlled modern robots. Early improvement going back to 500B.C demonstrates that the Egyptians, Indians, the Chinese, and the Romans constructed numerous automatics manikins which copy the development of creatures and fowls [4]. The Chinese manufactured many diverting gadgets that delineated successive movements. In the 1940s, remote transported ace slave controllers were produced [5]. Afterward, compel criticism and sensation tactile components were added to them to encourage better control. Tele-worked gadgets were utilized as a part of blemishes investigation in 1976. In 1948, the change was developed at Bell research centers U.S.A. In 1952, IBM‟s first business PC IBM 701 was presented [6].

In the work distributed by Robolab Technologies (online) on IR Controlled Robotic Vehicle, a mechanical vehicle with infrared TV remote controller was built. The vehicle can move in four directions yet the IR remote control confines its productivity as it couldn't be controlled

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with a protest obstructing its observable pathway from the controller [7]. Comparable works by Gupta et al (2013) on Design and Implementation of Mobile Operated Toy Car by DTMF and Ranu Kaushik and Renuka Singh (2013) on GSM Mobile Controlled Robotic Car could control a mechanical auto utilizing DTMF signals with the use of a microcontroller [8], [9]. In these works, the received tone is prepared by an ATmega16 microcontroller with the help of DTMF decoder MT8870. The decoder translates the DTMF motion into its paired proportionate and this is sent to the microcontroller modified to take a decision for a specific info and yields its choice to the engine drivers with a specific end goal to drive the robot forward, in reverse, left or, on the other hand right. In circumstances where there is no GSM network interfacing these robots can't be controlled hence there is need to include an option path for controlling the vehicle [10], [11].

3. DESCRIPTION OF PROJECT

This section presents the list of the varied components utilized in the individual blocks to form this work. Remote controlled vehicle has both hardware and software part, figure 2 and figure 3 shows the block diagram of transmitter side and vehicle side.

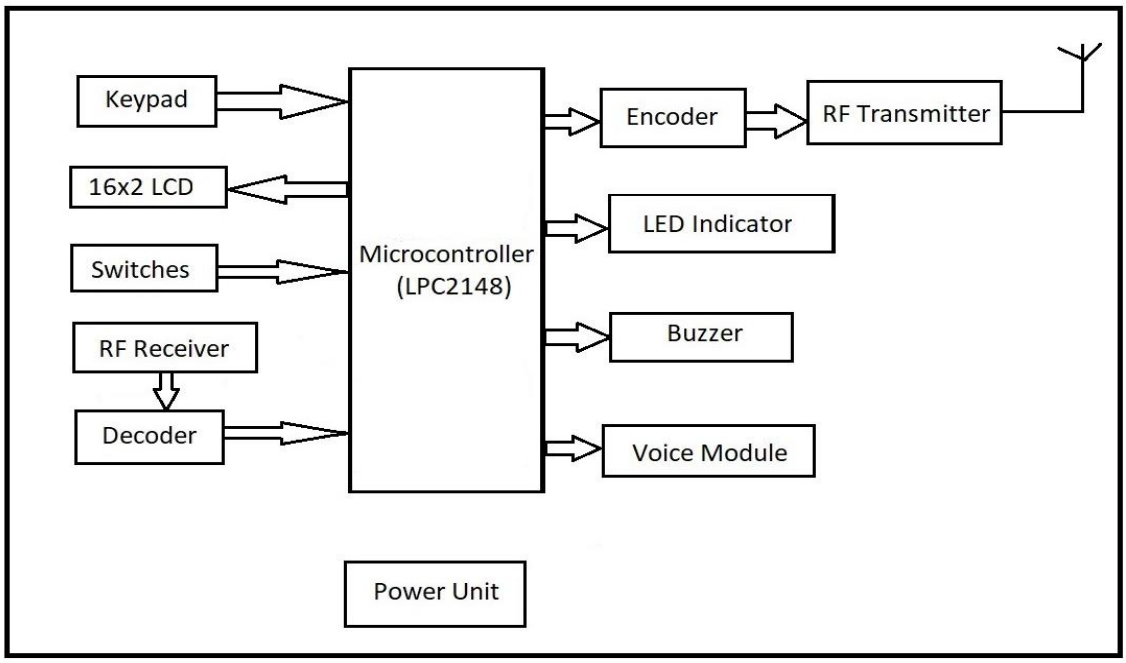

Figure 2. Block Diagram of Remote Side

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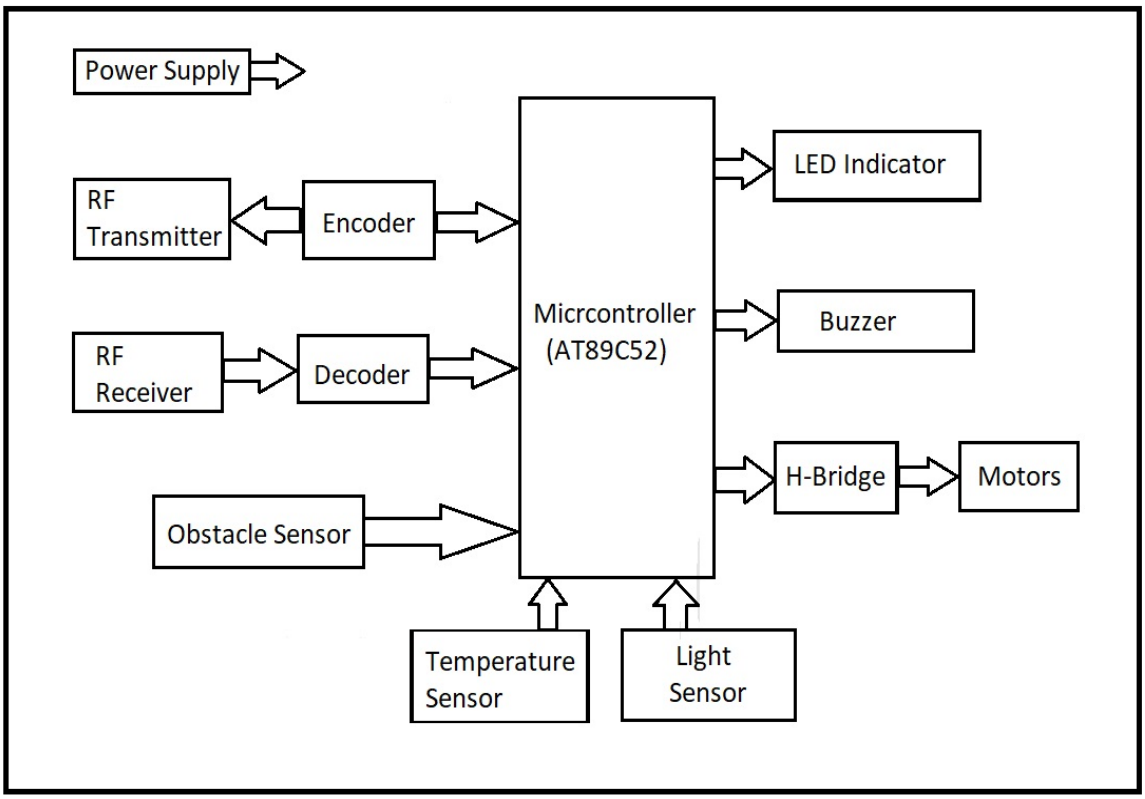

Figure 3. Block Diagram of Vehicle Side

***3.1.1 Microcontroller*:** In this project two microcontrollers ARM7(LPC2148) and AT89C52 are used. At the remote side ARM7(LPC2148) microcontroller is used. At vehicle side microcontroller AT89C52 is used.

3.1.2 RF Transmitter STT- 433 MHZ: STT-433 is ideal for remote control applications where negligible exertion and more range is required. The transmitter uses a SAW-offset oscillator, guaranteeing exact repeat control for best range execution. SIP style package and negligible exertion make the STT-433 reasonable for high volume applications.

3.1.3 RF Receiver STR-433MHZ: The data is gotten by the RF collector from the receiving wire pin and this data is accessible on the knowledge pins. Two data pins are given to collector module. Therefore, this data is utilized for additional applications.

3.1.4 HT12E Encoder: HT12E encodes the parallel input from microcontroller into serial output, which is transmitted through RF transmitter. 12-bit parallel data is encoded in to 8 address bits and 4 data bits. Address pins can provide 8-bit security code for secure data transmission.

3.1.5 HT12D Decoder: HT12D decodes the serial input from RF receiver into parallel output and transfers data to microcontroller. HT12D can decode 12 bits, which are 8-address bits and 4-data bits, the data bits remain same until new input is received.

3.1.6 L293D: It is a quad, high-current, half H-driver, it provides bidirectional drive currents. It is easier to hook up. DC motors drive in directions with the help of L293D.

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3.1.7 Voice Module: aPr33a3 series is used in this project. It gives high performance, unparalleled integration with analog input, digital processing and analog output.

3.1.8 Sensors: Temperature sensor (LM35), Obstacle sensor (IR sensor) and light sensors(LDR) are integrated in this vehicle to sense the temperature, obstacle and light.

4. IMPLEMENTATION OF PROJECT

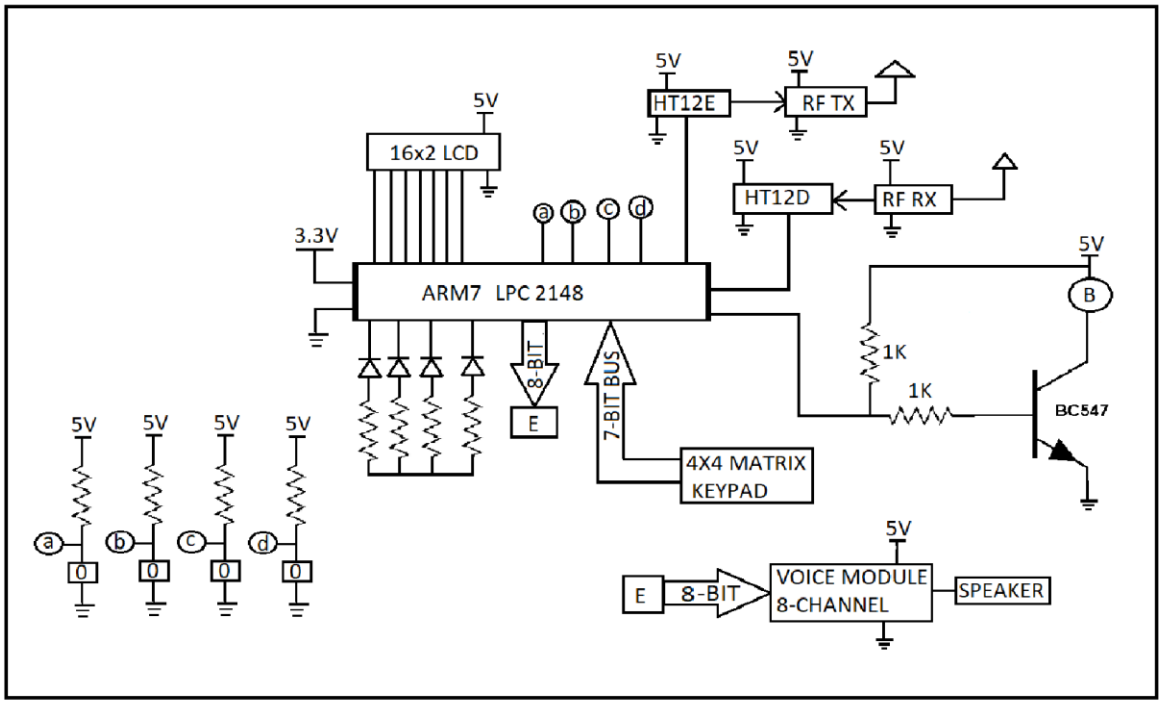

Figure 4. Circuit Diagram of Transmitter

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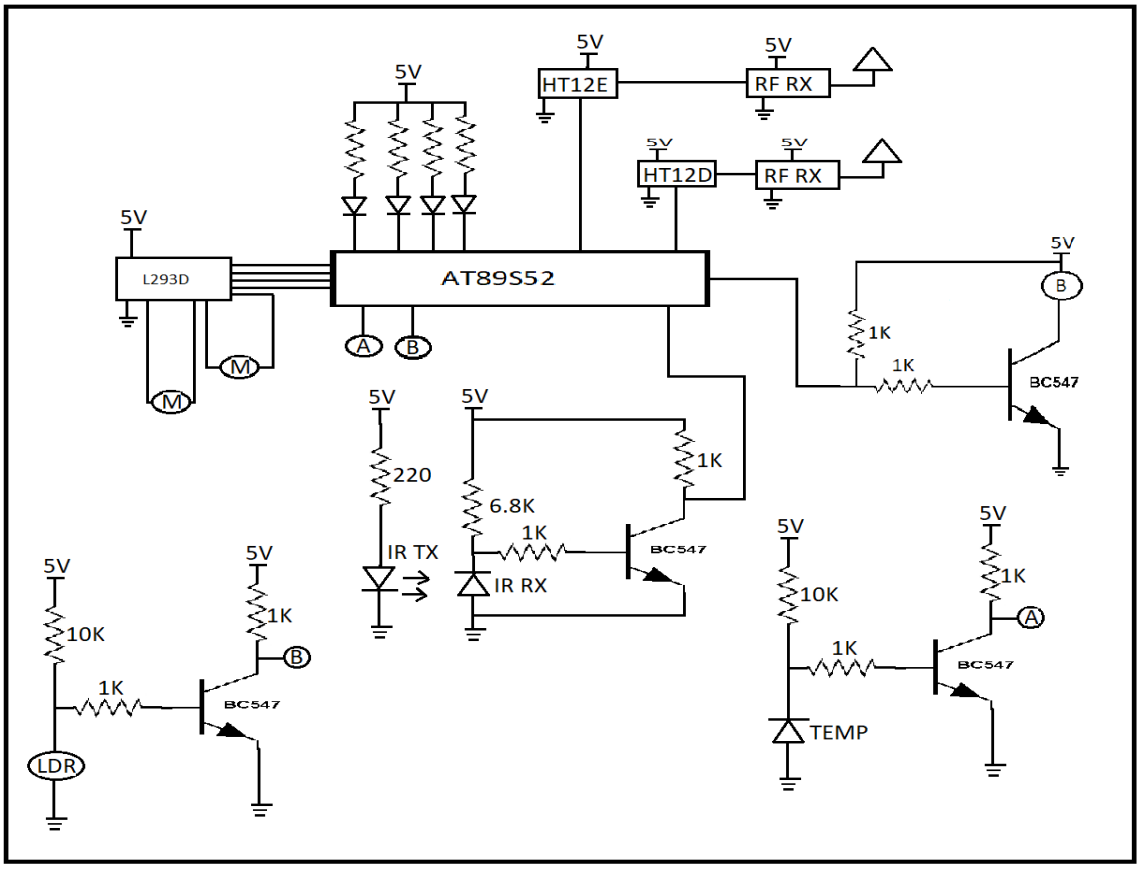

Figure 5. Circuit Diagram of Receiver

Circuit connections of transmitter and vehicle side are shown in figure 4 and figure 5.

Operation of the RCV

First, we enter the password using keypad at remote side. LPC2148 checks the password entered correctly or not. If not, the maximum trial is three, and the system gets locked, again reset the vehicle. After entering the correct password, the success message is displayed in the LCD display, and then start control the robot. After password authenticated, the commands for robot to move in specified direction given by user. Vehicle moves in the direction as per the commands given by user, in its path if it finds any obstacle, it senses the obstacle and deviates its path by moving backward for some distance and turn left and continues with the command given by user before it finds any obstacle, if still it finds any obstacle in its path, it continues with the same operation. At the time when vehicle finds obstacles it does not operates according to the commands given by user, automatically it moves backward and turn left. Meanwhile in its path if any light falls on the vehicle it sends alert message to user, if it finds any extreme conditions in temperature, it senses the temperature and give alert message to the user. The maximum temperature range it can sense is 110 degrees.

Vehicle gives attention to user by beep sound, voice module and LED indicator. By using all these indications, the user can take control on vehicle, by user commands the robot operates. Project aims to drive a vehicle using a interactive RF based remote controller. The project

requires one remote control, which has interface to give commands to the robot and to receive data from the robot. Robot receives the commands through RF channel and with the help of a motor driver operates the vehicle movement.

In this vehicle, we used H-Bridge of asynchronous drive, the motors of vehicle are independent of each other, so that if vehicle get strucked in mud also with the help of other motor, it can easily come out of mud which is one of the advantage of this vehicle. We have used FSK communication between transmitter and receiver so that we can reduce power usage which is the main factor in this generation.

5. RESULT

The implemented RF based vehicle is shown in figure 6. The RF modules used in the project are tested for successful communication. RF transmitter and RF receiver established a successful communication. Password authentication, checks for correct and incorrect password and the response of microcontroller is observed. Proper encoding and decoding of data is completed.

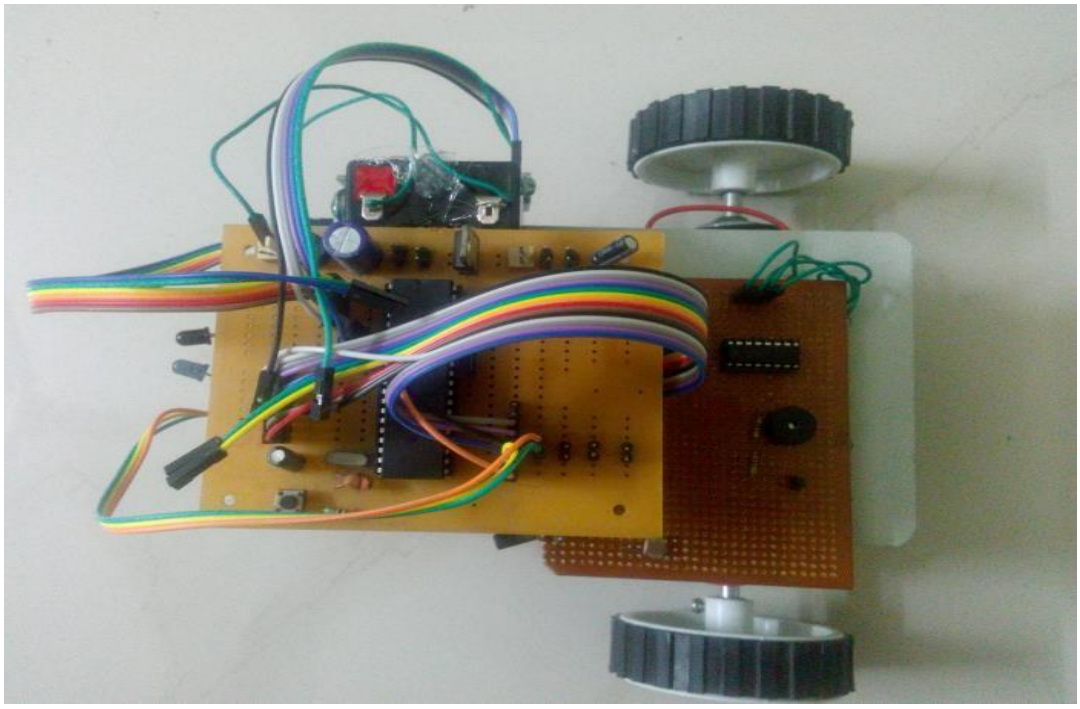

Figure 6. Implemented RF Based Vehicle

6. FUTURE SCOPE & APPLICATIONS

In future, this project may be stronger by means of including a wi-fi digicam at the robotic so that the operator can control the movement of the robotic remotely by means of watching it on a display. Through integrating GPRS inside the vehicle we can understand the precise role of remote control vehicle, in order that the user can control the robot successfully. Challenge can also be carried out by way of the use of ZigBee generation to enlarge the number

of nodes. This vehicle may be used as firefighting robots, warfare automobiles, surveillance programs, massive places where it's no longer feasible or dangerous for any person to move.

7. CONCLUSION

In this paper, we presented a design of vehicle using RF communication with wireless audio transmission and it is designed and implemented with ARM7 LPC2148 and AT89S52 MCU in embedded system domain. The vehicle can move in directions using switches. The vehicle can sense temperature, light & obstacles in its path and sends alert message to user, so that the user can control the vehicle by sending commands to the vehicle. Experimental work has been carried out carefully & successfully. Higher efficiency is achieved using the embedded system. The proposed method is highly beneficial for the security purpose and industrial purpose.

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