

# RAKSHAK ROBOT- ROBOT FOR DEFENCE

N.Divya<sup>1</sup>, U. Hari<sup>2</sup>, Dr.K.Ravichandran<sup>3</sup>

<sup>1</sup>PG Scholar, Embedded System Technology, Department of ECE, SRM University (India)

<sup>2</sup>Asst. Prof, Department of ECE, SRM University (India)

<sup>3</sup> Asst Prof, Department of Nuclear Physics, Madras University (India)

## ABSTRACT

Recently terrorists have attacked many places in our country and also worldwide. In our work we have designed a model of terrorist Detector and attacker, which can identify terrorist and also detect a bomb. Our model Robot is named as RAKSHAK ROBOT. The robot searches and moves from one place to another place within a coverage area and detect the presence of bomb and terrorist with the help of sensors. All security guards have an IR transmitter signal (i.e. Defence ID card signal). The robot senses the security guard ID card (IR TX signal) and it confirms that they are defence staff. If the robot could not receive the security ID card signal it confirms that the person is Terrorist. Immediately the robot will attack with the help of the terrorist attacker unit (Induction coil gun). In this work, the robot detects and if any terrorist enters the restricted area it immediately attacks the terrorist and it detects and diffuses the bomb. So we can save our public and defence staff.

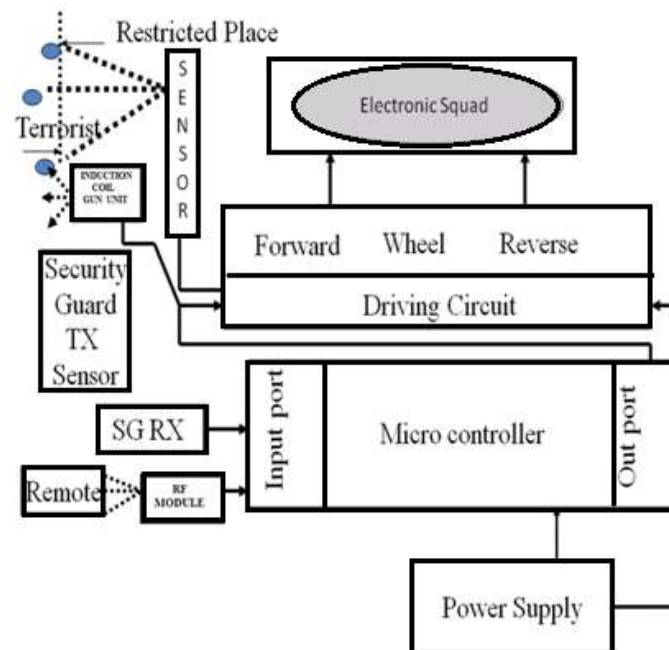
**Keywords:** Atmel AT89S52 Microcontroller, IR (Infra Red) Transmitter and Receiver, RF (Radio Frequency) Module, Sensors, Terrorist Attacker Unit (Induction Coil Gun).

## I. INTRODUCTION

Almost all countries are witnessing the Terrorism issue. Terrorism destroys human life and vast properties. It is an inhuman act done and being done by a group of people. This work is designed to detect and destroy the act of Terrorism through Electronic Squad – Rakshak Robot, which functions electronically as defence head. The main aim of the work is to detect the terrorist and to fight against the Terrorism with the help of security guards who are identified as their defence staff. By using Infra red Transmitter signal, the movement of Rakshak Robot as a defence head detects terrorist by matching with the ID provided to their security guards. With the help of signals from IR both the Rakshak Robot and its security guards acts within certain coverage area.

## II. BLOCK DIAGRAM

The Robot operates in DC supply, so a 6v battery is fixed in the robot hardware section. The 5v supply is connected to the Microcontroller section, LCD display section, IR Transmitter and IR receiver section through regulated chip 7805. In the microcontroller port 0 and port 2 are initialized as output port; port 1 and port 3 as input port. The IRD modular has 3 pins which are Vcc pin, Gnd pin and output pin. This output pin is connected with RXD pin of the microcontroller. By pressing remote key, the remote key pad will transmit a RF signal to RF modular. The microcontroller receives the remote data and its gives the output signal to motor driver chip IC L293D which is connected to the output port2 pin.



**Fig. 1: Block diagram of the work**

The output of the L293D is connected to the gear motor. If the microcontroller gives signal to output port, the buffer IC 74573 gives proper high signal to the motor driver chip then the gear motor will move forward, reverse, left or right. When the microcontroller receives AUTO mode data from remote, it will move in forward direction. Fig. 1 describes the block diagram of the work.

By sensing the exact signal transmitted by the defence staff, the IR photodiode gives information to the microcontroller. The microcontroller checks the Infra Red frequency that has been assigned to the defence staff. If the IR photodiode finds the defence staff signal the microcontroller will display as Defence Staff; if there is a mismatch in the signal it will display as Terrorist. The output port 0 is connected to pull up resistors. The pull up resistor avoids the TRI state condition. LCD display is connected to port 0.

### III. BLOCK DESCRIPTION

The power supply section is very useful to give power to all sections. The 6v free maintenance battery is given to supply for all electronic circuits. In this section we are using regulated IC 7805. The IC output gets a 5volt constant voltage supply and other unregulated supply connects to the relay driving section.

AT89S52 is programmed in assembly language. The inputs and outputs are connected in the hardware circuits and check the input signal and analysis the program and give the corresponding output signal to the output port. A RF Module (Radio Frequency Module) is used to transmit and receive radio signals on one of a number of carrier frequencies. In this section an induction coil gun is connected with the relay. Infrared Transmitter and Infrareds Receiver are fixed with a Gear motor. If any person moves in front of the sensor transmitter signal will interrupt and reflect in the receiver section. The receiver output is connecting with input of the microcontroller.

### 3.1 Power Supply

The 6v free maintenance battery is given to supply for all electronic circuits. In this section we are using regulated IC 7805. The IC output gets a 5volt constant voltage supply and other unregulated supply connects to the relay driving section.

### 3.2 Atmel Microcontroller At89s52

Atmel AT89S52 microcontroller is programmed using KeilµVision4 software for this work. Fig. 2 shows the pin diagram of AT89S52.



Fig 2: Pin diagram of AT89S52

### 3.3 Remote Control System

A remote control system is used for controlling the rover. RF based wireless remote system is used for this work. Radio frequency electromagnetic radiation (RF) will pass through non-metallic walls and opaque objects. Infrared light generally will be blocked by anything that is visibly opaque except for special IR filters. Moreover, users have to point the remote directly at the IR receiver on the equipment they wish to control which means they need a clear path unobstructed by people, furniture and walls. And IR typically uses a unidirectional communication technology. Bidirectional communication is possible, but it's expensive and prone to interference from other light sources. Therefore RF remote is preferred for controlling the rover in this work.

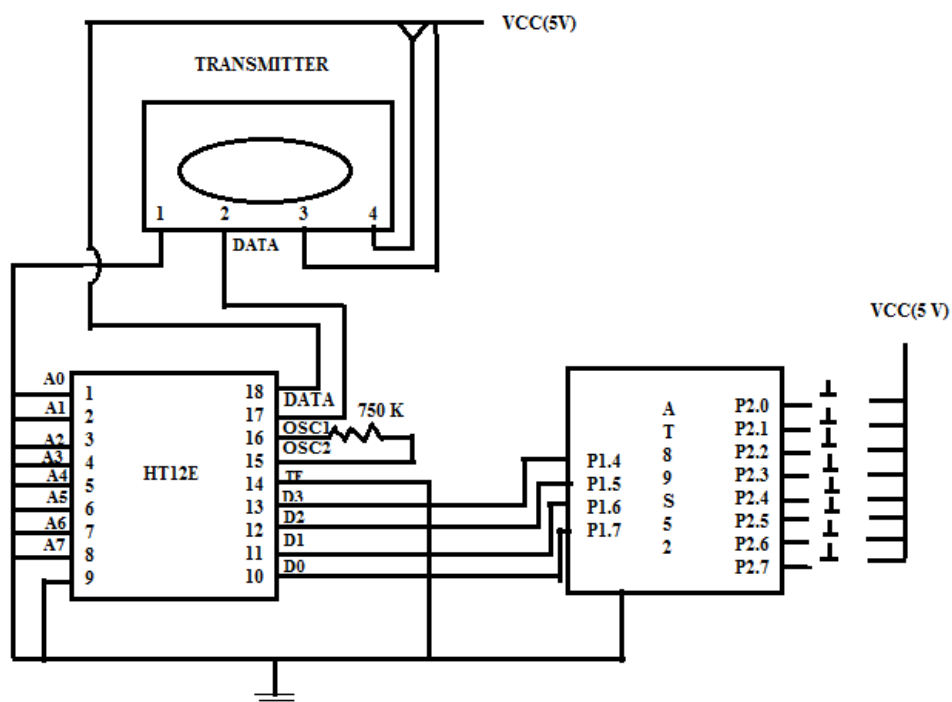
RF module (Tx/Rx) is used for making a remote, which could be used to trigger an output from a far place. RF module, uses radio frequency to deliver signals. These signals are disseminated at a given frequency and a baud rate. A receiver can obtain these signals only if it is tuned for that frequency. A four channel encoder/decoder pair is used in this system. The input signals, at the transmitter, are driven through four switches while the outputs are monitored on a four LEDs display respective to each input switch. The radio frequency (RF) transmission system uses Amplitude Shift Keying (ASK) with transmitter/receiver (Tx/Rx) pair performing at 434 MHz. The transmitter module takes the input in serial mode and transmits these signals by RF. The transmitted signals are received by the receiver module placed far away from the source of transmission.

The system allows half-duplex communication between two nodes. The RF module has been used in addition with a set of four channel encoder/decoder ICs. HT12E & HT12D have been used for encoder and decoder

respectively. The encoder changes the parallel inputs into serial set of signals from the remote switches. These signals are serially transmitted through RF to the reception point. The decoder is used beyond the RF receiver to decodes the serial format and retrieve the original signals. These outputs can be monitored on corresponding LEDs.

### 3.3.1 RF Transmitter

A transmitter with the aid of an antenna, generates radio waves. The transmitter produces radio frequency alternating current, which is given to the antenna. The antenna radiates radio waves when excited by this alternating current. The output ports of the controller are connected to the data pins of HT12E encoder. The HT12E encoder is connected to RF transmitter by the circuit configuration shown in Fig. 3.



**Fig. 3: Interfacing of AT89S52 with RF transmitter**

### 3.3.2 RF Receiver

On receiving serial data from encoder IC (HT12E) the transmitter, transmits it to the RF receiver. The receiver, on receiving these signals, disseminates them to HT12D via pin2. The serial data is received at the data pin (DIN, pin14) of HT12D. The decoder then obtains the original parallel format from the received serial data. When no signal is obtained at data pin of HT12D, it will remain in standby mode and consumes very less current ( $< 1\mu\text{A}$ ) for a voltage of 5V. When signal is obtained by the receiver, it is applied to DIN (pin14) of HT12D. On receiving the signal, oscillator of HT12D is activated. HT12D IC then interprets the serial data and checks three times the address bits. If there is no mismatch with the local address pins (pins 1-8) of HT12D, then it keeps the data bits on its data pins (pins 10-13) and makes the VT pin in high state. An LED is connected to the VT pin (pin17) of the decoder to observe the valid transmission. The corresponding output is obtained at

the data pins of decoder IC. A signal is disseminated by lowering all the pins 10-13 of HT12E and respective signal is obtained at the receiver end of HT12D. Address bits are formed by using the first 8 pins of both encoder and decoder ICs. To send a given particular signal, address bits must match at encoder and decoder ICs. By designing the address bits properly, a single RF transmitter can be used to control different RF receivers operating at same frequency.

### 3.4 IR Id

In order to identify the terrorist and defense staff we have assigned all defense staff an IR ID (Infra-red Identity), which transmits a signal of particular frequency. If the signal from the person's ID signal doesn't match with the given signal, the robot assumes that he is a terrorist and attacks him with induction coil gun.

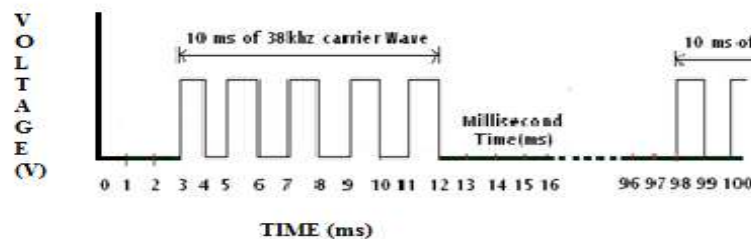
#### 3.4.1 IR Transmitter

Modulation of the information signal with carrier signal is the basic building block of any IR transmitter because the receiver modules which are for a particular carrier frequency. So that when you choose a particular IR receiver module, it is mandatory to transmit the modulated wave with the same carrier frequency of that of an IR receiver module. We have assigned 38 KHz carrier signal for the defense staff. If the IR sensor doesn't detect the exact signal or if there is any mismatch the robot detects the person as a terrorist and attacks the person with the induction coil gun. The implementation of IR transmitter can be done using Microcontroller (Atmel AT89S52) inbuilt wave generation module. Circuit using Microcontroller (Atmel AT89S52) inbuilt wave generation module is shown in Figure 4.

#### 3.4.2 Modulation of a Carrier Signal

ON state = 10ms

OFF state = 90ms

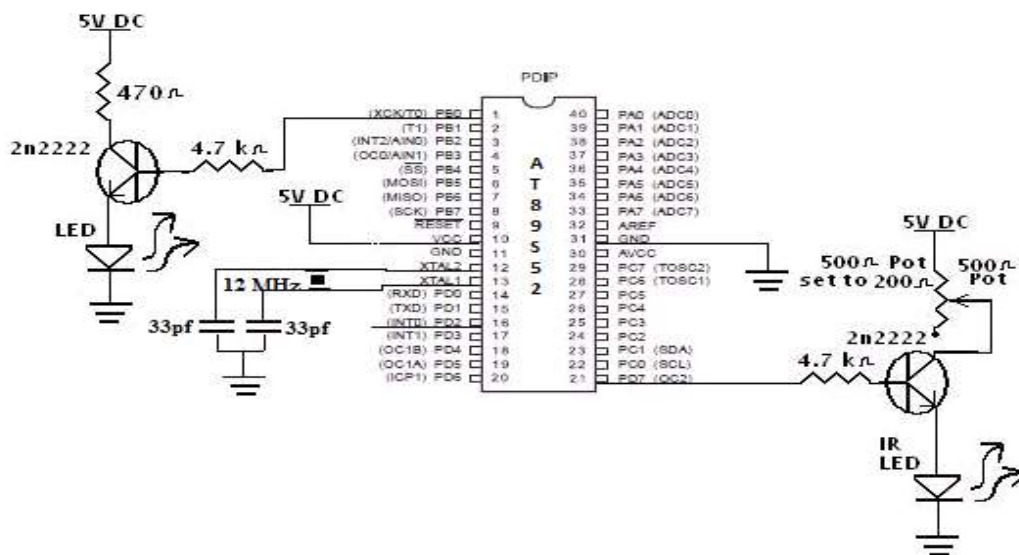


**Fig. 4: Modulation of a carrier signal**

Fig. 4 describes the process of modulation, similar to OOK (ON-OFF Keying) modulation, where the carrier signal is ON for certain period. When transmitting a signal for obstacle detection, it is necessary that the carrier signal is transmitted for a short period (10 milliseconds in our case) and remains OFF for longer period. If the transmission of the carrier signal is extended then the receiver module will treat it as a noise and ignores receiving the transmitted signal.

### 3.4.4 IR Receiver

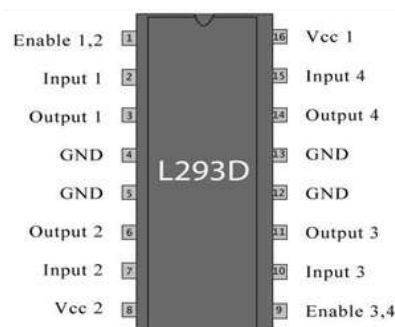
In this work, the transmitter is designed for 38 kHz carrier signal; hence the IC selected should work for the same signal. If there is any signal mismatch the robot assumes the person as a terrorist. Fig. 5 shows the microcontroller integrated with IR transmitter and receiver.



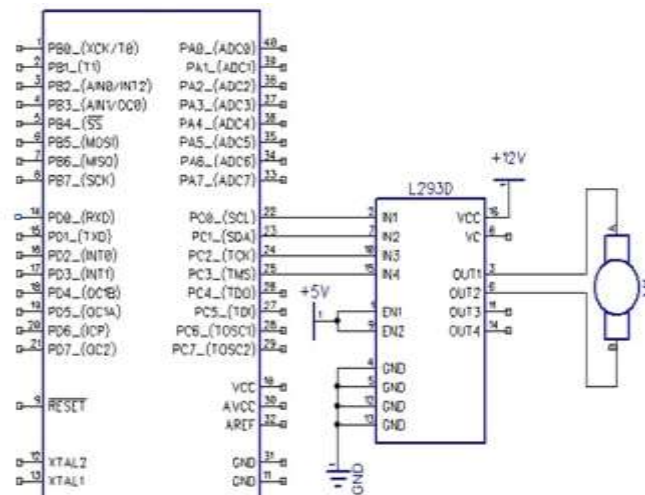
**Fig. 5: AT89S52 integrated with IR transmitter and receiver**

### 3.5 Driving Section

L293D is used in the work to drive the motor for moving the robot. The L293D is an integrated circuit motor driver used for simultaneous, bi-directional control of two tiny motors. The L293D is constrained to 600 mA. The L293D is simple and low cost for low current motors. It contains two inbuilt H-bridge driver circuits. During common mode of operation, two DC motors can be driven at the same time, both in forward and backward direction. Fig. 6 shows the pin diagram of L293D.



**Fig. 6: Pin diagram of L293D**



**Fig. 7: Interfacing Motor Using L293 IC**

Two motors can be controlled by input bits logic at pins 2 and 7 for one and 10 and 15 for other. Input logic bits 00 or 11 will stop the respective motor. Logic bits 01 and 10 will rotate it in dextral and anticlockwise directions, correspondingly. Pins 1 and 9 are enable pins must be high for motors to start operating. When an enable input is in high state, the corresponding driver gets started. As a result, the outputs become progressive and work in phase with given inputs. Similarly, when the enable input is not high, that driver is not enabled, and their outputs are off and in the high-impedance state. Fig. 7 shows the motor interfaced with L293D.

### 3.6 Mechanical Section

A robotic arm is used in this work, for rotational and linear displacement. A gripper for robotic arm is used in the kit to pick up the bomb after it has been detected as a bomb by the sensor. It is used for holding the object with grip. The robotic gripper must withhold not only the weight of the object but also acceleration and the motion that is caused due to frequent movement of the object. A servomotor is used for driving the robotic arm. Servo motor is used for precise positioning and so a servo motor is used for the robotic arm. A gear motor is used for controlling the rover movement.

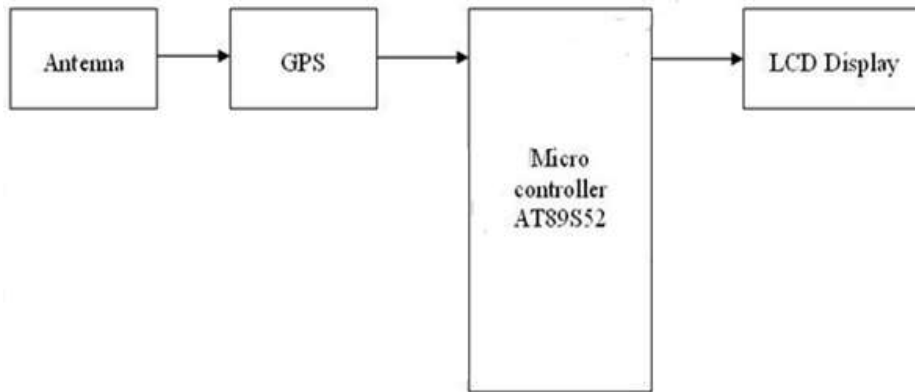
An induction coil gun mechanism is formed by a wire coil, an electromagnet and at one of its ends a ferromagnetic projectile is placed. A current-carrying coil will draw a ferromagnetic object at its center. A large current is passed through the coil of wire and a strong magnetic field forms, pulling the projectile towards the center of the coil. When the projectile nears end point the electromagnet must be switched off, to prevent the projectile being arrested at the center of the electromagnet. [8]

### 3.7 Gps System

GPS (Global Positioning System) is used in the kit to locate the exact position. The robot could be tracked with GPS. The system is useful to defence, military department etc to track the terrorists. It is developed by the United States government and is freely accessible to those with a GPS receiver. A GPS receiver finds its



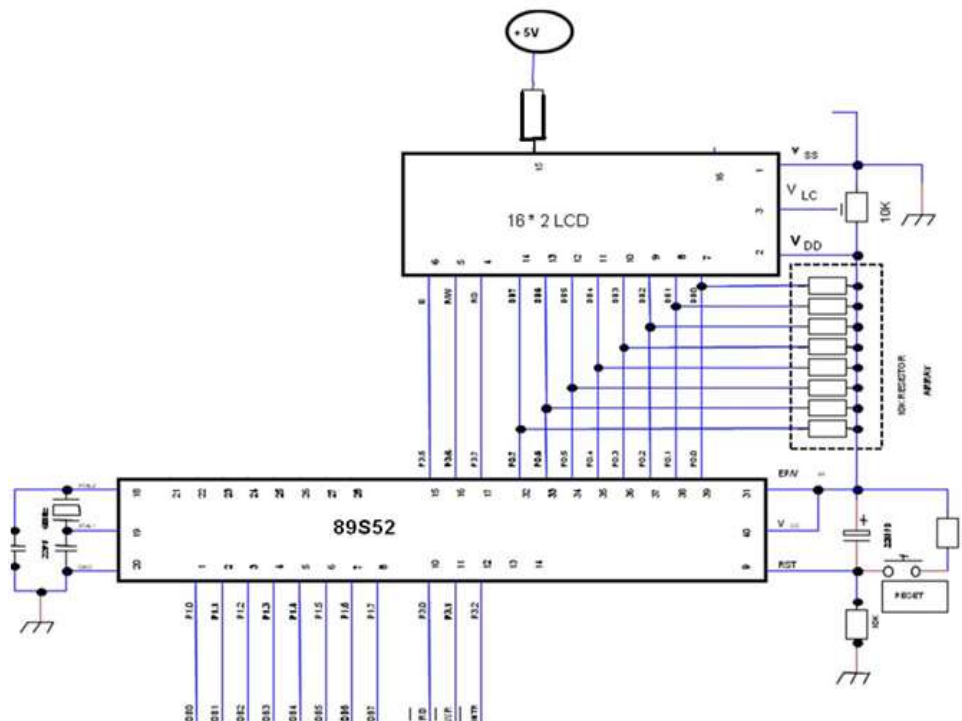
position by timing of the signals sent by GPS satellites at an altitude very high above the Earth. Fig. 8 shows the block diagram of GPS system interfacing with AT89S52 and LCD.



**Figure 8: Block diagram of interfacing GPS with AT89S52 and LCD**

### 3.8 MICROCONTROLLER & LCD INTERFACING

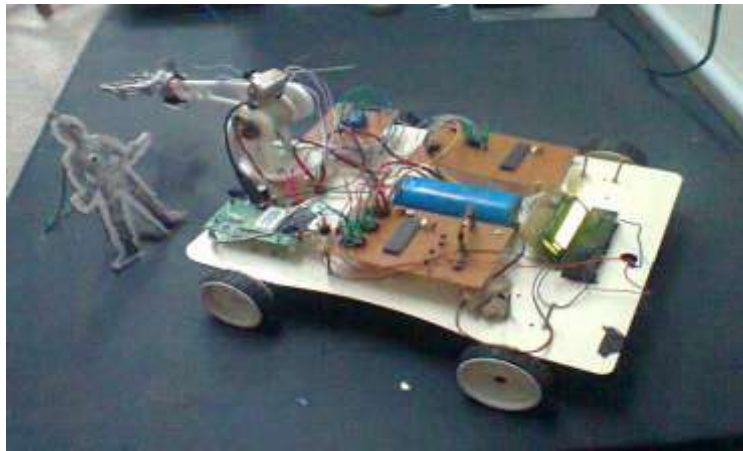
A 16\*2 LCD is interfaced with AT89S52 controller to display the position of the robot. Fig. 9 shows Microcontroller & LCD Interfacing Circuit Design.



**Fig. 9: Microcontroller & LCD Interfacing Circuit Design**



#### IV. RAKSHAK ROBOT KIT



#### V. CONCLUSION AND FUTURE WORK

The Electronic Squad functions as a head of the defence and prevents invasion of terrorist. Creation of such Electronic Squad is ideal to fight against Terrorism without any life and property loss. This work can be further be developed by programming the remote using the controller which needs no control over the rover manually.

#### VI. ACKNOWLEDGEMENT

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