iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 4 **Issue:** IV **Month of publication:** April 2016

DOI:

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Volume 4 Issue IV, April 2016
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Design of Entrapment Escalation using GSM for Elevators

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Abstract – Due to advancement in technology, elevators are used in order to reduce human efforts for climbing steps of large buildings. The elevator being electrical equipment has a possibility to stop working during its operation resulting in entrapment of passenger. To rescue the entrapper an escalation has to be done to concern department or person or an indication should be made to the people outside the elevator for arrangement of rescue operation. But sometimes the escalation of entrapment in elevators can be a challenging problem, since entrapped passenger may not be aware of the escalation procedure or the elevator may not have an indicator or alert for the people outside the elevator. Many times during entrapment, escalation to the concern department may become harder, may be due to unavailability of resources required like mobile phone with the entrapper or may be an alert system with the elevator. To overcome this Entrapment Escalation using GSM for Elevators can be used, where SMS will be sent to the concern department through GSM for arrangement of rescue operation, and also an indication will be done in the form of buzzer for the people outside the elevator to make them aware of this entrapment.
Keywords – Elevator, Entrapment, Escalation, GSM and Rescue

I. INTRODUCTION

An elevator powered by electrical motors, is a vertical transportation that is either pulled up or pushed down inside building by a mechanical means. The elevator being electrical equipment may sometimes stop working whenever it is carrying passenger in it, resulting in an entrapment of passenger inside its car. There are manual ways of rescuing passenger from elevators, which is only possible when entrapment situation is escalated to the concerned rescue department. The information of entrapment can be passed manually to the concern.

But with the development in technology, automated systems are preferred choice for human to increase their comforts because automated systems have less manual operations, flexibility, and reliability, and are accurate. Due to this, every field prefers automated systems, especially when it comes to the rescue operation during entrapment in elevators. People may need an automated system for escalation of entrapment in elevators for arrangement of rescue operation. Even they may need indication to the one outside the elevator to make them aware of entrapment. So a system like Entrapment Escalation using GSM for Elevators can be used for intimation of entrapment rescue operations. A system, on its own, detects the entrapment and sends a SMS to the concern department for arrangement of rescue operation, and also indicating the people outside the elevator to be aware of entrapment.

The block diagram of the Entrapment Escalation using GSM for Elevators is as shown in Fig.1.

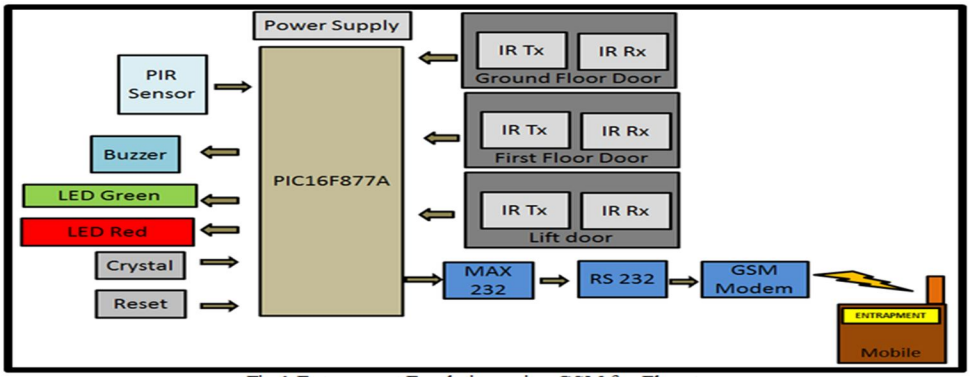


Fig.1 Entrapment Escalation using GSM for Elevators

This system consists of PIC microcontroller, PIR sensor which is place inside elevator car for detection of human being inside elevator car, Ground floor door IR sensor which is place on the door for detecting whether the ground floor door is open or closed,

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First Floor door IR sensor which is placed on the door for detecting whether the First floor door is open or closed, Lift door IR sensor which is placed on the door inside the elevator car for detecting whether the Lift door is open or closed, based on this sensors output system decides the entrapment and follows the steps of escalation as being programed for it like, Green LED glows when no one is entrapped, Red LED Glows when someone is entrapped, Buzzer glows when someone is entrapped and GSM sends SMS "ENTRAPMENT" to the concerned rescue team when someone is entrapped. The overview of the system can be better understood by the process flow given in Fig.2.

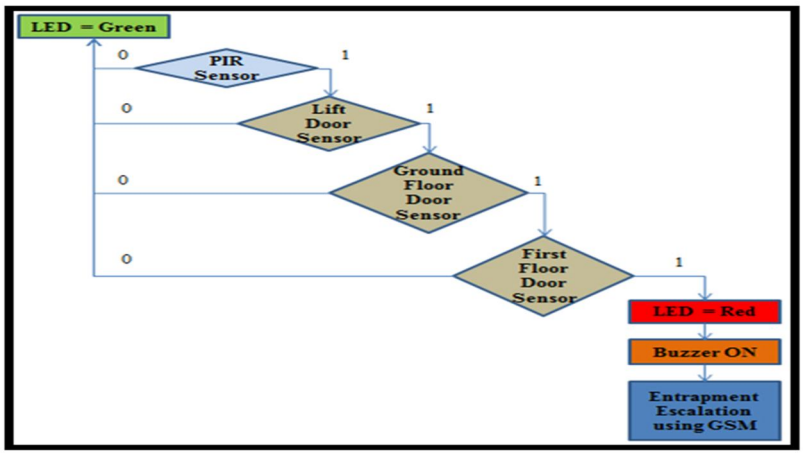


Fig.2 Entrapment Escalation using GSM for Elevators process flow

From the Fig.2 it is our assumption that if someone is there inside the lift and all doors are not getting open, and even after some amount of time the situation remains the same, then it can be consider as entrapment.

II. SOFTWARE DESIGN

Based on the above assumption of entrapment, the flow chart shown in Fig.3 is considered for Entrapment Escalation using GSM for Elevators.

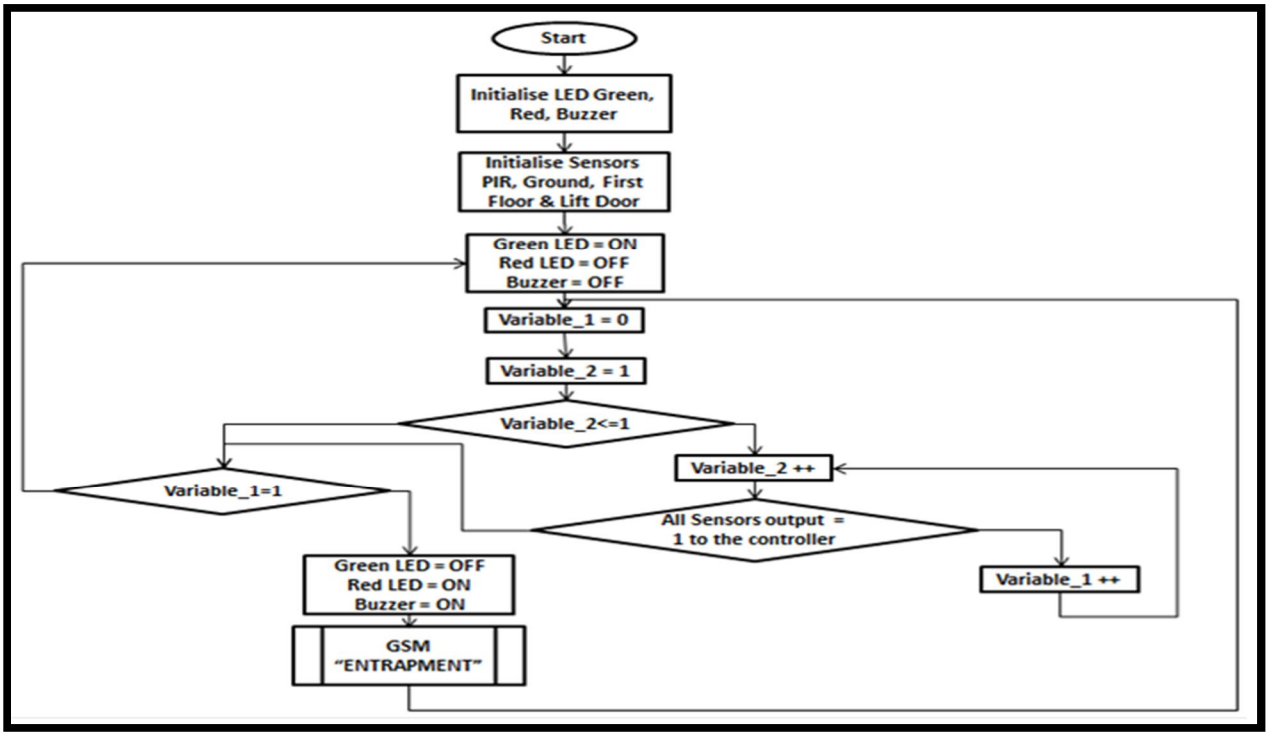


Fig.3 Entrapment Escalation using GSM for Elevators flow chart

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From the above flow chart it is understood that we would like to consider few things like, initializing the pins of microcontroller connected to Red LED, Green LED and Buzzer as output pins. Also initializing pins of microcontroller connected to PIR and IR sensors as input pins. Making Green LED ON indicating that no one is entrapped. Since no one is entrapped as per assumption making Red LED and Buzzer OFF. We used one variable_1, to create delay, for some amount of time, if a signal is received from all sensors to confirm entrapment. This is also being confirmed using a second variable_2. One's entrapment is confirmed the Green LED is made OFF, Red LED is made ON and Buzzer is made ON. And finally using GSM a message "ENTRAPMENT" is sent.

III. HARDWARE DESIGN

As far as concerned with the hardware design, simulation software like proteus is used to implement the above concept before implementing it on actual hardware. In this proteus PIC16F877A pic microcontroller is used, a PIR sensor is connected to pin RB0, (this proteus does not support IR Sensor Library so we assumed logic state to be considered as IR sensor output to the controller) IR Sensors are connected to RB1 to RB3, Terminal is connected to Tx pin, LED's and Buzzer is connected to RD0 to RD2 pins, as shown in Fig. 4.

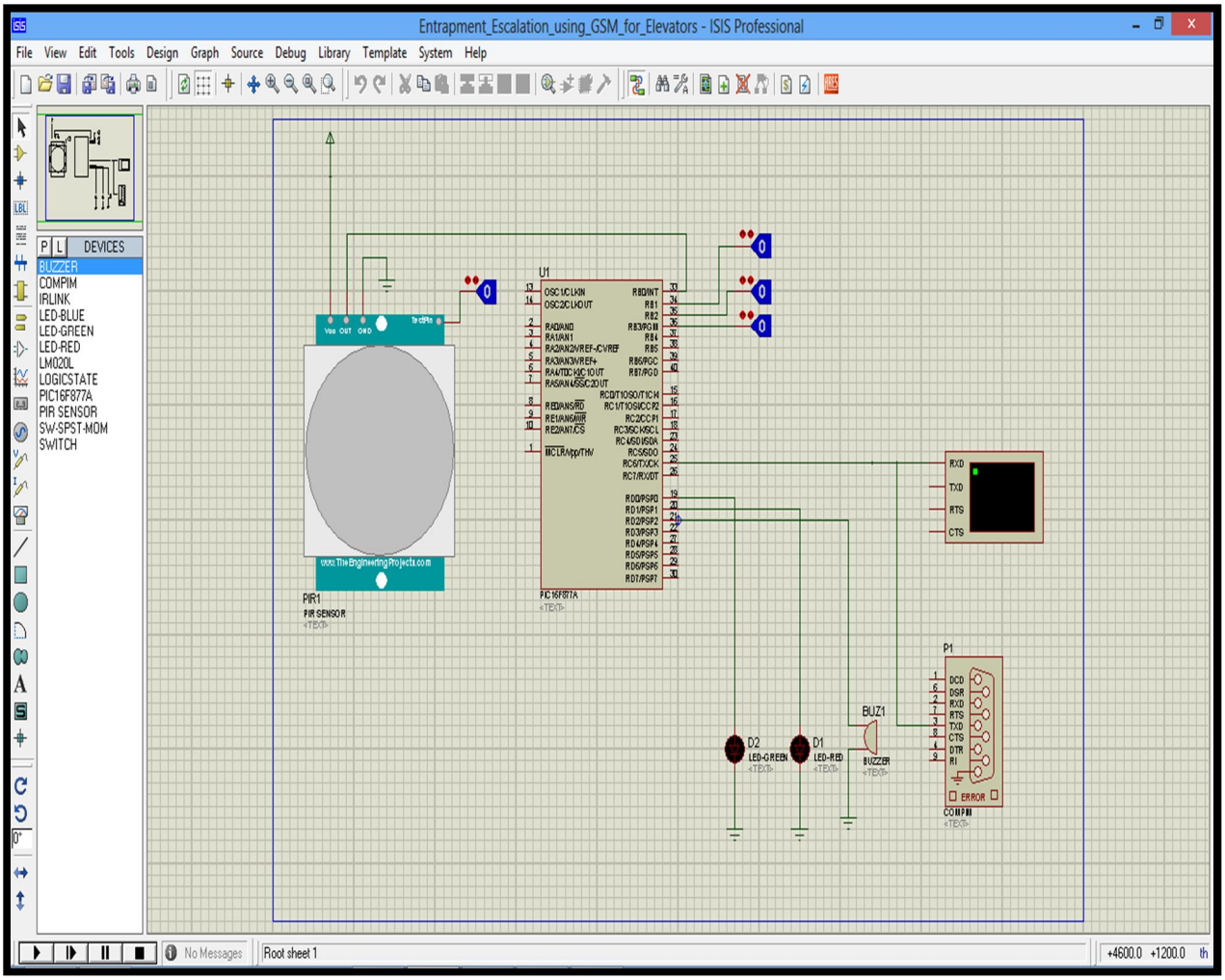


Fig.4 Entrapment Escalation using GSM for Elevators proteus diagram

IV. HARDWARE AND SOFTWARE CO-DESIGN

To simulate the hardware design shown in Fig.4, the code for PIC is written in mikroC PRO as per the flow chart shown in Fig. 3. The hex file is generated and is being linked to proteus PIC16F877A. The simulation is run and it is observed that we were able to receive a message on Virtual Terminal as shown in Fig. 5 which may be received on Mobile phone as SMS.

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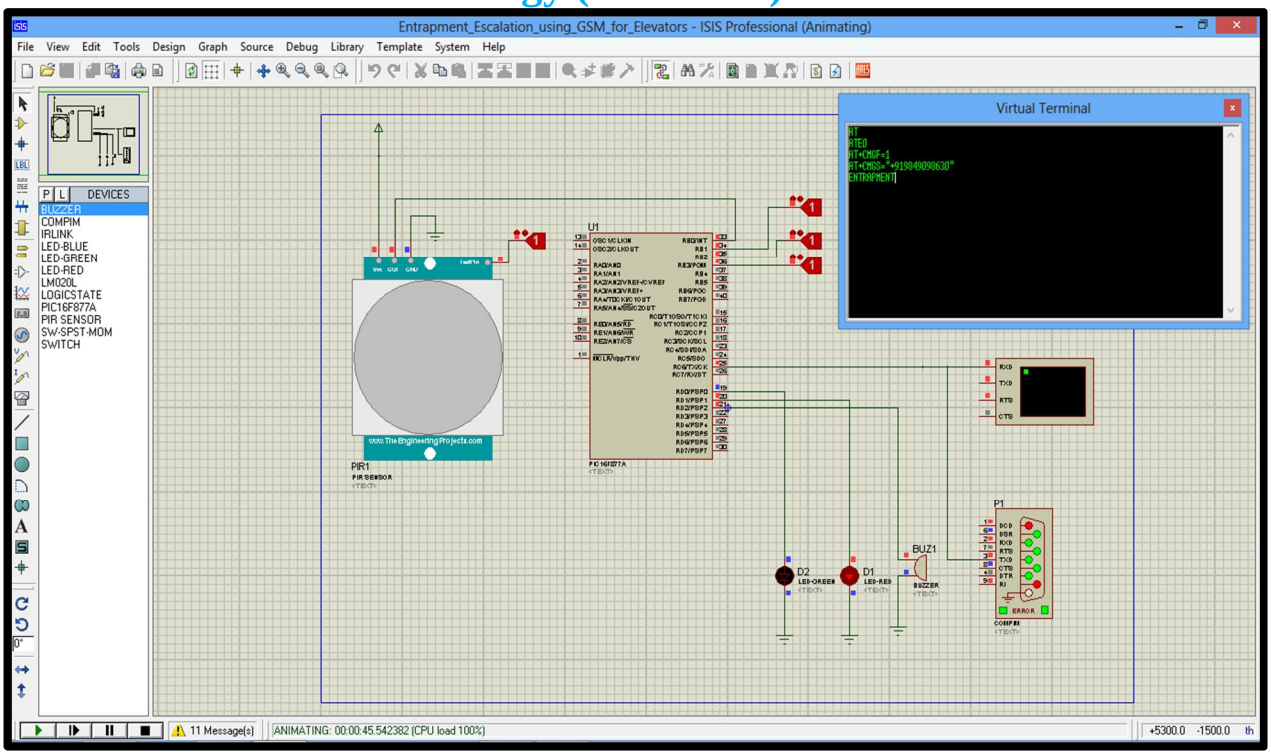


Fig.5 Entrapment Escalation using GSM for Elevators proteus output

V. CONCLUSION AND FUTURE SCOPE

The elevator is being considered as an important element of shopping malls, theatres, residential buildings, hospitals etc. And there are cases of entrapment for which rescue is done. This rescue is being done using manual information passing mechanism. With rapid increase in development of technology, same process of escalation may require automation mechanism. For such scenario the Entrapment Escalation using GSM for Elevators is one among possible way. It is manual less escalation process where there is no need to remember any contact number of rescue team for escalation. It can also be observed that there is no need to worry if entrapper is not carrying any mobile phone for escalation during entrapment. One's entrapment is assumed by the system it automatically sends alert message to mobile phone of the rescue team for rescue operation arrangement. It can be implemented in Personal Lifts in residential areas, Commercial Lifts in malls, Bed Lifts in hospitals and many more kind of Lifts. This work can be extended in future to make elevators more and more interactive with owners of elevators and also entrappers of elevator.

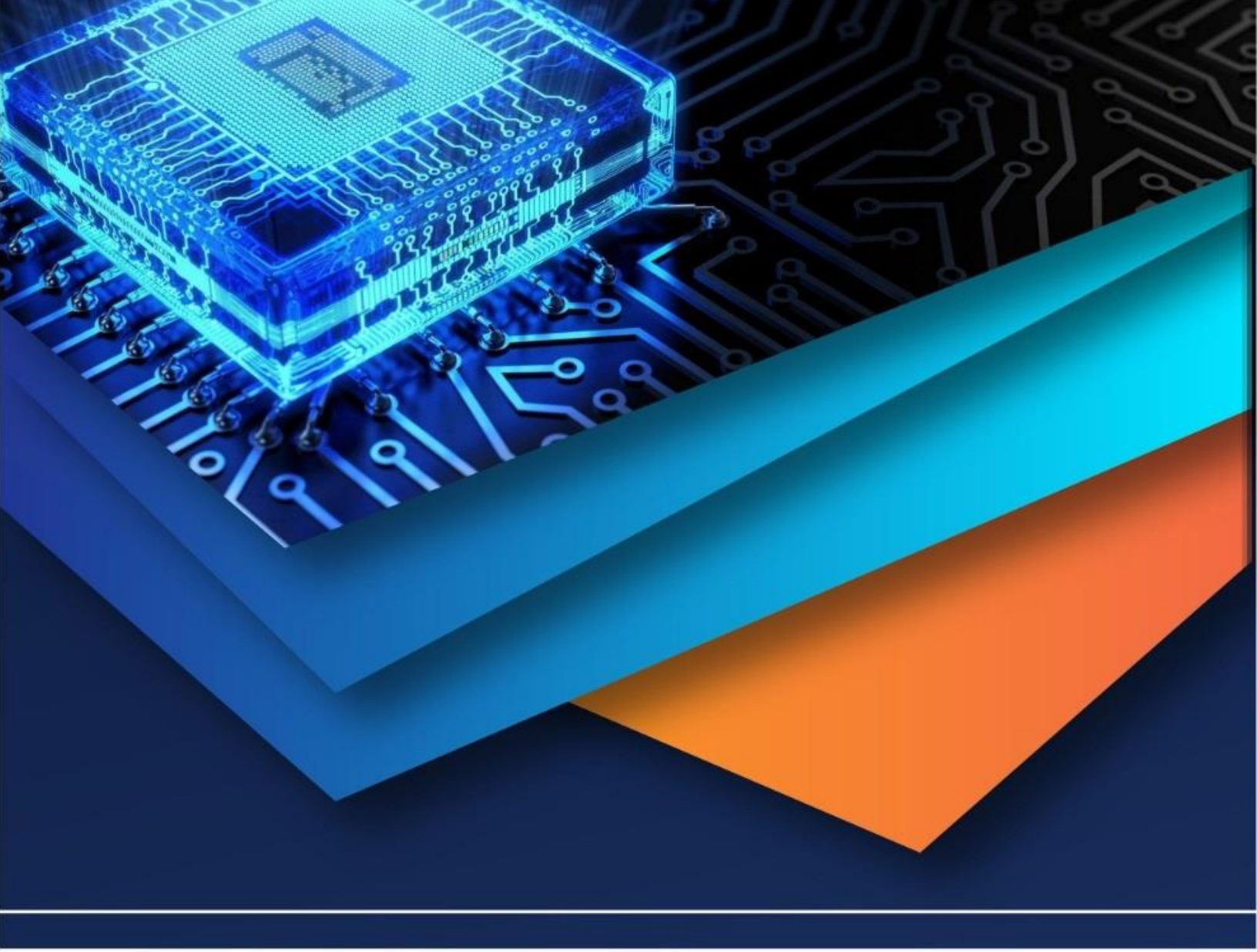
VI. ACKNOWLEDGEMENT

We would like to thank Ms Subhashini Assistant Professor, Department of ECE, Dhaanish Ahmed College of Engineering, Chennai, for giving valuable suggestion throughout the work.

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