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Advance Hand Gesture Controlled Robotic System

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Abstract*: In this paper we are presenting robot which can be controlled by hand gesture, Smartphone through Wi-Fi and joystick (Wired and wireless). And hands like human hand are attached with robot which can be controlled by hand gesture based on accelerometer sensor by the user to perform different tasks. In this robot, a machine learning and artificial intelligence is used to trained system show it can be used for automation of the robot.
Keywords: AVR microcontroller, Accelerometer sensor, ESP8266 Wi-Fi module, Encoder and Decoder, Smartphone, RF receiver and Transmitter.

I. INTRODUCTION

Now in this rapid change world is shifting to autonomous and robotic system to perform vital work. This project is developing on that base. In this project, we are using ADXL335 [1] accelerometer sensor to create robot which can perform different task on the bases of human hand gesture [13]. We are also adding it in different control mode for movement of robot (but not robot arm) like Wi-Fi module [2] so robot also controlled by smartphone, RF transmitter and receiver [3] for wireless control remote. We are using AVR microcontroller [4] for processing purposes. And for storage we are using oracle database. We also can connect it using WAN [5][6] (Wide Area Network) for remotely control processes for which we are using Ubuntu Server OS.
This robot is developed to make world more safe, comfortable and sustainable, through which mankind keep evolve and become more efficient.

II. EASE OF USE

This is design for perform multiple task all of them are vital in their field. They are

A. Use in Defence and Rescue operation

This robot can use in defence field for thing like bomb defusal this device give them a user-friendly experience which is easy to control and the natural way (or give perfect grip to work on bomb) to perform task work like defusing bomb with their hands and VR help them to see thing in more detail. While rescue operation VR and hand help to perform more efficient manner then traditional recuse equipment.

B. Construction at high altitude

Use of this robot give construction industry to complete their task in more efficient and safe manner which is most vital part of this field. By this robot, they can perform all the task which need to be done by human hands at the high altitude without send labour to the high altitude (and without risking their life) because it can be operate from wireless control system and VR support give them clear 360 view of worker task which need to perform in high altiude.

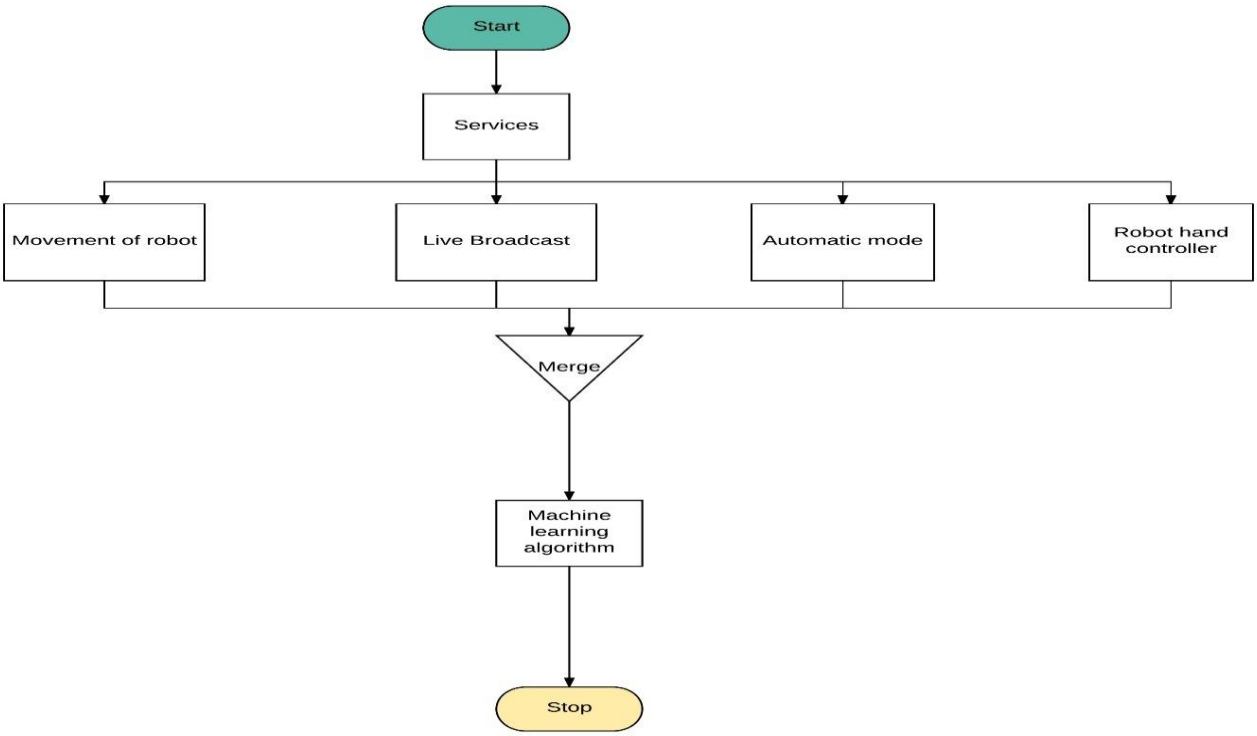
C. Use in The Medical field

This robot can be used to trained new doctor that how to perform surgery in VR graphical representation mode which help medical college to full-fill shortage of body for training purpose and can use it for research. Hospital's use it to perform surgeries and this will give then more stable and natural way to perform surgery and VR will also can also give more defined and clear view of operational area in the body.
These uses can be monitored and use to trained as well as creating automatic device in their respective field. And suggest more efficient way to perform their task.

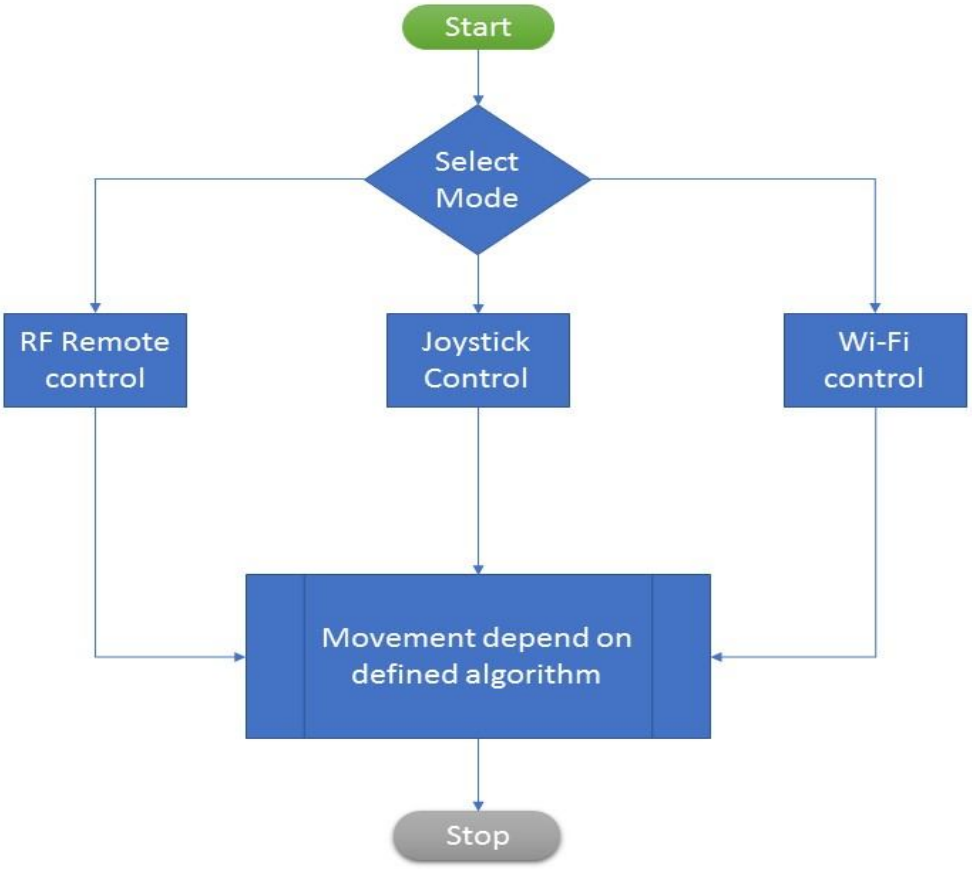
III.METHOD AND CIRCUIT

The flow chart of robot function which can be performed individually or in combination or all together.

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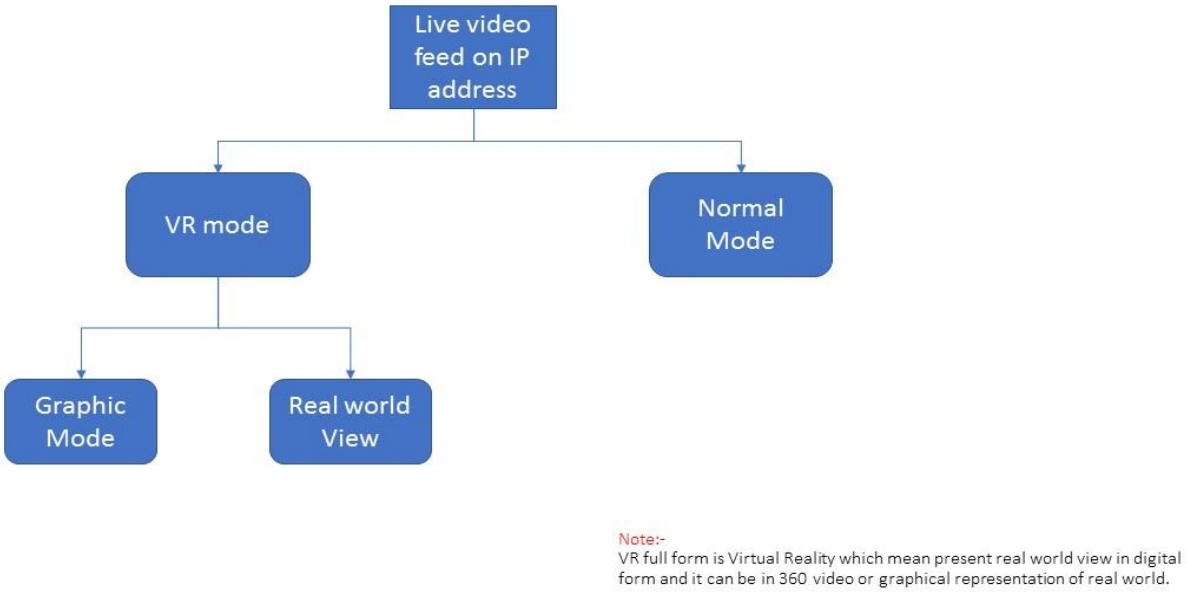


Flow chart for Movement function of robot.

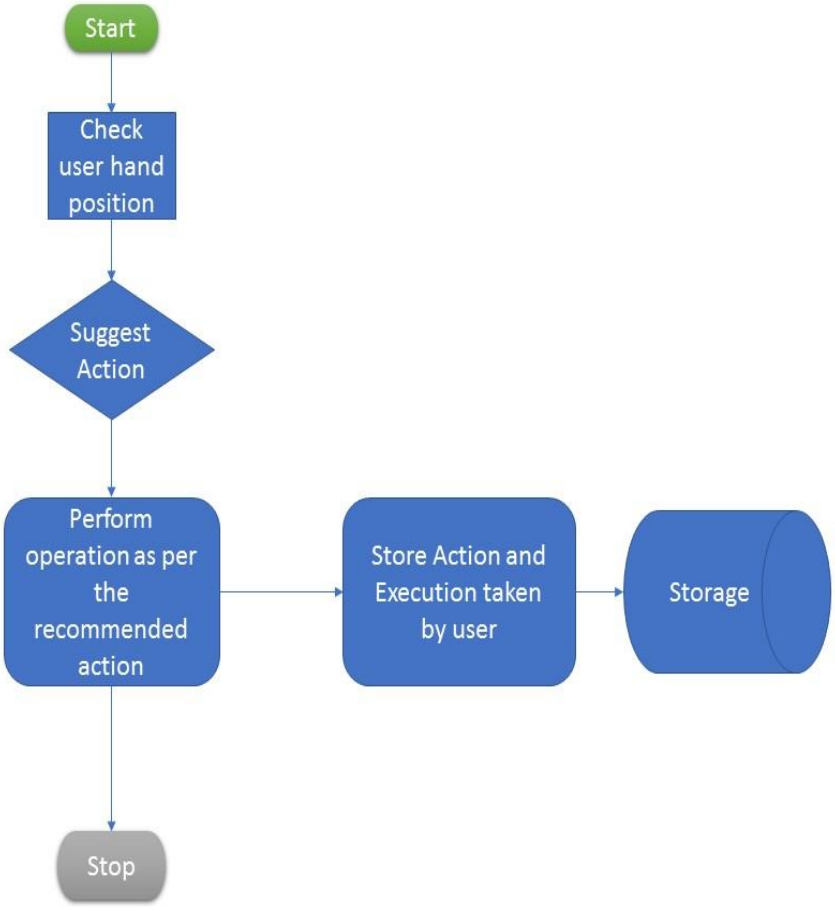


Block diagram for live broadcast function of robot.

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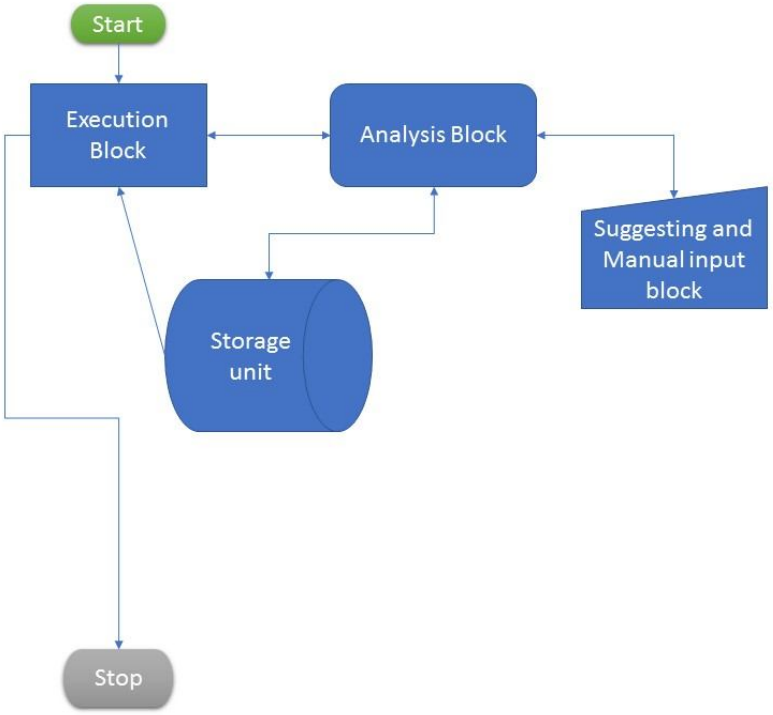


Flow chart for Hand control function of robot.

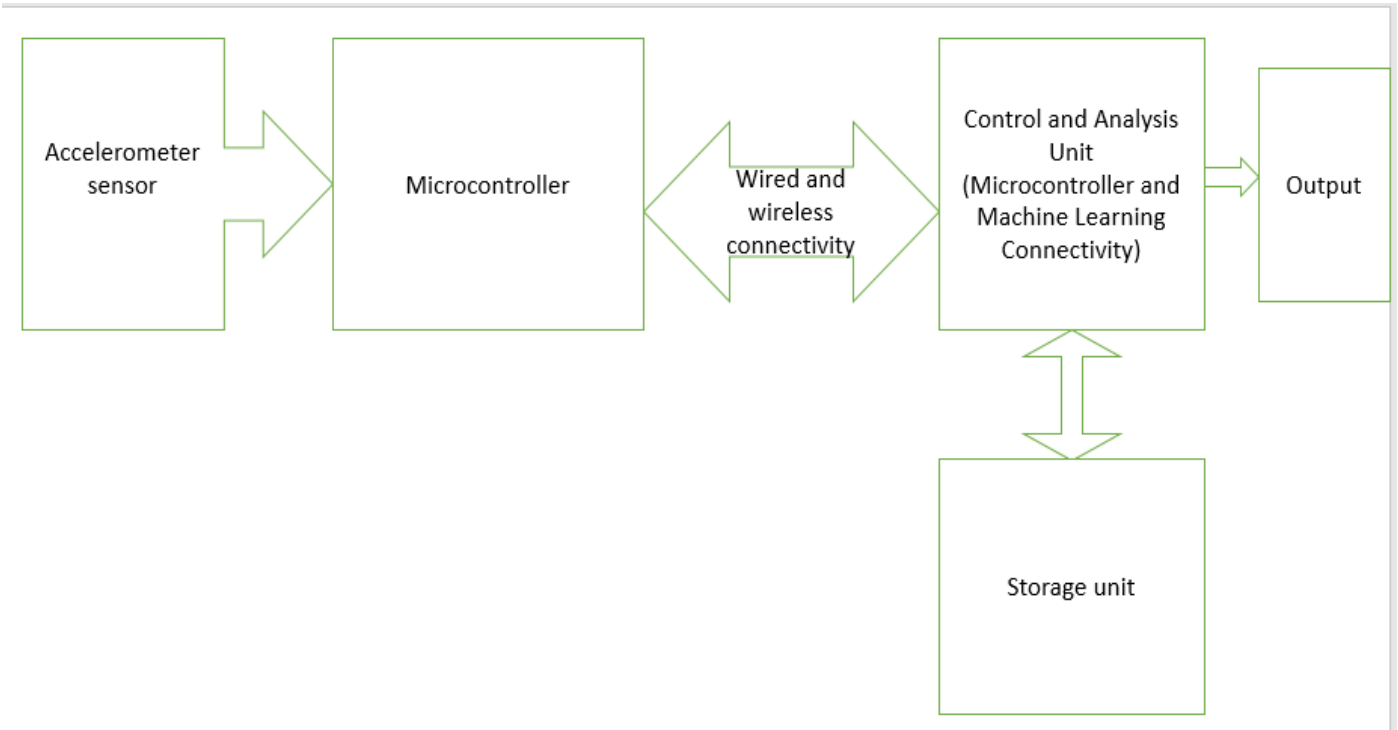


Flow chart for Machine learning and Artificial Intelligence.

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Here Execution block is used to perform task define by user or system itself execute by the permission of user. It extracts data from a storage unit and from step as per data taken from storage unit and receive by user.
Analysis block is use to analysis or monitor the execution done by execution block and give suggestion to user for enhancing step to complete task robot in more efficient or exact manner.
Storage unit store and share data between analysis and executio block.



Circuit Block Diagram

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And security of robot which means that how robot understand that hand gesture send data is it user or not can be perform by biometric [6] security system for vital and responsible jobs and RFID [9] security system for normal jobs, encoder [10][11][12] and decoder[10][11][12] are also used for encrypting data while communicating between main circuit and control circuit.

VI. RESULT [7][8]

As per the given conditions the robot will control its movement
For RF (accelerometer sensor) based system:
Case-1 If ((YA> 0) and (YB> 0))
Then robot will move forward.

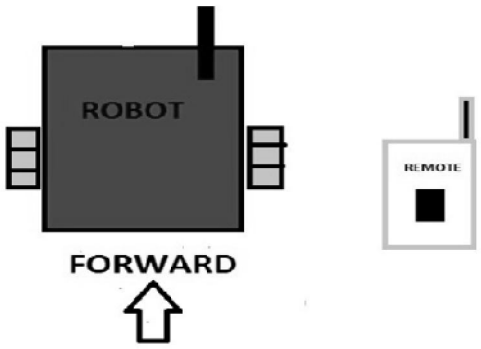


Figure 7: Robot moving forward.

Case-2 If ((YA<0) and (YB> 0))
Then robot will move backward.

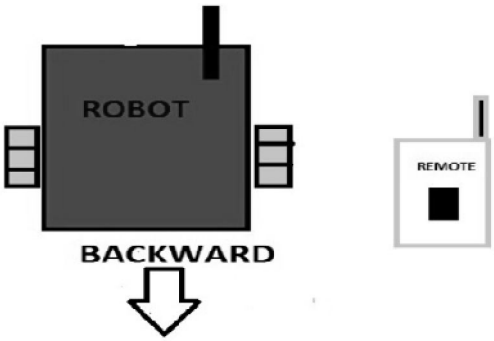


Figure 8: Robot moving backward

Case-3 If ((YA>YB)
Then robot will turn left.

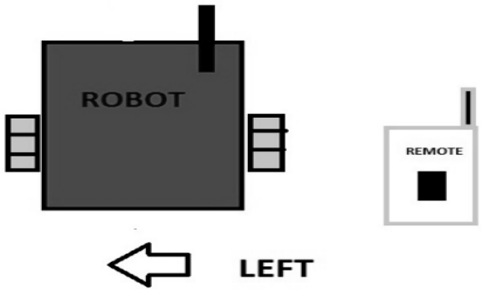


Figure 9: Robot turn left.

Case-4 If ((YB>YA)
Then robot will turn right.

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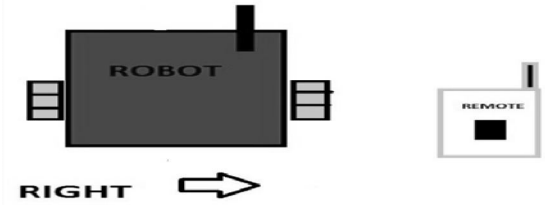


Figure 10: Robot turn right.

Case-5 If ((XA>XB)
Then robot arm will be opened.
Case-6 If ((XB>XA)
Then robot arm will be closed.
Where,
XA is value of x-axis of accelerometer sensor A.
YA is value of y-axis of accelerometer sensor A.
XB is value of x-axis of accelerometer sensor B.
YA is value of y-axis of accelerometer sensor B.
For Wi-Fi based system:
After the start of broadcasting, user will pass command through Wi-Fi network.
If user clicks on "Forward", then the robot will move Forward.
If user clicks on "Backward", then the robot will move Backward.
If user clicks on "Left", then the robot will turn Left.
If user clicks on "Right", then the robot will turn Right.

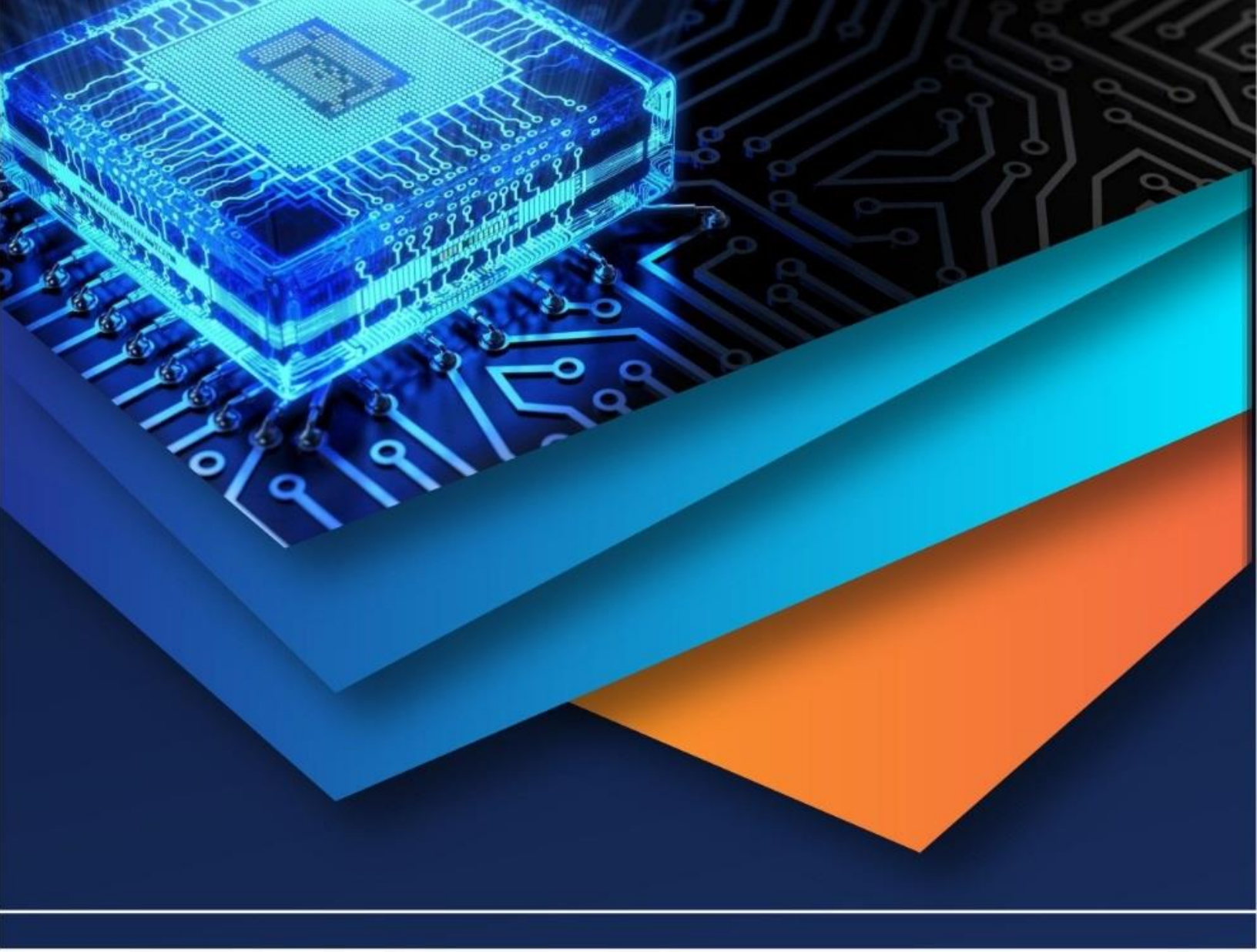
IV. CONCLUSIONS

As we all know, these days our nation is sick of massive terror attacks and bomb explosions. To avoid such disasters technological power must exceed human power. Human life and time are priceless. We completed our project "Accelerometer Based Gesture Controlled Robot", which is an efficient circuit (robot), which can be moved in any direction by making simple gestures. Since the circuit is wireless and as we have used Atmega8 microcontroller to realize the circuit because it has some additional features when compared to the basic microcontroller 8051, it poses an in-built ADC and DAC, pulse with modulation feature, high resolution etc. In this project, we used rechargeable battery so that the robot is very reliable. The accelerometer sensor on android smart-phone can also be used as a motion control of robots. Overall, the control process goes well. The farther the distance between the smart-phone and the robot, the slower the response time of robot in motion. The whole system explain in fig- 1 and PCB layout of RF receiver and transmitter is shown at fig-2 and4.

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