GPS Controlled Robotic Vehicle For Environmental Impact Analysis

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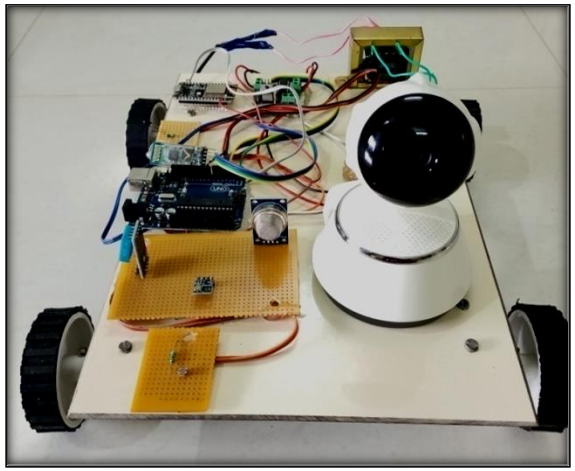
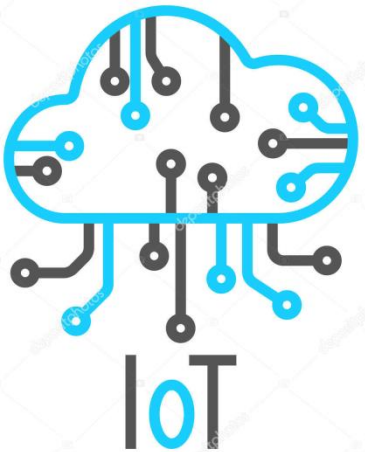
PROJECT DOMAIN

IoT (Internet of Things)

GPS Controlled Robotic Vehicle For Environmental Impact Analysis is the IoT based project .





ABSTRACT

- IoT is all about connecting electronic devices together and exchanging data
- We proposed an automated vehicle to monitor environmental parameters
- Robotic vehicle is controlled by an individual via android application

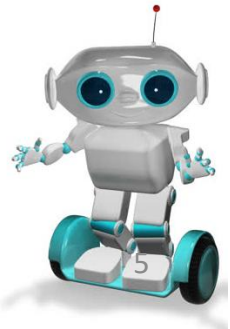
- Two way Audio communication and visualization is obtained
- Data obtained by the system is monitored by an android application
- The system can update the data to the application for every 2 seconds

SCOPE AND OBJECTIVE

- Data are collected and transmitted to phone through Iot
- It monitors environmental parameters such as temperature, humidity, air quality, and harmful gas concentration
- Data is analyzed for future prediction
- Provides new opportunities are arising for large scale environmental monitoring

LITERATURE SURVEY

PAPER TITLE	AUTHORS	CONCEPT	DRAWBACKS	ADVANTAGES
Intelligent Controlling of Indoor Air Quality based on Remote Monitoring Platform by Considering Building Environment	Shaodan Zhi	Remote Monitoring Platform for Indoor Air Quality	✓inadequate for outdoor monitoring	✓Monitors Air indoor quality ✓UAV monitoring
A Cyber-Physical System for Environmental Monitoring	George Mois	Monitoring parameters from a fixed station	✓Limited monitoring parameters	✓Design of the nodes in achieve low power consumption



LITERATURE SURVEY

PAPER TITLE	AUTHORS	CONCEPT	DRAWBACKS	ADVANTAGES
Smart Environmental Sensing Robotic Vehicle for the Internet of Things Framework	Abina Latheef	Monitoring environmental parameters.	✓Inadequate visualization ✓Monitors only Air quality	✓Implemented Robotic Vehicle
The Design and Implementation of GPS Controlled Environment Monitoring Robotic System based on IoT and ARM	Hasan Salman	Monitoring environmental parameters.	✓Direction is controlled using distance vector ✓High Cost	✓Compact design ✓Data can be used for prediction

EXISTING SYSTEM

- Robot has GPS coordinates, and it can store data on the Thing Speak IoT platform
- The whole system is realized using ARM-based embedded system called Arduino and Raspberry Pi
- The device is controlled by a smart phone which runs an app built on the Android platform
- The system updates sensor data to IoT server in every 15 seconds

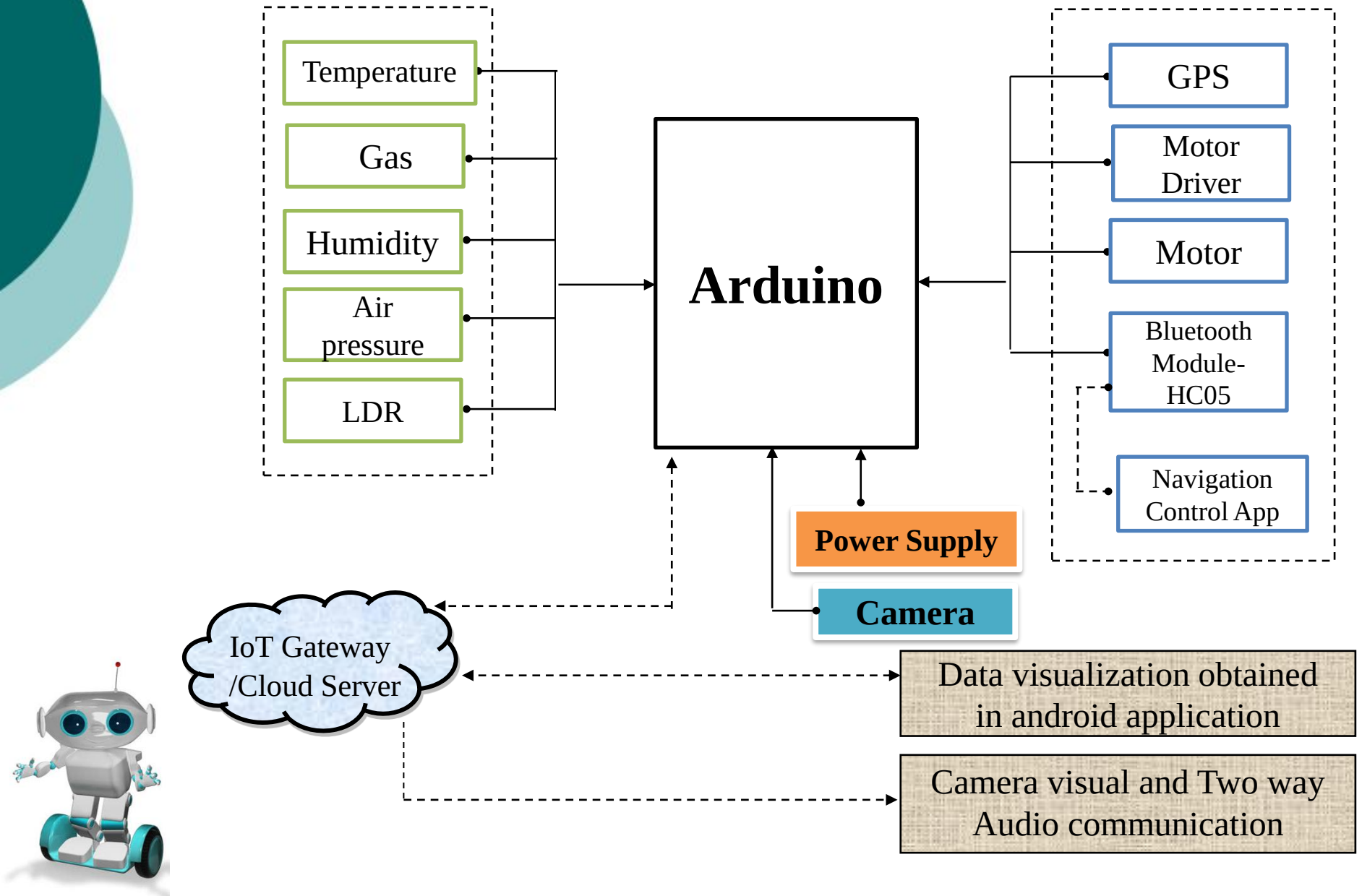
DRAWBACKS OF EXISTING SYSTEM

- System Design is more expensive to implement
- It takes more time to upgrade sensor data to IoT Server
- Two way Audio communication is not obtained
- Environmental visualization is not obtained
- To obtain the data special applications need to be developed

PROPOSED SYSTEM

- The Intuitive user interfaces in the App and Autonomous movement after getting instruction from the user
- It updates sensor data to IoT server in every 2 seconds
- Two way Audio communication and environmental visualization is captured through camera.
- The design of the system allows the user to obtain the satellite and map view of the location
- The system is cost-effective

PROPOSED SYSTEM ARCHITECTURE



ADVANTAGES OF PROPOSED SYSTEM

- The system is cost-effective
- The creation of prototypes is quick and efficient
- System work effectively in remote places to collect data
- Open source application helps in effective data transfer
- Controls risk and provide a real-time view of key metrics
- Provides scalability to monitoring system

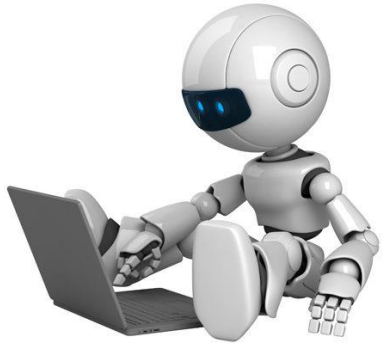
SYSTEM REQUIREMENTS

HARDWARE

- Arduino At mega
- Regulated Supply – 5V
- Bluetooth Module HC-05
- Filter Capacitor
- NodeMCU
- Sensors
- Motor driver
- DC Motors
- Mobile Phone
- Wireless IP camera

SOFTWARE

- Arduino IDE
- Open Source Blynk Application
- Arduino Bluetooth control
- V380 Pro



MODULES DESCRIPTION

Module 1 : Sensors

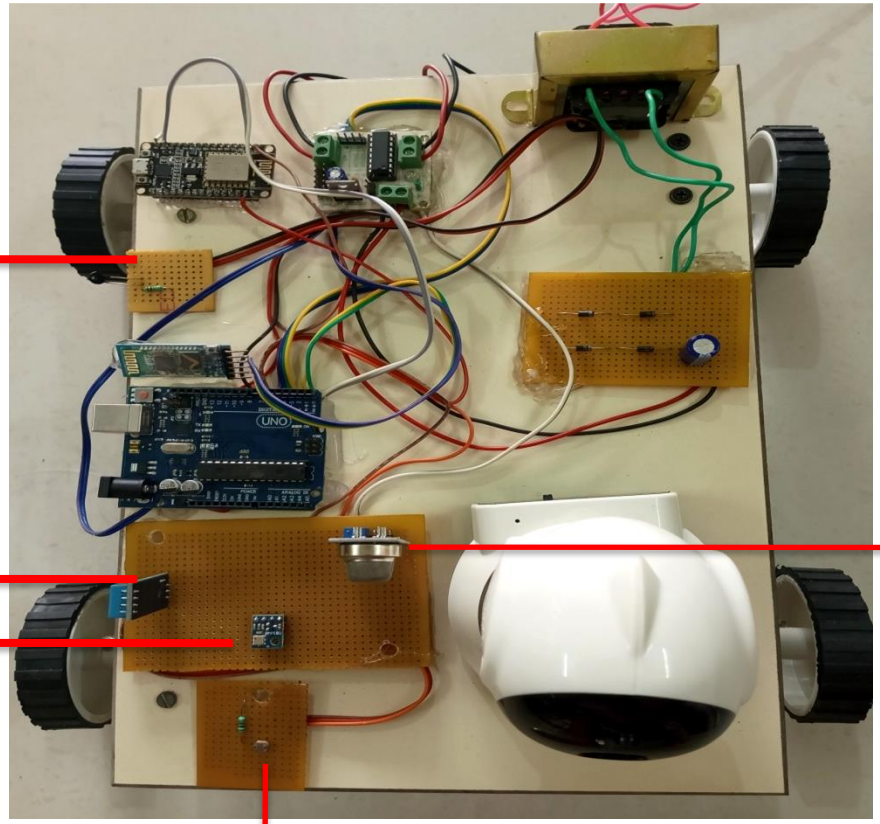
Sensors used to obtain data about the environmental condition through IoT platform are

1) Temperature Sensor - LM35
2) Gas Sensor - MQ-2
3) Photoresistor - LDR
4) Humidity Sensor - DHT11

5) Pressure sensor - DIGITAL AIR PRESSURE

MODULE DESCRIPTION

Developed prototype



Temperature sensor

Humidity Sensor

Pressure Sensor

Gas Sensor

LDR Sensor

MODULE DESCRIPTION

Module 2 : Navigation and Control Module

- **L293D Motor driver IC** is used to control the autonomous movement
- It allows DC motor to drive on either direction
- Dual H-bridge Motor Driver integrated circuit (IC)
- Two major sections in navigation and control
  - Controlling the robotic vehicle
  - Monitoring the system.

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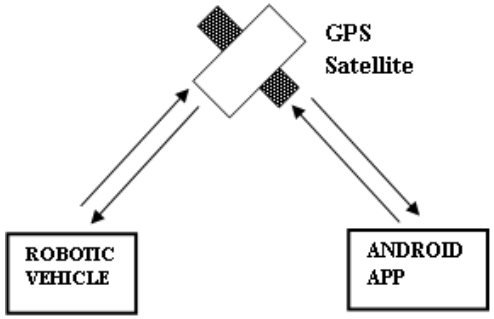
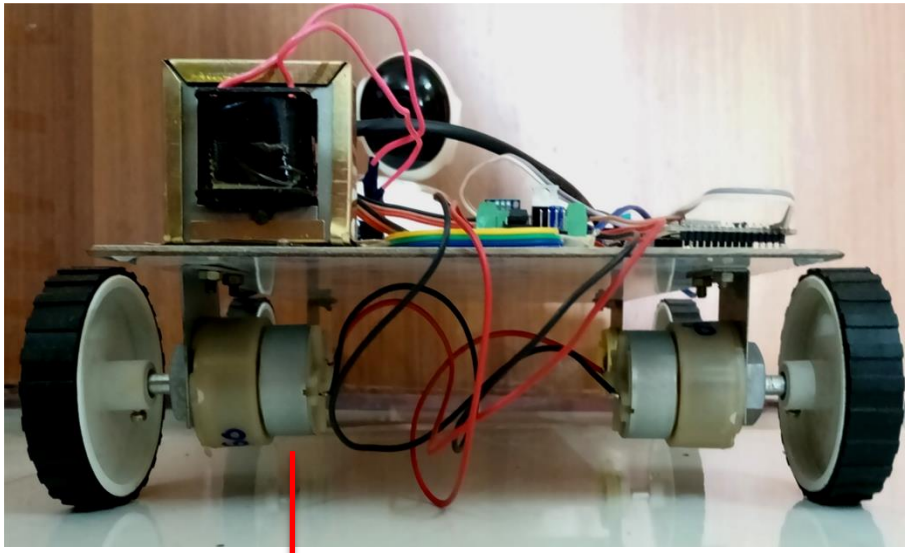
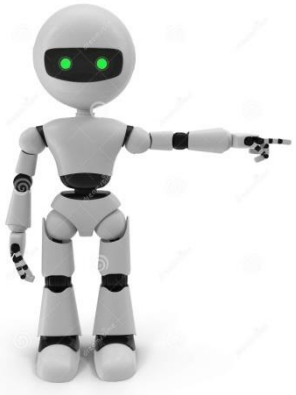
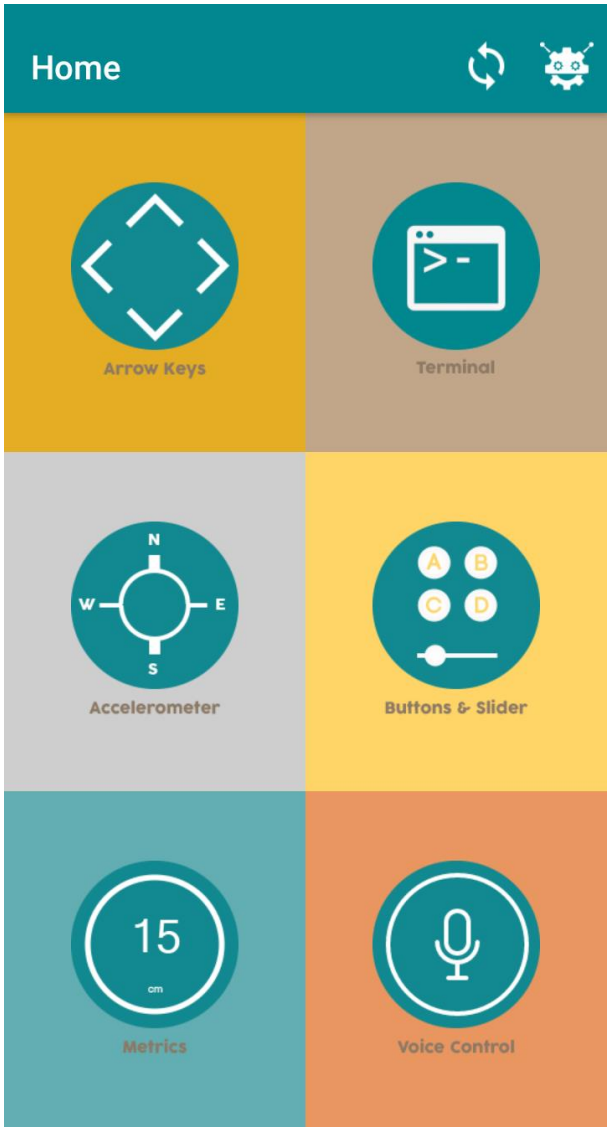


NAVIGATION MODULE

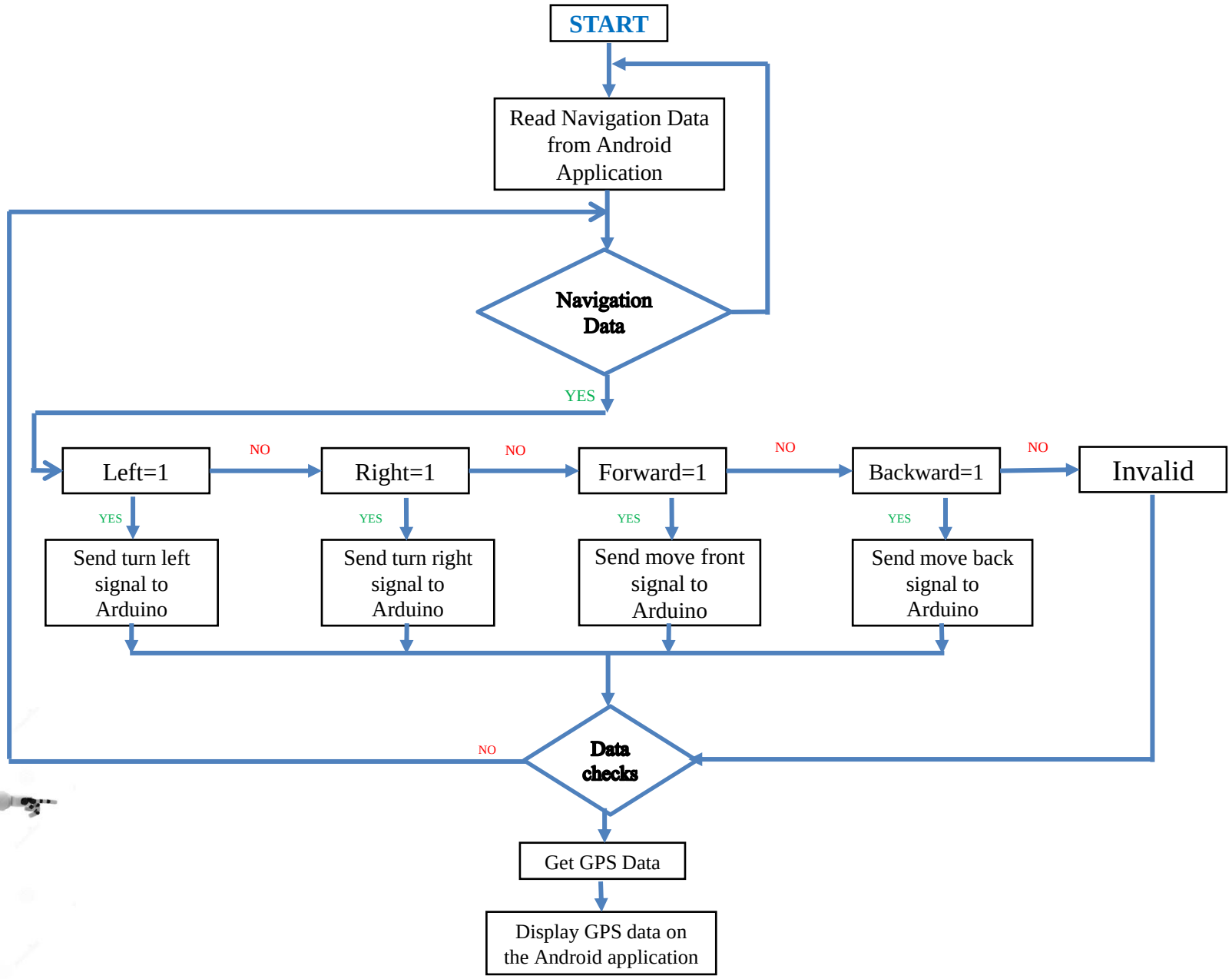


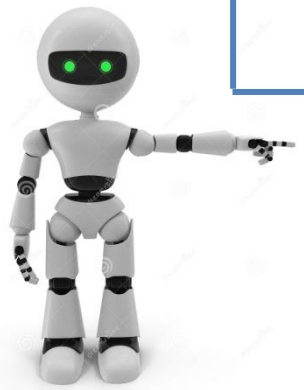
DC motor





NAVIGATION ARCHITECTURE

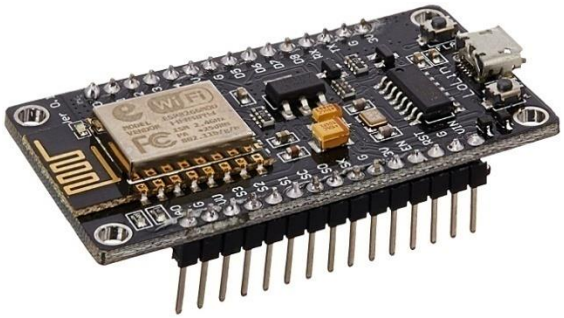




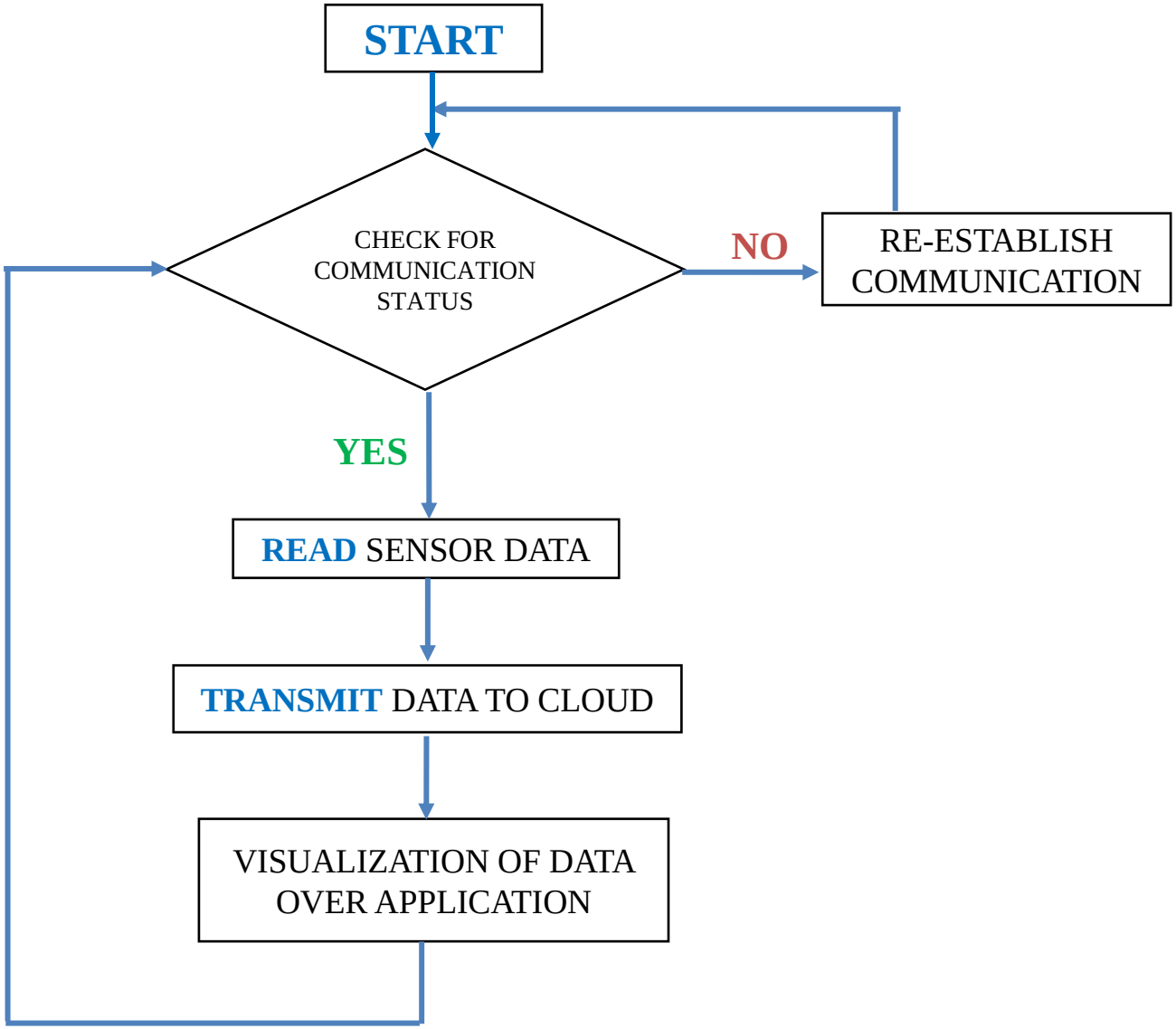
MODULE DESCRIPTION

Module 3 : Iot Gateway Module

- **NODE MCU** is use as a IoT gateway
- It serves as a connection point between cloud and controllers, Arduino
- **Sensor data** ,**Visualization** and **Two way audio communication** details obtained from robotic vehicle is transmitted to the app through IoT gateway
- **GPS** Location is obtained from IoT module



COMMUNICATION ARCHITECTURE



MODULE DESCRIPTION

Module 4 : Visualization Module

- Environmental visualization is obtained through smart camera system
- It is used to obtain Audio and Video Data
- Features
  - Wireless Connectivity
  - P2P Night Vision
  - Live broadcasting
  - Supports up to 64gb SD Card in recording
- **Two-way Audio** allow to hear and respond to voice

MODULE DESCRIPTION

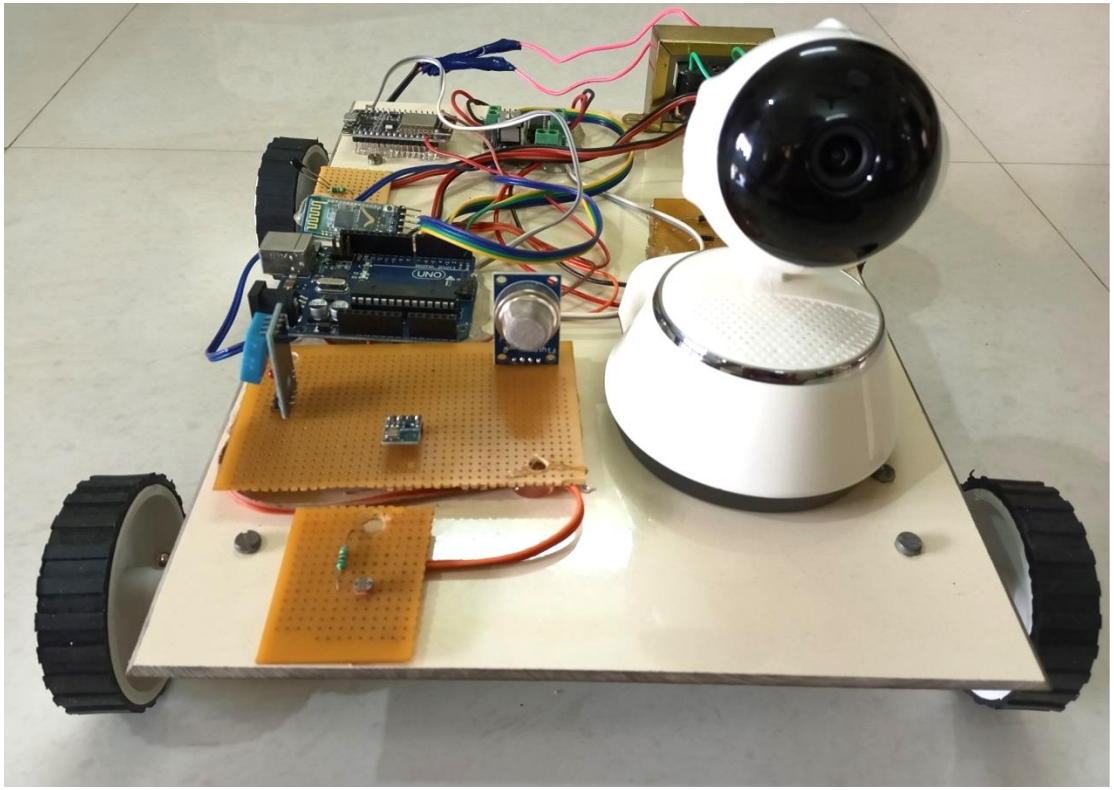
Prototype

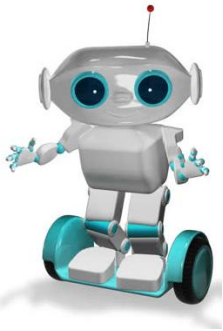
- Rotate up to **355** degree towards side
- **110** degree towards the upside angle
- **320** degree coverage

RESULT

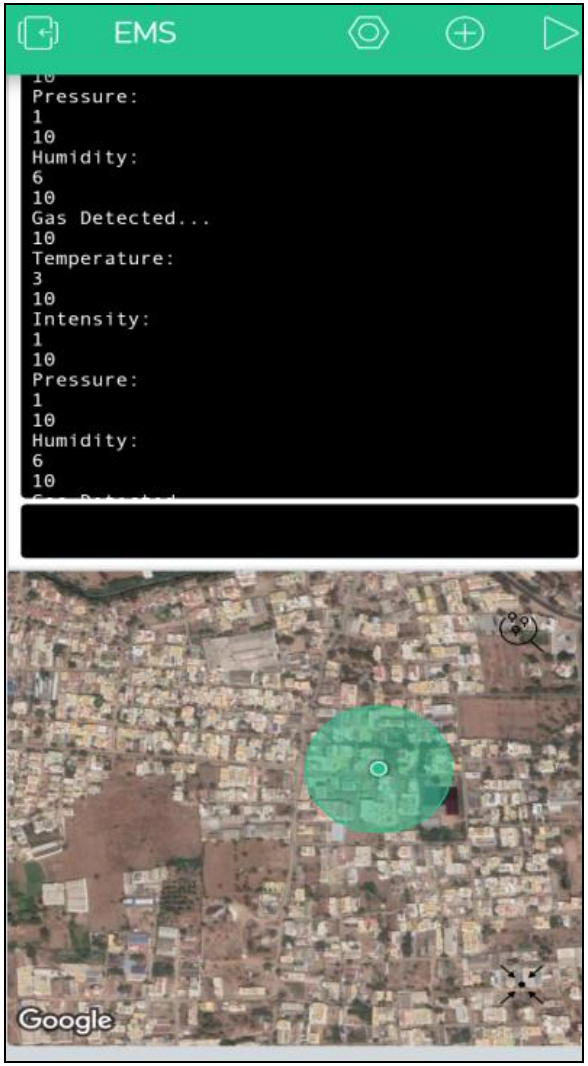
- Environmental conditions such as temperature, humidity, air quality, air pressure and light intensity are monitored
- Visualization and Two way audio communication is obtained
- Autonomous movement are performed after obtaining instruction
- The proposed system is cost-effective when compared to other existing methods .The cost is less than 70 USD

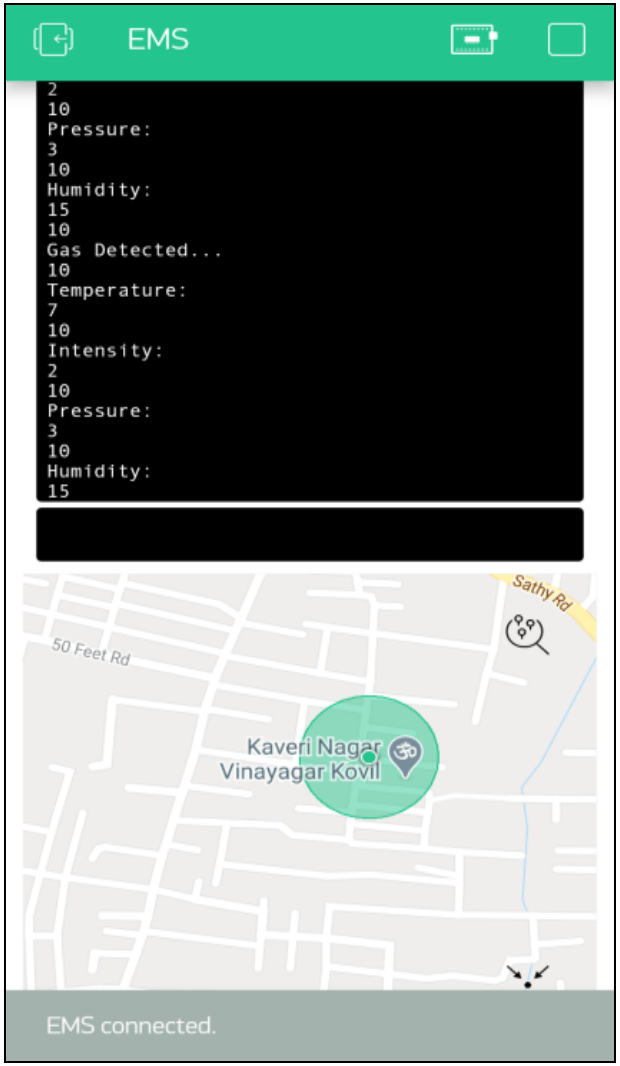
DEVELOPED PROTOTYPE

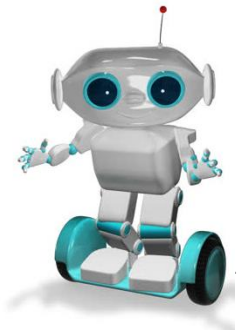




SCREENSHOTS







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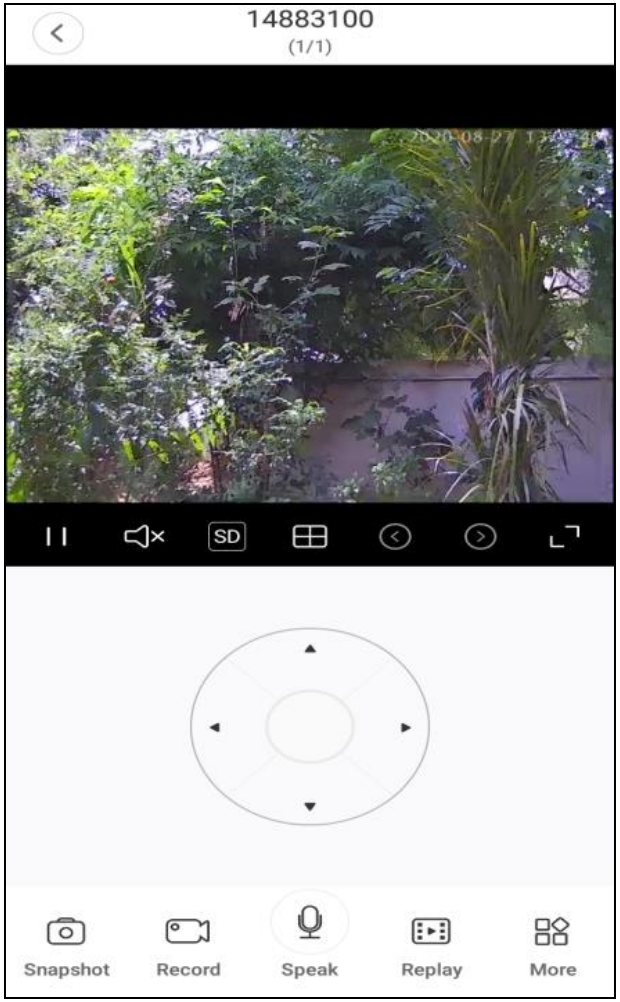

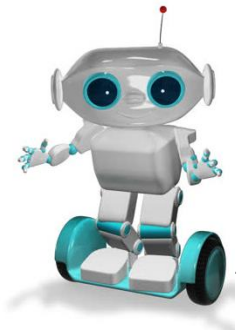

CONCLUSION

- The prototype can work effectively in remote places to collect data alone or in teams
- Secured data in IoT platform can be accessed from anywhere of the world
- System updates sensor data to IoT server in every 2 seconds
- Sampling of events can be done that are too dangerous for Human
- Communications can be established

FUTURE WORK

- The design method can also be applied in drone technology to make it even more dynamic
- Enhance the reliability and security in data transmission over the IoT communication platform
- Solar cell battery charging along with the power supply can be implemented in the design
- System control can be connected to satellite for better communication

REFERENCES

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- Mois, T. Sanislav and S. C. Folea, "**A Cyber-Physical System for Environmental Monitoring**," in IEEE Transactions on Instrumentation and Measurement, vol. 65, no. 6, pp. 1463-1471, June 2016

THANK YOU