



REMOTE SURVEILLANCE BOT

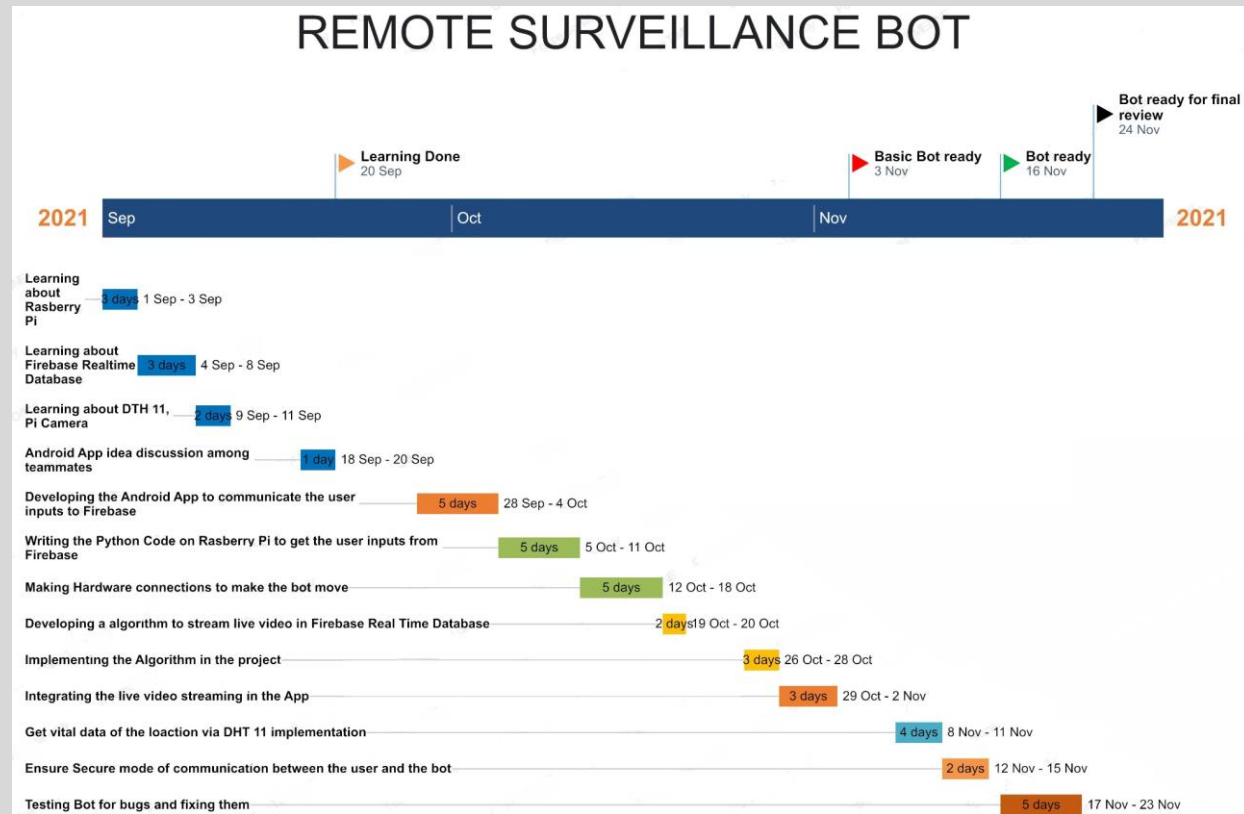
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Introduction

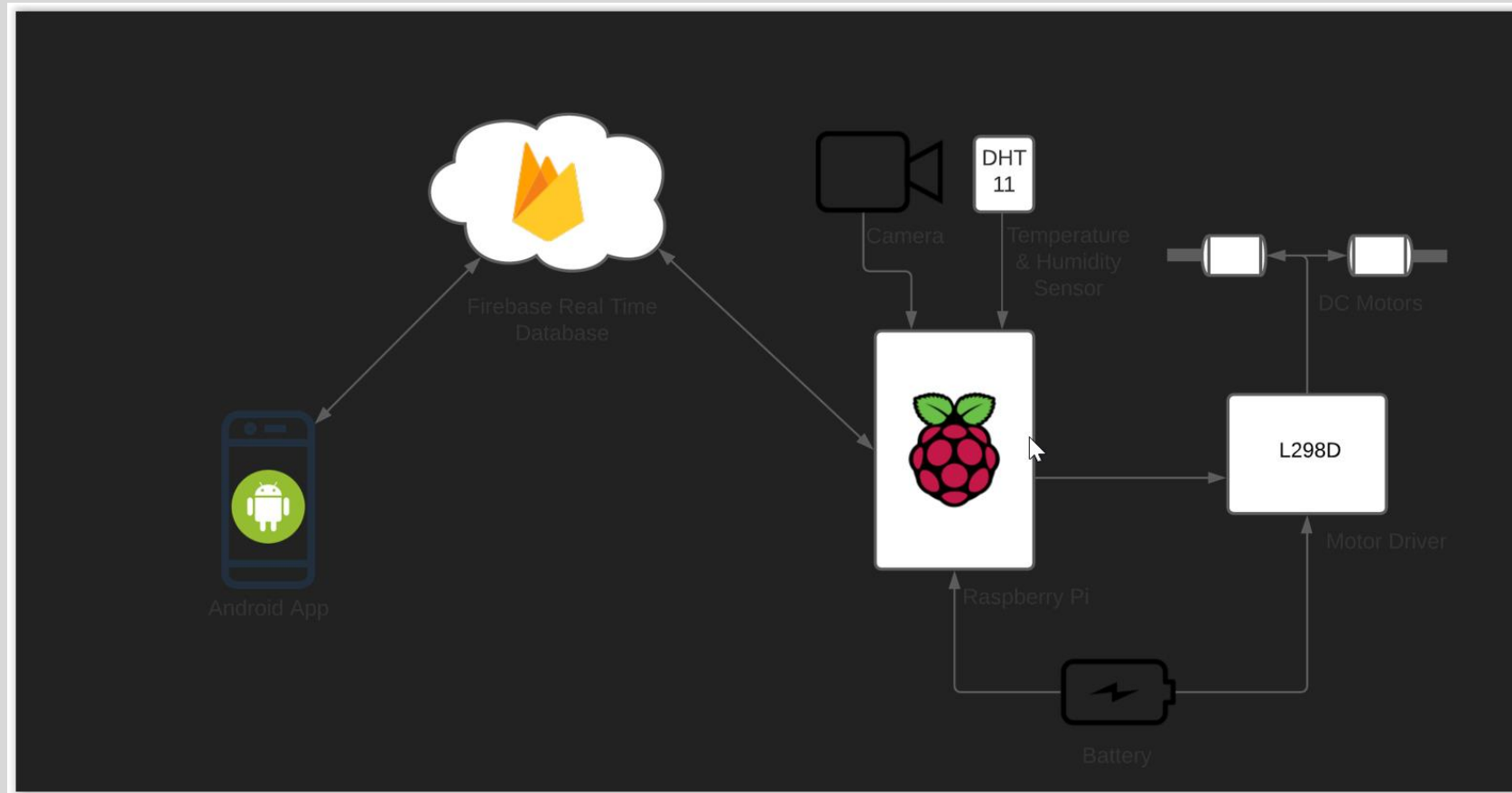
In modern world security is one of the largest priority of people. But every camera has its blind spots. Through this project of ours we plan to cover such blind spots along with providing users with the ability to better detect hostility. Through this project we also provide the ability to provide visual input to user in regions where the person can't reach manually. Also, our project could be used in both government civilian and private sector. This flexibility which is provided by this bot is the reason why we decided to make it.

- Live video in real time is the most difficult assignment in the field of surveillance, as it isn't much secure what's more, the data is extensively huge. However, Firebase, being a protected cloud stage, live video in real time utilizing its continuous data set hasn't been done at this point. We will be designing a mechanism for live video streaming through Firebase. A robot will additionally be created, which will be controlled with the assistance of an android application to transfer live video using the developed mechanism/ algorithm, consequently guaranteeing high security and low information use.

Gantt Chart



Block Diagram



Overview

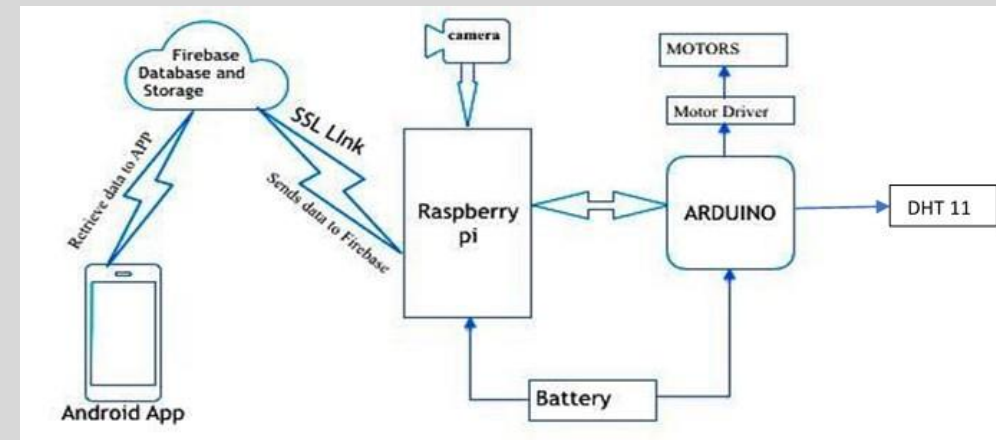
- The Raspberry Pi is being utilized as the core controller for the surveillance robot, and a USB camera is being used to capture video for live streaming. The Raspberry Pi was connected to the camera. Arduino uno was used to control the forward, backward, right, and left motions. The L293D motor driver was used to operate the motor from the Arduino. The Raspberry Pi sends control signals to the Arduino. The information is sent to Arduino via GPIO pins on the Raspberry Pi. The 1800mAh LiPO battery that powers the robot has a 5v output. The motor was powered by a 12v external battery. The key challenge in prior surveillance bots made with Raspberry Pi or Arduino was establishing a secure connection between the bot and the controlling system.

Overview

- This difficulty is solved by establishing a link between the bot and the controlling device in order to transfer control signals and video streaming using Firebase Real-Time Database. Google's Firebase is a safe and secure cloud platform. To operate the bot, we will use an app created in Android Studio. In Android Studio, we're building an app with the flutter SDK framework. We will develop the app to communicate with Firebase and deliver control signal information to the robot. In addition, the video data must be retrieved and stored in an app. On Firebase, secure user authentication is performed so that only the authorized person has access to the intelligence information and can control our bot.

Overview of Product

We will develop an android application using android studio that will be like the remote of the bot. We will give it joystick-like keys through which the bot can be controlled. The rotation/ movement of the keys will change the data (angle and magnitude) in the cloud storage, and through cloud functions, any change in the data will trigger a data transfer to the raspberry pi. The raspberry pi will process the data and accordingly send signals to arduino to move the bot via the motor drivers. The bot is fixed with some sensors like DHT11 and camera. The camera captures the surroundings and sends the data to raspberry pi. In the raspberry the data is processed using the algorithm mentioned below and is uploaded to the cloud. The temperature and humidity details from the DHT11 sensor is received by arduino and is sent to raspberry pi which is uploaded to the cloud from there. The android app receives the temperature details and humidity details of the terrain from the cloud and it is displayed to the user. The image is uploaded to the firebase's Realtime database in the form of a string of base64.



Hard Ware Requirement

- **Raspberry Pi**

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.

- **Arduino UNO**

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.

- **Raspberry Pi camera board**

The Camera Module can be used to take high-definition video, as well as stills photographs. ... It supports 1080p30, 720p60 and VGA90 video modes, as well as still capture. It attaches via a 15cm ribbon cable to the CSI port on the Raspberry Pi.

- **L298 Motor Driver Module**

It is a high voltage, high current dual full-bridge driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors.

Hard Ware Requirement

- **DHT11 Sensor**

The DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed).

- **Bot chasse**

Chassis is very essential in robots as well as many mechanical devices. Robot chassis is particularly designed for robots and other mechanical devices. These accessories handle PCB, components and parts that are interfaced and connected to it.

- **2 DC motors**

Simplest type of motors which work on direct current.

Software Requirement

Firebase Realtime database

Google's Firebase is a safe and secure cloud platform to store and host data. On Firebase, secure user authentication is performed so that only the authorized person has access to the data.

- **Android Studio**

Built on JetBrains' IntelliJ IDEA software and customized exclusively for Android development, Android Studio is the official integrated development environment for Google's Android operating system.

Algorithm to Live Stream by Firebase

- The camera captures the video of the surroundings and gives it to raspberry pi.
- Raspberry pi, using OpenCV library takes frames of those videos and converts them to text format
- The text format used is the base 64 string format. The string is then uploaded to the Realtime database.
- The android app fetches the base 64 string from the Realtime database and converts it into image format.
- The image along with the analysis is then displayed into an image viewer in the android app.
- By frequently repeating this process (1-6) we will give the illusion of live video display to the user operating the bot.

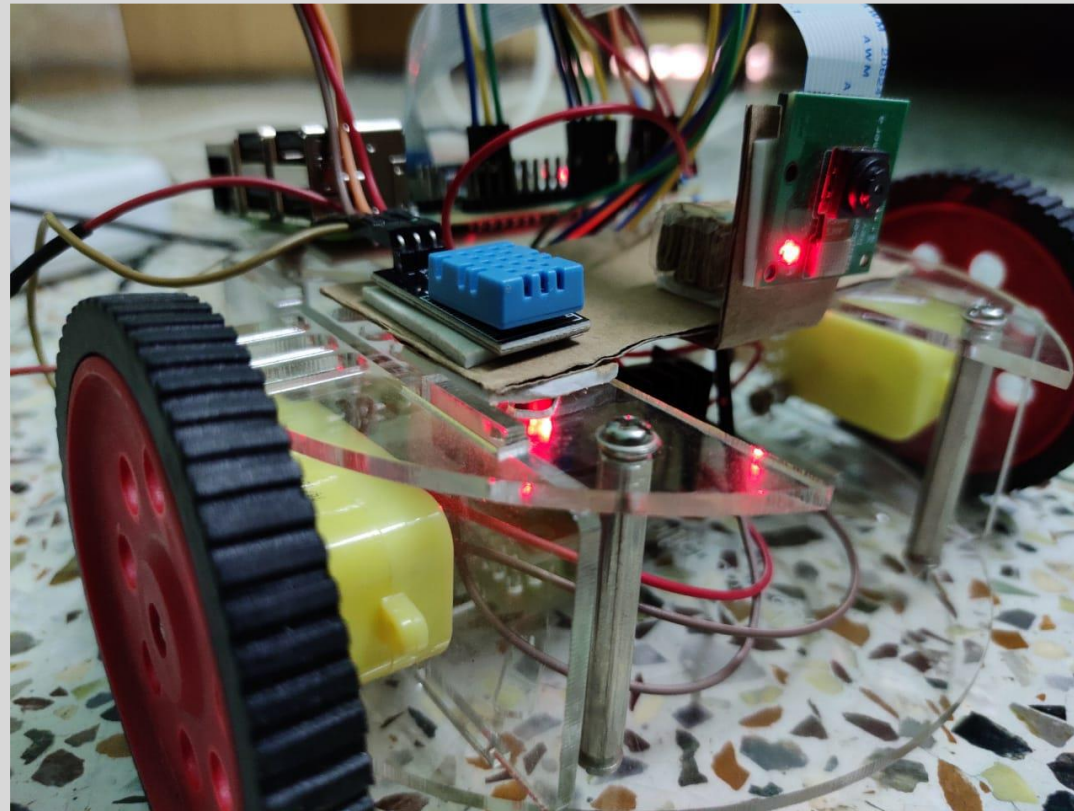
Algorithm to Control Bot

- Input the position of the joystick from the android app.
- Upload the positional value of the joystick if the position changes into the Realtime database of Firebase.
- The data is triggered via a cloud function whenever it gets changed to the raspberry pi. Raspberry Pi receives the data from the cloud and accordingly sends instructions to the arduino to operate the dc motors via the motor driver.
- In exactly the same way the DHT 11 sensor sends back temperature and humidity data to the android app via the cloud platform.

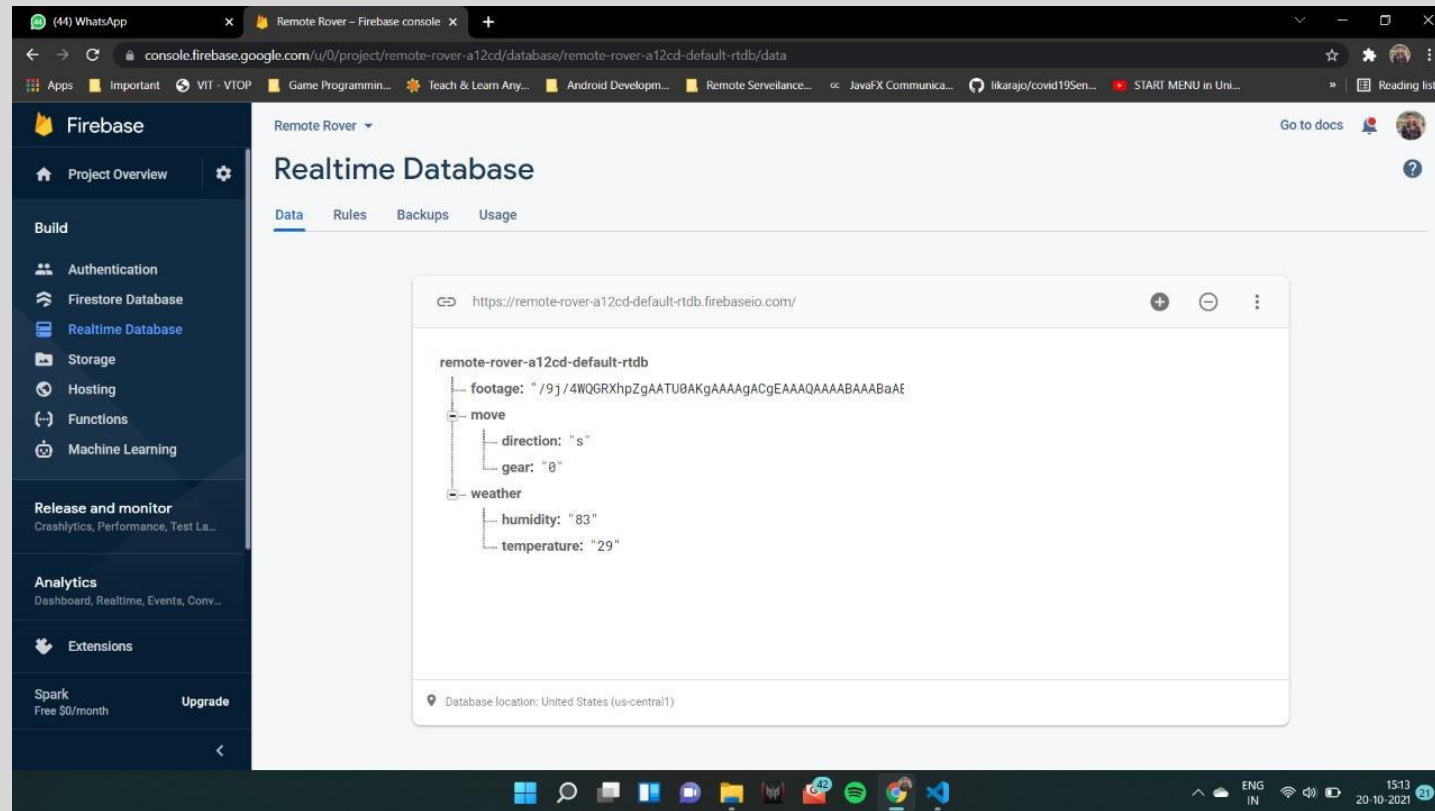
About App

The app will be developed in android studio. It will have a very user-friendly interface and simplistic design. It will have two joystick buttons to control the bot. And a screen in the middle to show the live video from the environment. The panel will also give the details of the temperature and humidity. If some human faces are detected in the video, it will also alert the user with its UI, as it will prove to be an important feature in rescue, spying and explorations operations.

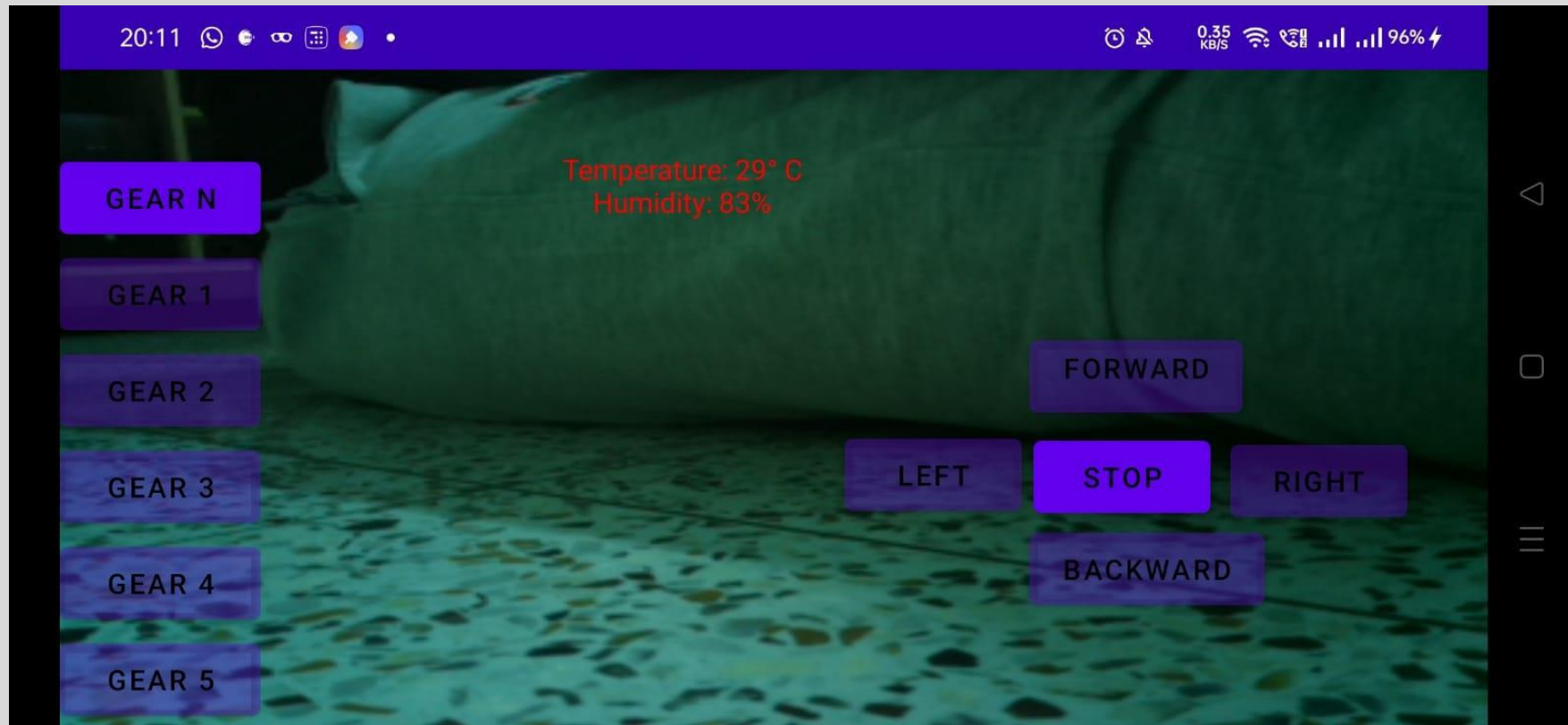
Picture of our Bot



Real-time Database of the Firebase.

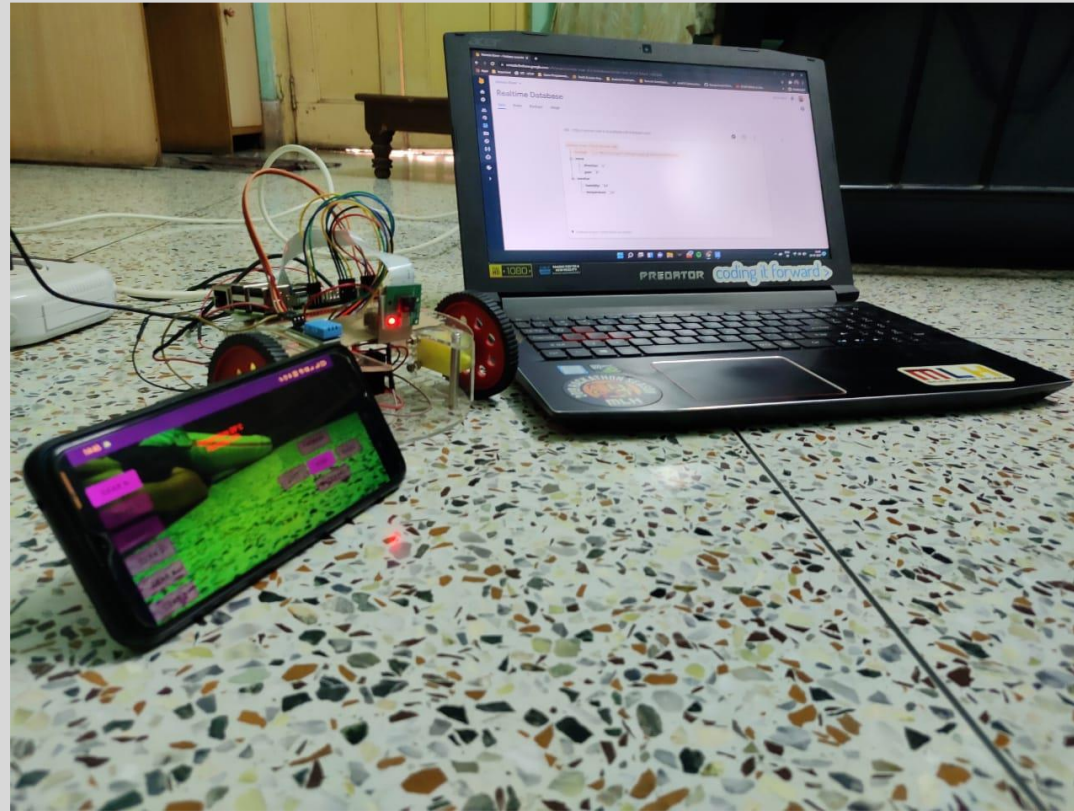


Screenshot of Android App



- Video Demonstration of our Remote Surveillance Bot:

Final Picture of all Components



Conclusion

- The final objective of our project is to create a fully functional product, i.e., a movable can move thus can cover all the areas in contrast to CCTVs remote surveillance bot with a tiny Camera mounted on it. This can be used for numerous tasks, varying from spying, reconnaissance, information gathering, terrain exploration, border patrolling, etc. To eliminate the range problem of modern-day bots we will be controlling the bot over the internet. The bot can thus cover all the areas in contrast to CCTVs. This bot will be operated on the Wi-Fi network, thereby giving it, a much greater mobility of range and it can be controlled from anywhere as long as they are communicating on the same network, which is a great convenience. This bot does not require radio signals or Bluetooth signals, hence there is no range limit as is the case for the majority of the products in the market. The bot has a camera that will give us the live stream of the location. This bot can be useful for home security. This bot can even be deployed in army and can be operated in any territory where internet is available. This will be a low-cost bot as all the components used, are extremely cheap and easily available, thereby adding considerable value to the product



THANK YOU