IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Ride Along Application

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Abstract

The high demand for transportation has increased traffic danger and road accidents. The surge in the volume of traffic on the road has also led to an increase in road accidents, which is much unsafe for two-wheelers. Around 57% of people refuse to wear helmets. Thus, leading to the cause of two-wheelers being the most unsafe mode of road transport. Wearing an appropriate helmet improves riders' chance of surviving an accident by 42% and helps avoid up to 69% of the injuries to the rider.

To solve the above-mentioned problem, we came with an innovative idea to make sure people wear helmets. Also, it reduces fatalities and road accidents, and loss of precious lives. To make it more attractive and also to help the local stores, we propose to provide offers and discount coupons to people who use the App called "RIDE ALONG". The design includes a Helmet embedded with a proximity sensor on top of the helmet connected to Bluetooth via an Arduino Nano, which helps the proximity sensor stream the data to the mobile application. The mobile application, i.e. 'RIDE ALONG ' collects the data via Bluetooth and using GPS in the mobile, calculates the distance traveled and thus rewarding the user, based on kilometers

Introduction

Our project focuses on the perennially important theme of 'Road Safety'. As noted earlier, with the increase in revenues, the number of two-wheelers have also increased. But this has also given rise to a violation of rules like not wearing a helmet while riding. Also, many times, violators are pulled across for not wearing helmets that results in an unnecessary fine, penalties, and also a waste of time. The forever worrying concern is that a lot of people are not wearing helmets is and many of them meeting with an accident that results in severe injuries, disabilities, and sometimes even death of the rider. Our project aims to solve all these limitations through a meticulous combination of a mobile app and a hardware-connected helmet. With the usage of components like Bluetooth, sensors connected to an app, the above limitations can be achieved. The system consists of a proximity sensor, Bluetooth, an Arduino board mounted on a helmet. The components will be connected through an app that can be monitored by both the user and admin.

Another important perk of using the app is being rewarded for wearing a helmet! For every kilometer of a ride, a coin will be credited to the user's account. After the end of the ride, certain coins are credited towards the ride taken in the user's account. When the required number of coins is collected, the rewards or offers can be redeemed across various stores listed in the app. The intended users of the app can be self-drive rental companies, delivery personnel, parents monitoring their children's rides. The rewards section mainly focuses on small businesses that are scarcely known or do not have the resources to advertise their product. This is a meager attempt to help them grow and attain recognition for their businesses.

Literature Survey

1. According to the research paper in 2015 titled "Microcontroller based smart ware for driver's safety", the author has discussed an earlobe sensor that uses an infrared sensor to detect whether the rider is wearing a helmet. Using this principle, we developed a system that has a proximity sensor on the top, inside the helmet. This sensor is connected to an Arduino Nano and also connected to a Bluetooth transmitter. This system gets the information from the sensor and transmits the data to the connected mobile. The Arduino code contains a loop that streams the data of the sensor which states the condition of the helmet i.e., whether it is being worn or not.

2. In a study from a paper published in the year 2020 with the title "Intelligent smart helmet system: A Review", the author embeds a GPS tracking system inside the helmet to check if the rider is riding at an appropriate speed. In our system, we decided to use the GPS from the user's mobile. To get the precise distance traveled by the user and reward them we get the location on a very small interval and add the location points received.

3. According to a study published in the year 2017 titled, "Security flows in OAuth 2.0 framework: A Case Study", the author mentions the difficulty of maintaining the identity of the users which can be solved using Single Sign On (SSO). To maintain and manage the number of users and their data we have implemented SSO and Phone number authentication which helps analyze data based on the number of users and gives better security and it is easy to maintain.

4. For the database according to a research published in 2012 titled "SQL and NoSQL Databases", the author mentions NoSQL Databases are distributed, non-relational, and horizontally scalable. NoSQL Databases do not follow the properties of SQL Databases like ACID. Hence, are easy to maintain and organize. The database used in our App is not SQL-based and the data is stored in a JSON format.

5. According to the study titled "Reengineering the use: Privacy concerns about personal data on smartphones", the author strongly feels, tracking the location is a privacy violation. In order to protect the user's integrity even while tracking the location, we ask for permission to access the user location and will be tracking the location only when the user starts the ride. To achieve this, we have introduced a button, which on clicking starts the location tracking, and the same is used to terminate the location tracking. By this, the user will know when the location is being tracked and thus, the privacy is not violated.

6. From a study titled, "Application of Firebase in Android App Development-A Study". The author has mentioned various services provided by Firebase and how easily they can be implemented. Using Firebase authentication, we authenticate every user based on email or Google SSO, so that we can have an idea of the number of users using the application. Using the Firebase storage, we store all the images provided by the user as a profile picture and also pictures provided by the local stores. To get the images to the application from the server, we use the updated plugins provided by Google Firebase, so as to keep the application secure and updated.

7. According to the study titled "A Study on the impact of rewards and recognition on employee motivation", the author believes that rewarding is the best way to motivate a person to do things. In this case, to ensure people's safety, we are rewarding people when they wear a helmet. In order to reward people and advertise the local vendors, we provide an option where the local vendors can put various offers to attract customers and to make sure they wear helmets, we set a target to unlock each offer. These targets are points that can be obtained by wearing a helmet while riding on a bike.

8. From research titled "User Interface and user experience (UI/UX) design", the author suggests how the interface of an application should be simple and the fundamental elements or features should be easily accessible. Implementing this and to attract users we come up with a simple design that is easily understandable and can be used by any layman. To also keep the application customizable, users can change their profile picture.

Architecture and Design Details

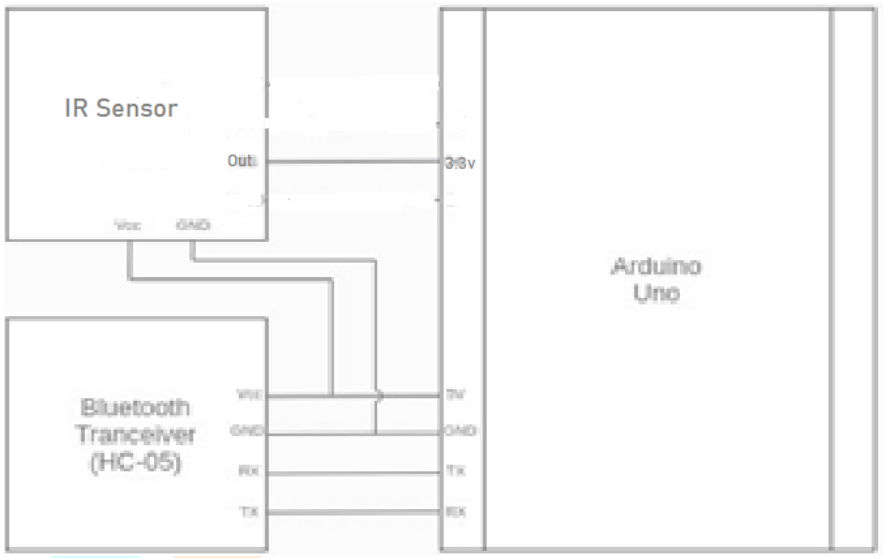


Figure 1

Ride Along consists of two modules-hardware module consists of a smart helmet and a software module consists of an application. The front end of the application was designed on Figma and built on Flutter and Android Studio. The back end of the application is controlled by Google's Firebase. It controls user authentication and other services like real-time database and cloud functions of the application.

To build the hardware component, the IR sensor is connected to Arduino. The signal of the sensor is connected to Pin A0, VCC is connected to 5V, and GND of the sensor is connected to the GND of the Arduino. Next, the Bluetooth module is connected to Arduino. TX of the Bluetooth module is connected to RX of Arduino, RX of the Bluetooth is connected to TX of Arduino, VCC of Bluetooth is connected to 3.3V of Arduino, and GND of Bluetooth is connected to GND of Arduino. Arduino is connected to the PC and the program is loaded onto it using the Arduino IDE.

To start the ride, the user will need to connect the hardware component to the app through Bluetooth. Once the connection is established, the user can start the ride. The haversine formula is used to calculate the distance travelled by the user, given the latitude and longitude. Vouchers are rewarded to the users based on the amount of distance they have travelled.

Bluetooth HC-05: Here we have used serial Bluetooth module for Arduino and other microcontrollers. It has an operating voltage between 4V to 6V and requires operating current of 30mA. It has a range of less than 100m and is TTL compatible. It uses Frequency-Hopping Spread Spectrum (FHSS) and can operate in Master, Slave or Master/Slave modes. It can be easily interfaced with laptops or mobile phones with Bluetooth.

IR Sensor HW-201: The IR Sensor used here requires a 5VDC operating voltage. It has a range of up to 20cm and has adjustable sensing rage. It comes with built-in ambient light sensor and also has a mounting hole. It requires a current supply of 20mA.

Arduino Uno: The microcontroller used here is ATmega328P with an operating voltage of 5V. The limit of the input voltage is 6-20V. It consists of 14 Digital I/O pins, 6 PWM Digital I/O pins, and 6 Analog Input pins. It has a flash memory of 32KB out of which 0.5KB is used by bootloader. It has a clock speed of 16MHz.

Module details

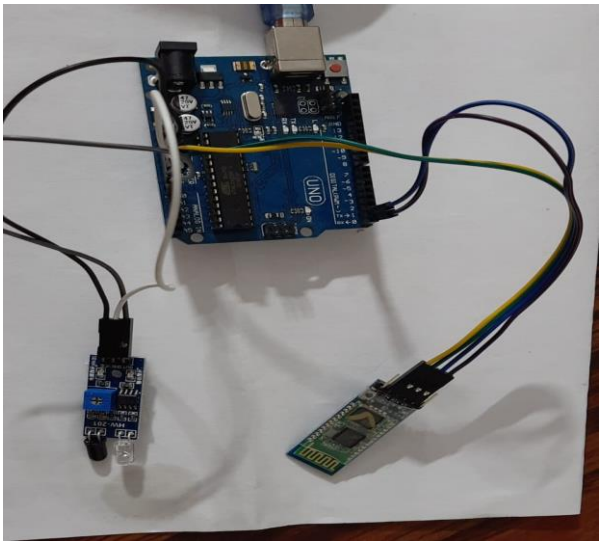


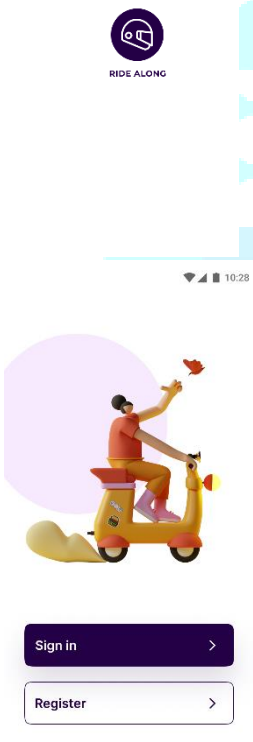
Figure 2

IR Sensor:
It is an electronic device that measures and detects infrared radiation in its surrounding environment.

Bluetooth-Transceiver:
HC-05 Bluetooth transmitter is simple to use Bluetooth Serial Port Protocol(SPP),this Bluetooth is made for transparency of wireless serial connection setup which makes an easy way to interact with controller or PC.

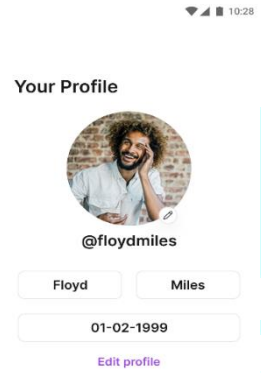
Experimental Result

This is the landing page of the **RIDE ALONG** Application once the application is installed in a device.

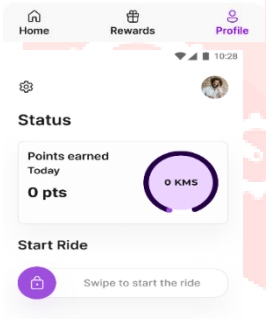


The user gets this page after opening the application , if you are registering for the first time you need to click on the register and it will get you to fill in some details or you can even register via your google , phone number or email account.
If you have previously registered then you click on the sign in page and enter your account page.

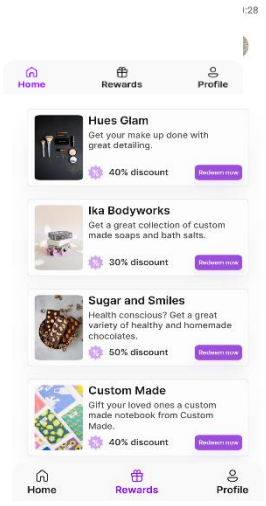
The next step is to connect your application to the helmet and this is done through Bluetooth, this is where the hardware and the software component integrate.
The hardware component has HC 05 Bluetooth. This establishes the connection between the helmet and the application and it will always ensure that the passenger is wearing the helmet throughout.
We also have an IR sensor which will ensure the passenger is wearing the helmet at all times.



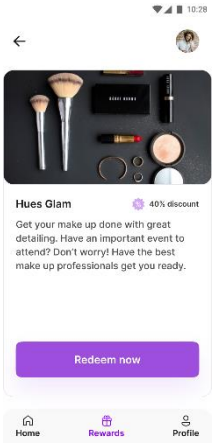
This is how the profile page looks once signed in.



Once your Bluetooth is connected the Application starts to tract your location and once you start your ride it starts calculating the distance travelled from point A to point B.



From the points acquired you can redeem the rewards of your choice. This is a small initiative to promote small businesses and a strategy to make the passenger wear the helmet at all times.



After clicking on the desired offer now you can click on redeem now to redeem the offer. Apart from there are other features where you ca log your previous rides.

Conclusion

This project is a small initiative to avoid road accidents which is due to passengers not wearing helmets. We want people to wear helmets consistently, to make this work we are introducing a strategy of giving some credits for the people who wear helmets every time they ride. It not only ensures that you have a safe ride, it also avoids penalties or getting pulled over by cops and helps local vendors to grow their business.

The outcome from this project is:

- Driver's safety should be ensured
- Distance travelled is monitored
- Rewards earned on covering certain distances.
- Preventing theft of helmet.
- Encouraging use of public transport.

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