Location based Dynamic Toll Tax Collection System

An Engineering Project in Community Service

Review – II Report

Submitted by

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in partial fulfillment of the requirements for the degree of

Bachelor of Engineering and Technology

VIT Bhopal University Bhopal
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Bonafide Certificate

Certified that this project report titled **"Location based Dynamic Toll Tax Collection System"** is the bonafide work of " 20MIM10077 ABISHEK AM, 20BCE10471 SURESH MAHALINGAM ,20BCG10091 VIKRAM, 20BME10038 ABISHEK A , 20BCY10129 NIRANJAN SURYA PRASAD R P , 20BAI10237 PRATHISH J S , 20BAS10081 UGESH C , 20BAI10192 ANFINSEN JOSEPH **"** who carried out the project work under my supervision.

This project report is submitted for the Review - II held on 13.03.2023

Supervisor

1.Introduction

Transportation has emerged as a dominant part of India. Toll plazas play a crucial role in maintaining road transportation. At present, manual toll collection is the most widely used collection method in India. It significantly requires a toll collector or attendant. Due to manual intervention, the processing time at toll plazas is highest. The project has been designed for the automation of toll tax payments using GPS Technology. Automation of toll plaza has been experimented using combination of Microcontroller, RFID, Global positioning system, Global system for Mobile. Implementation of automation in toll plaza enhances the monitoring of vehicles that are traveling in predestined routes. This project aims in designing a system, which automatically identifies the vehicle that advance towards the Starting point of the highway and initiates the system to process the distance traveled through the highway . If a vehicle diverts from the highway rather using the full stretch of highway the GPS module will initiate a end point on the system where the vehicle diverts from the highway and then predetermined amount is automatically taken from the user account Here the GPS based highway toll collection system will acquire GPS coordinates constantly to pinpoint the position of traveling vehicles.

Objective →

1) To introduce GPS technology for the toll collection system. by installing a physical OBU (On Board Unit) in the vehicle .

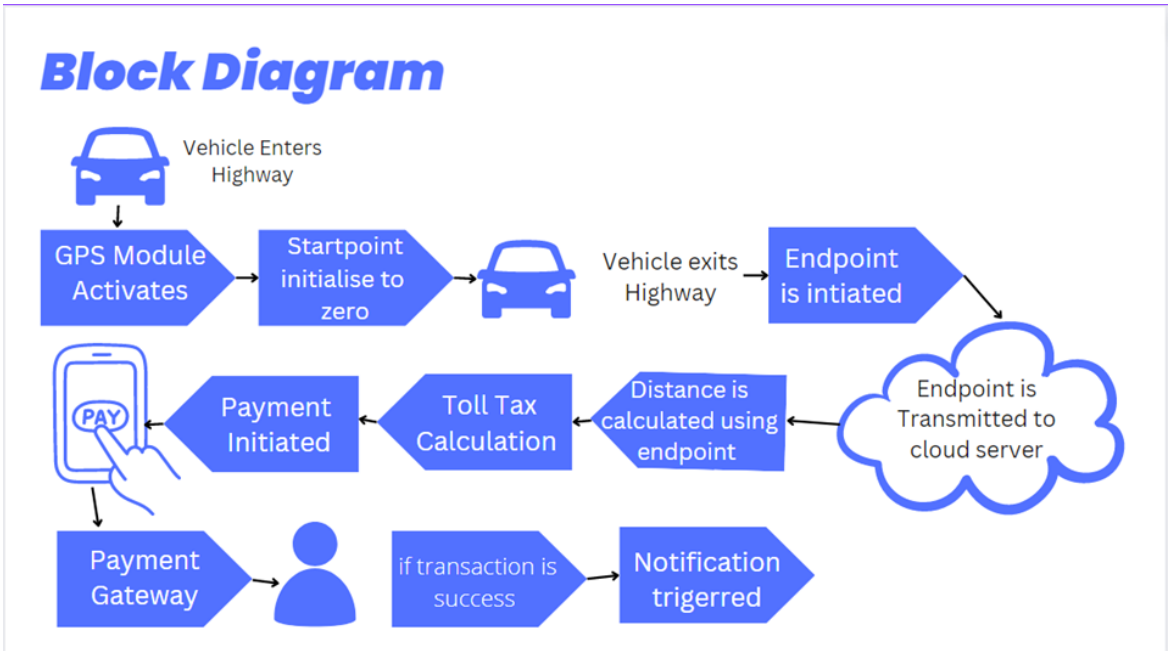
2) On the basis of the GPS data collected from OBU of the vehicle , precise toll fee for the distance traveled on the highway will be calculated and automatically the toll fee will be collected from Users linked account.

By implementing a GPS based toll system , the need for Physical toll plaza would be eliminated . thus , resulting in a reduction of traffic congestion near the toll plaza . Since the entire toll tax collection will happen automatically , hassle free experience can be delivered to the vehicle drivers on the road.

2.Working Principle / Block Diagram

Dynamic toll collection refers to a system of toll collection that adjusts the toll price based on the current demand for the road. This is done in order to reduce congestion and improve the flow of traffic on the road.

Dynamic toll collection systems can help reduce congestion and improve the flow of traffic by encouraging drivers to use the road at non-peak times or to carpool. They can also help generate revenue for the road operator, which can be used to maintain and improve the road.



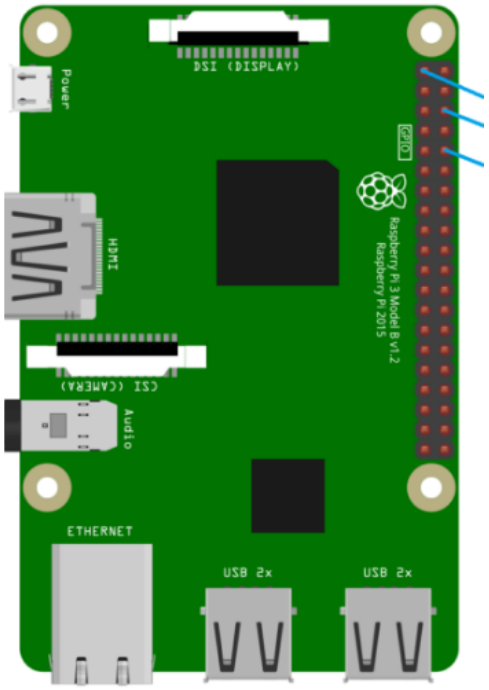
3.Teammates and work division

Suresh Mahlingam Konar (20BCE10471)

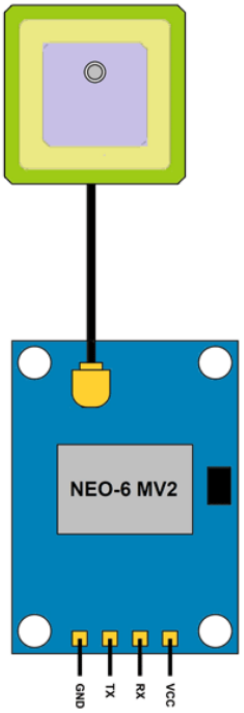
Pratish J S (20BAI10237)

Our responsibility in this project is to setup (OBU) on board unit which would be placed in the car for gps data collection and for cloud integration; We were responsible to manage the required hardware resources , setup Raspberry Pi 3b+ model and interfacing it with Neo-6M gps module .

Raspberry Pi 3b+ model



Neo-6M gps module



We have tried interfacing the GPS module with Raspberry Pi and will extract GPS information. We have interfaced the GPS module to Raspberry Pi using Python .We have extracted Latitude, Longitude, and time information from the NMEA GPGGA string received from the GPS module using Python. And then send the longitude and latitude data to cloud server for distance and toll tax calculation process.

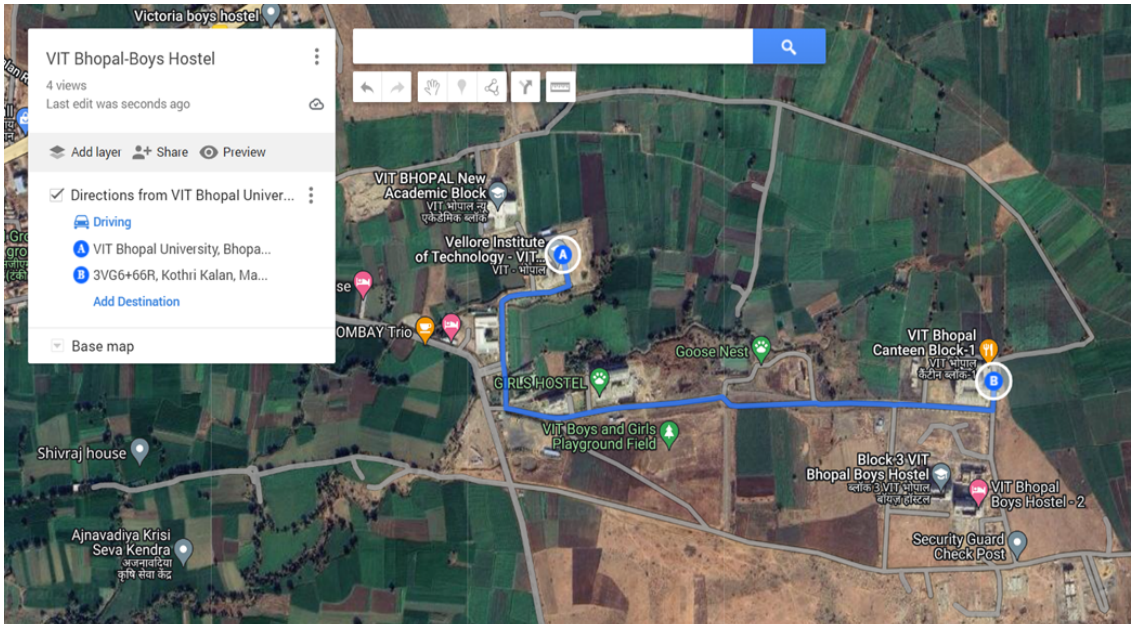
Niranjan Surya Prasad R P (20BCY10129)

Abishek A.M (20MIM10077)

Our responsibility in this project is to build a dataset containing the coordinates (latitude and longitude) of a predetermined path. We are also responsible for managing our project in the AWS cloud where we maintain our user's database and set up an instance to execute our program which determines the amount of toll tax the user has to pay.

In this review 2, We have completed our former part, which is to create a dataset of Coordinates for a defined path. For the testing phase, we have taken the defined path as the route from **VIT Bhopal Academic Block to VIT Bhopal Hostel - 1.** For this, we have used Google My Maps to visualize the path and exported the entire route in **.kml** file format. Further to take out only the coordinates of the entire route as Latitude and Longitude we convert the **.kml (Keyhole Markup Language) to .csv (Comma-Separated Values)** using an Online converter. We also got the Coordinates of the endpoints separately.

Google My Maps (Route Visualization):



VIT Bhopal Academic Block to VIT Bhopal Hostel - 1

	A	B	C	D	E	F
1	Latitude	Longitude				
2	23.0758	76.8605	VIT - Boys Hostel - 1			
3	23.0775	76.8515	VIT - Bhopal Bhopal Madhya Pradesh			
4	23.0758	76.8605				
5	23.0758	76.8605				
6	23.0758	76.8602				
7	23.0758	76.86				
8	23.0758	76.8599				
9	23.0758	76.8597				
10	23.0758	76.8596				
11	23.0758	76.8595				
12	23.0757	76.8594				
13	23.0757	76.8594				
14	23.0757	76.8593				
15	23.0756	76.8593				
16	23.0756	76.8592				
17	23.0756	76.8592				
18	23.0755	76.8592				
19	23.0755	76.8592				
20	23.0754	76.8592				
21	23.0753	76.8592				
22	23.0752	76.8591				
23	23.0749	76.8591				
24	23.0749	76.859				
25	23.0749	76.8587				
26	23.0749	76.8586				
27	23.0749	76.8586				
28	23.0749	76.8585				
29	23.0749	76.8584				
30	23.075	76.8575				
31	23.0749	76.857				
32	23.0749	76.8569				
33	23.0749	76.8569				
34	23.075	76.8568				
35	23.0749	76.8552				
36	23.0749	76.855				
37	23.0751	76.8548				
38	23.0751	76.8548				
39	23.075	76.8546				

	A	B	C
40	23.075	76.8538	
41	23.0749	76.8534	
42	23.0749	76.8531	
43	23.0749	76.8529	
44	23.0749	76.8527	
45	23.0749	76.8525	
46	23.0748	76.8524	
47	23.0748	76.8521	
48	23.0748	76.852	
49	23.0747	76.8516	
50	23.0747	76.8516	
51	23.0747	76.8514	
52	23.0747	76.8512	
53	23.0747	76.8512	
54	23.0747	76.851	
55	23.0747	76.8509	
56	23.0748	76.8507	
57	23.0748	76.8506	
58	23.0748	76.8503	
59	23.0749	76.8502	
60	23.075	76.8502	
61	23.0752	76.8502	
62	23.0753	76.8502	
63	23.0756	76.8501	
64	23.0757	76.8501	
65	23.0757	76.8501	
66	23.0766	76.8501	
67	23.0767	76.8501	
68	23.0768	76.8501	
69	23.0768	76.8501	
70	23.0769	76.8501	
71	23.0769	76.8501	
72	23.0769	76.8501	
73	23.0769	76.8501	
74	23.0769	76.8502	
75	23.077	76.8503	
76	23.077	76.8504	
77	23.077	76.8505	
78	23.077	76.8508	
79	23.077	76.8508	
80	23.077	76.8509	
81	23.077	76.851	
82	23.077	76.8511	
83	23.0771	76.8513	
84	23.0771	76.8514	
85	23.0772	76.8515	
86	23.0775	76.8515	

The above images shows the coordinates of the predetermined path stored in a dataset.

Anfinsen Joseph (20BAI10192)

My responsibility in this project was to choose a payment method for payment integration.We have chosen three of the various payment options for comparison. These include RazerPay API, Paytm API, Google API.All three payment gateway solutions, Razorpay API, Paytm API and Google Pay API, can be used in our projects. However, the best option for our project will depend on specific requirements, such as ease of integration, transaction fees, security features, and user experience.

	Razer Pay API	Paytm API	Google API
Features	The Razorpay API is known for its easy integration with any platform. It offers clear documentation, client libraries, and SDKs for various programming languages to help developers integrate it seamlessly.	The Paytm API is also easy to integrate and offers SDKs for various platforms like Android, iOS, and web.	The Google Pay API is primarily designed for mobile platforms and offers SDKs for Android and iOS. It has a well-documented integration process but requires a Google Pay merchant account to use.
Security	Razorpay offers robust security features like SSL encryption, 3D Secure authentication, and PCI-DSS compliance to ensure the security of online transactions.	Paytm also offers similar security features to Razorpay, but also has an extra layer of security through its Paytm wallet.	Google Pay API has advanced security features like biometric authentication, device lock, and tokenization to secure online transactions.

This led us to the conclusion that the paytm api would be the greatest option because of how simple it is to integrate compared to other options. There is also a little transaction fee. good security and user experience.

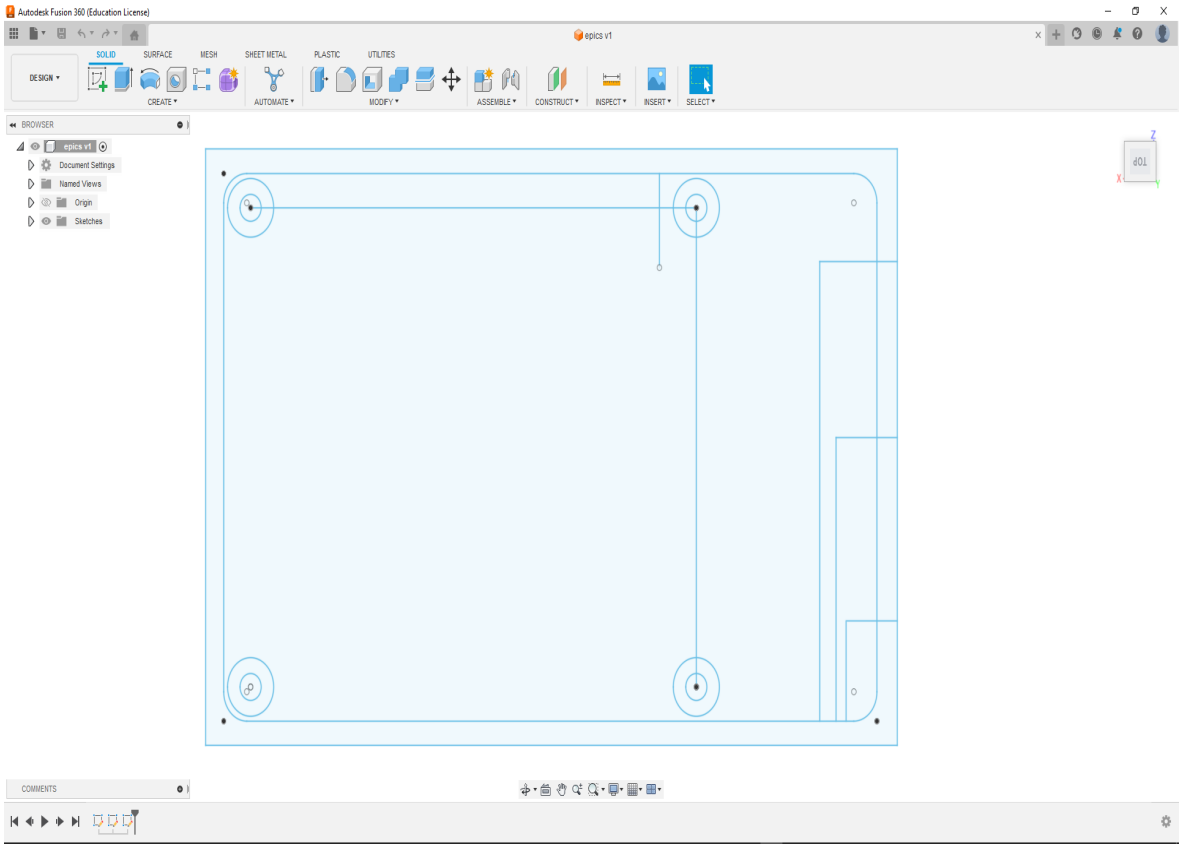
Further upgrades will include auto debit and python connection with the paytm api.

Abishek.H (20BME10038)

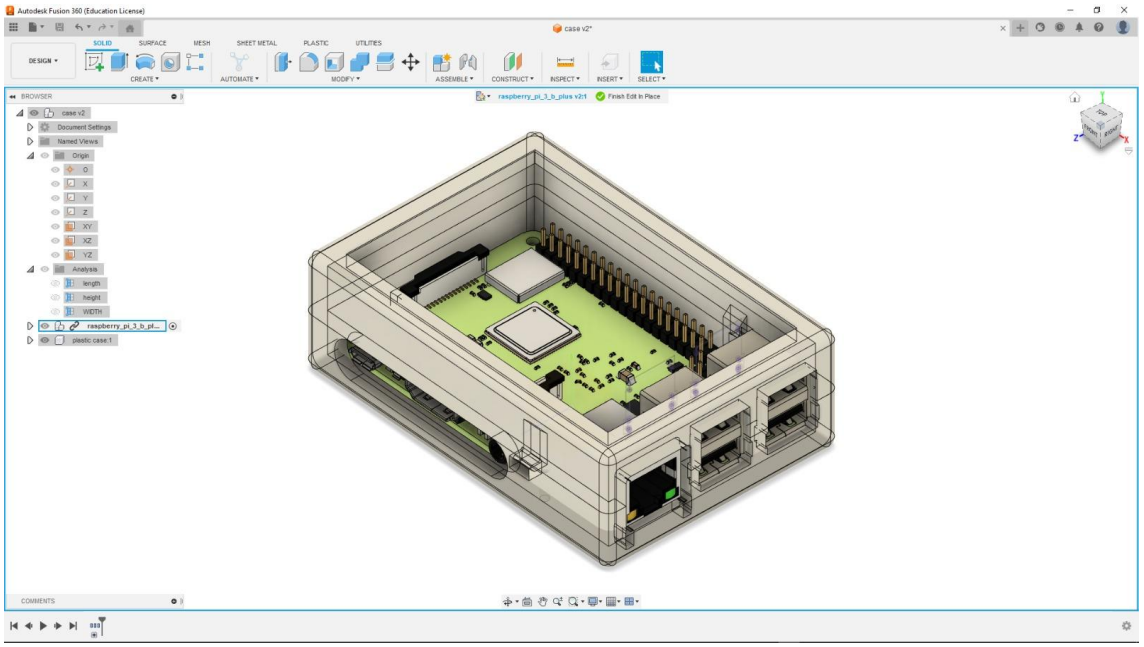
My responsibility in this project was to make a hard casing to secure the Raspberry pi module, battery and the lcd screen.

In this review, I have made the 3d model of the casing or enclosure for the Raspberry pi module by following the steps of taking the actual dimensions of the Raspberry pi 3B+ module and made a sketch of that then created a 3d rendered model of the module. Then I created a basic sketch of the case and then created a 3d rendered model of the casing of two parts with snap fit joints. The case is rendered with ABS plastic as body material, but the material may be changed in the future based on the availability of the filament and stress analysis results for the 3D printing of the case.

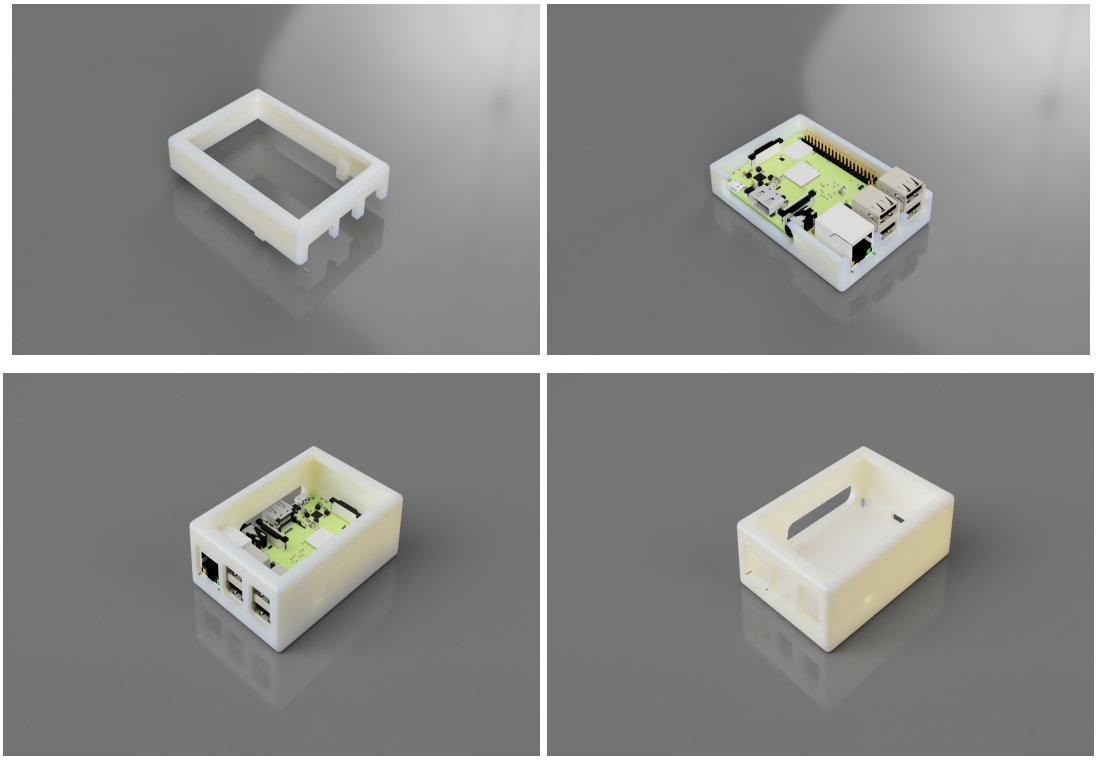
Basic Sketch for case :



Created 3d casing:



Rendered Image :



In future, the case can be 3D printed with G-codes and the design of the case is subjected to change based on the future improvements and requirements.

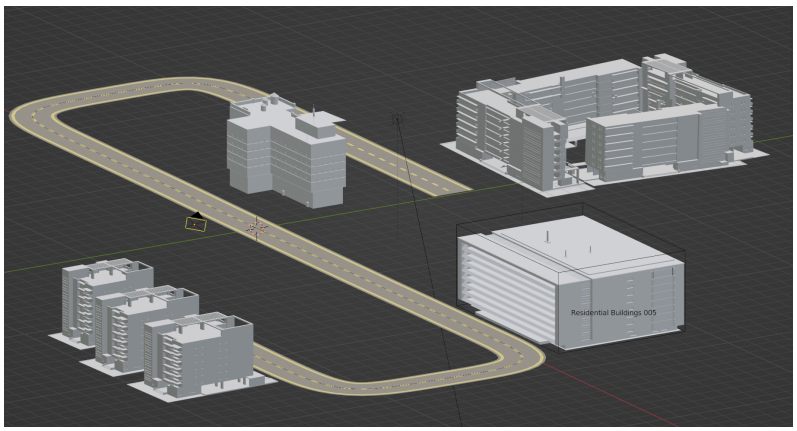
Vikram(20BCG10091)

Ugesh(20BAS10081)

Our responsibility in this project was to create a 3D model of the path in our university which starts from Boys Hostel Block-1 to VIT Bhopal Academic Block. The 3D model was created using the software, Blender. We have created several assets of building and road separately and merged them together.

In the future, we would design and add the assets of surroundings and other features necessary.

Development Phase:



Rendered Image: