

Dock Based Bicycle Rental System

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ABSTRACT:

Many college students who live away from home do not own a vehicle, making it difficult for them to go around between courses, the cafeteria, the ground, the sports arena, and so on. Although walking is beneficial to one's health, it is nonetheless time intensive. 'Bicycles' is a possible replacement for this. It takes less time, burns more calories, and strengthens the lower body. Aside from the aforementioned benefits, choosing bicycles over polluting automobiles also helps to minimise hazardous pollutant gases. Bicycle rental systems provide a low-effort and ecologically beneficial means of transportation for short distances. This eliminates the need to purchase a new bicycle and makes it more accessible to a larger audience. It cuts down on the amount of time and money that a bicycle owner would have to spend on maintenance. The purpose of this study is to investigate why there is a growing demand for bicycle rental apps, how they are superior to air-polluting vehicles, their health and environmental consequences, and how many bicycle rental applications are now available in India.

Keywords: Bike rental system, Bicycle Management system, Cloud-based servers, Google Firebase, Android Studio, Android application, Google map API, Google direction API.

1. INTRODUCTION :

As technology advances, everything we desire is only a click away. We can book cabs online for travel, but we don't have the option of renting bicycles and going anywhere we choose. We built this website intending to reach out to college students who do not possess a vehicle. Cycling is far healthier than walking since it burns more calories. Walking is also excellent for your health, but it takes up extra time that could be spent on other productive pursuits. Cycling takes up less time. Aside from that, it helps to improve the environment by lowering air pollution and noise pollution. Transportation is a key contributor to rising greenhouse gas emissions, which may be lowered by replacing vehicles with bicycles.

One of the health advantages of bicycles over vehicles is that they lower the expense of injuries caused by road accidents[1]. The bicycle is an ideal short-distance transportation alternative since it emits no pollution,

requires no energy, is silent, tends to take up minimal space, and is quick and affordable (McLintock, 1992; Tolley, 1990). In the United Kingdom, 40% of all automotive commutes are less than 1.6 kilometres long, and given the correct motivation, the majority of them might be changed to bicycles.

Bicycles take up so little space that ten or twelve people may fit in the same space as one car. Their presence creates a calm and quiet atmosphere, as well as a more contemporary and appealing picture than a campus filled with parked automobiles. According to the British Medical Association, cycling should be encouraged to enhance the world's health (British Medical Association, 1992).[2]

Getting to work on a bike is a terrific way to avoid going to the gym. If you're a cyclist, it's an excellent way to increase your base mileage and fitness without having to devote time to particular training.

In cross-sectional and longitudinal studies, cycling and cardiorespiratory fitness in kids were found to have a definite positive relationship. Commuter cycling was found to have a strong negative relationship with all-cause mortality, cancer mortality, and cancer morbidity in prospective observational studies among middle-aged to older persons. In intervention trials, commuting cycling resulted in persistent increases in cardiovascular fitness and some changes in cardiovascular risk factors in working-age individuals[3]. Several organisations aid in the finding of routes and offers for travel by public transportation (aeroplane, rail, or bus) as well as private transportation (car). Carsharing has been increasingly popular in recent years, and it is a company that mainly relies on online reservations. A slew of new free-floating car-sharing businesses has recently appeared, allowing users to go in one direction without having to return the vehicle to its original spot.[4]

2. LITERATURE REVIEW :

India's rapid urbanisation has resulted in a tremendous rise in the number of automobiles on the road. Automobiles are substantial emitters of anthropogenic carbon dioxide and other greenhouse gases, contributing considerably to urban air pollution. The transportation sector is a significant contributor, accounting for 90% of total emissions[5]. By switching 5% of automobile

kilometres to cycling, yearly vehicle travel will be reduced by 223 million kilometres, 22 million litres of gasoline will be saved, and transportation-related greenhouse emissions will be reduced by 0.4%. There would be a considerable decrease in emissions and exposure if all vehicle drivers living within a half-hour bike ride to work shifted to bicycling[6].

The switch from polluting automobiles to bicycles would significantly impact both the environment and human health. Increased physical activity would avert 116 deaths per year, with six fewer deaths due to local air pollution caused by automotive emissions and five more bicycle fatalities due to road crashes. In children and adolescents, there is evidence of better cardiorespiratory endurance and muscular fitness, as well as improved body composition, bone health, and cardiovascular and metabolic health biomarkers. There is strong evidence in adults for the prevention of early death, heart disease, stroke, type-2 diabetes, high blood pressure, adverse blood lipid profiles, metabolic syndrome, colon and breast cancers, weight loss when combined with diet, improved cardiorespiratory and muscular fitness, fall prevention, reduced depression, and improved cognitive function.

Bicycling has become the cheapest means of transportation due to annual gasoline price rises. Cycling is becoming increasingly popular among people of all ages, from youngsters to working adults, as a less expensive and healthier mode of transportation. Walking or cycling can be used to cover shorter distances. Not only would this reduce gasoline use, but it would also aid in pollution prevention[7].

The EZGO mobile phone app has proven to be a considerable improvement over the present vehicle rental system. This app is used to share cars between users, which helps both the owner and the lessee by allowing the lessee to utilise the vehicle according to his or her needs. This is intended to give a platform for visitors to the nation to hire a variety of autos at various prices, as well as to rent a car anywhere in the country with convenience and cost-effectiveness. [8]

OpenStack is a free and open-source cloud computing software platform. A data centre's varied, multi-vendor hardware pools of computing, storage, and networking resources are managed by the software platform, which is made up of interconnected components. To control it, users can utilise a web-based dashboard, command-line tools, or an API. [9] Access Control, Billing & Provisioning, Capacity Analytics, Cost Administration, Demand Monitoring, Multi-Cloud Management, Performance Analytics, SLA Management, Supply Monitoring, and Workflow Approval are some of the cloud management tools available in Google Cloud. While

OpenStack only has a few of them, choosing between these two platforms to supply a server is not difficult.

This application may be used to execute the Bike Sharing Bike Rental application, which allows individuals to visit locations by renting bikes quickly and easily. This programme can manage easy, rapid, and secure rental payment procedures. This programme can provide information from bicycle rental reports as well as a rapid and accurate financial record[10]. There are currently over 700 bike-sharing systems operating in over 50 countries, with 806,200 bicycles accessible at 37,500 stations. [11]. These bike-sharing programmes have helped to improve people's driving abilities daily.

However, modern bike-sharing systems have several operational challenges. Individual cycling behaviour and flexibility designs to improve scheme management and administration have received a lot of attention in recent years. For example, based on transitory bike usage trends, [12] and [13] looked at the geological clustering of docking stations. After observing the examples in use, bike armada regularity approaches were created and applied for various sorts of stations [14]. It was revealed that appearing business zones have a positive influence on the utilisation of station-based bike-sharing using a relapse approach that correlated encompassing area usage features with station demands. Such studies have mostly focused on the attraction and consistency of bike-sharing, with little emphasis paid to the relationship and influence of events that occur between bike-sharing and other means of transportation[15]. Various spatial-fleeting insights and system (chart) aspects of docking stations were investigated to assess the influence of Cylinder strikes in London on bike-sharing. Existing dockless bike-sharing research is sparse, focusing on bike fleet management [16] or bicycle framework planning [17]. There should be a lot more inventive research that focuses on versatility, such as dockless bike-sharing.

Using this app, the customer has the option of hiring any vehicle of his choosing based on the occasion. They also included a payment gateway that allows customers to pay using debit or credit cards. Furthermore, the user has the choice of picking or not selecting a driver. Three viewing models make up the majority of their system. One is given to the user, another to the administrator, and a third to the driver. The user app gives them the option of selecting from a choice of automobiles, as well as the purpose for the pickup and the location. The admin app is completely under the control of the administrator. They are responsible for adding and deleting vehicles, as well as accepting and refusing reservations. The drivers are the ones who are in command of everything.[18]

AHP is used in a study report on car rental services to establish the relative relevance of all the factors that consumers consider when renting a car. Eight characteristics were revealed in this study, with purchasers favouring the Vehicle model first, followed by price consciousness and automobile condition[19].

QR codes are used in apps to lock and unlock them, ensuring that they can only be unlocked by the user. The article on QR code security covers all of the most common usage scenarios as well as the attack vectors that go with them. - It organises the current state of the art in the scientific community. - It outlines the most important research topics for enhancing QR code security, with an emphasis on usability and security. [20]

3. ARCHITECTURE DESIGN

This application is built on android studio. We have used the Java programming language. We have also used XML for a smooth user interface. For storage and syncing data between users in real-time, we have used google firebase.

We have divided this application into multiple pages.

- 1) Home page: When we start the application, we are welcomed and the user can select between two options. If they are a first time user they can 'sign up in a few easy steps, otherwise, if they already have an account they can 'log in' to their account.
- 2) Registration page: If the user selects the sign-up option on the home page then they will be directed to the registration page. Here they will be asked to enter their name, email id, phone number, enrollment number and password and click on register. The user's profile is completed.
- 3) Dashboard: On the top right corner there is a dashboard on which the user can go to profile, book a ride, view a map or access the helpdesk if the user has any inquiries regarding the services.
- 4) Profile: From the dashboard, the user can access his profile. This displays users' details like name, email id, phone number, and enrollment id. Users can also edit these details if required.
- 5) Book your ride: This can be accessed from the dashboard. It will open the camera so that the user can scan the QR code on the bicycle. Once the scan is complete It will show details of the bicycle booked.

- 6) Map: The view map option in the dashboard allows users to allocate the nearest dock and navigate to it.
- 7) Helpdesk: This option can be found in the dashboard. Here users can connect to a chatbot regarding their queries about booking rides, FAQs, Payment issues

4. SYSTEM DESIGN

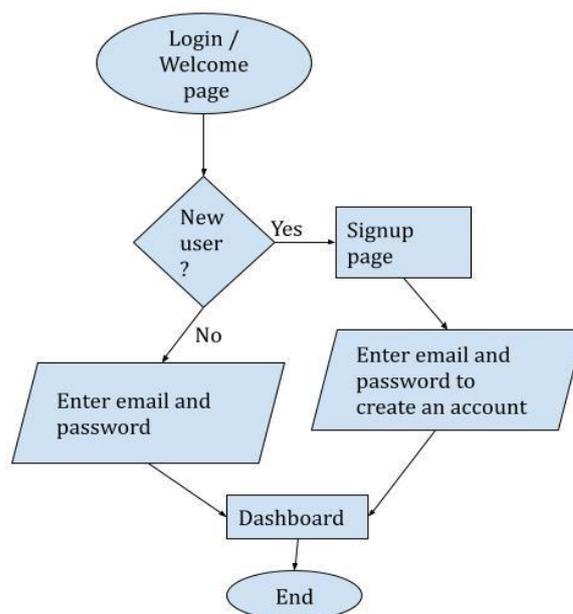


Fig-1: Login

Fig-1 is the login page or welcome page when you start the android application. On the welcome page, you have two options either you can enter your email id and password or you can create an account if you are a new user. After creating an account you are redirected to your dashboard page. The same redirection happens if you log in using your old/existing credentials.

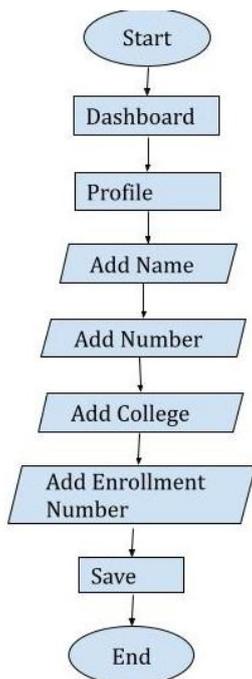


Fig-2: Add/ Update Profile

In Fig-2 You can go to the profile page from the main dashboard to update your details like name, phone number, college name, and enrollment number, so the admin can determine which exact student is currently occupying a ride. Then save button saves all data and updates all details in the account.

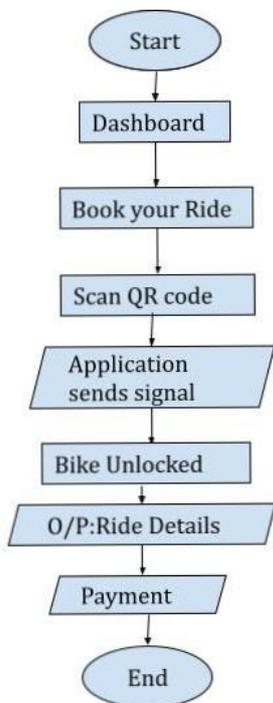


Fig-3: Book a riding

Fig-3 is a flowchart for how a user can book a ride. Once the user is in the main dashboard he/she can open the book a ride menu and the camera is opened to click a picture of the QR code through which the bike will be ready. After you end the ride you will be redirected to the payment page and a bill will be displayed.

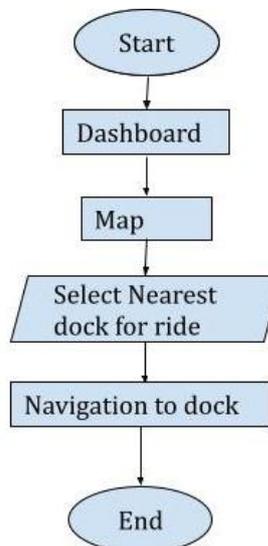


Fig-4: Navigating to the nearest dock using the map

Fig-4 shows how the user can navigate in the physical world with the help of Google navigation to reach the nearest dock where the user can book a ride. On the dashboard, you can select the map menu which shows all docks near the user. The user can select one and they will be navigated to the desired dock.

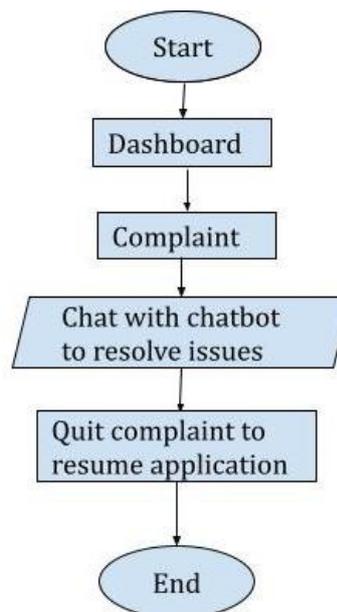


Fig-5: Chatbot in complaints

Fig-5 shows how a user can ask for help if they have any issues or problems regarding the bike or application and the chatbot will try and help them out. In the complaints section, you can find the chatbot.

5. Conclusion

In this research paper, we have studied how various bike rental applications have been developed using different approaches. We have tried to develop a similar bicycle rental application for students in colleges to make their life easier.

We have used Android Studio to build this application using Java and XML. Android Studio is a unified development environment that allows you to create apps for Android phones, tablets, Android Wear, Android TV, and Android Auto. Structured code modules allow you to break down your project into functional parts that you can create, test, and debug independently.

An Android application is a software program that runs on an Android device or emulator. An APK file, which stands for Android package, is also referred to by the word. This is a Zip archive that contains the app code, resources, and metadata. Android apps are developed in Kotlin, Java, or C++ and run inside the Virtual Machine.

The two most common programming languages used in Android app development are Java and XML. As a result, knowledge and expertise of these programming languages are required to create an Android app.

The Google Maps API is a series of application programming interfaces (APIs) that allow us to interact with the company's services. It will enable us to create everything from simple Web apps to sophisticated location-based apps for iOS and Android.

Firestore Authentication is a feature that allows users to sign in to the app using their email address, password, phone number, and federated identity providers such as Google, Facebook, and Twitter. Backend services, simple SDKs, and pre-built UI frameworks are all available with Firestore authentication. As a result, developers will find it easy to implement.

The Directions API is a web service that returns JSON or XML-formatted directions between two places via an HTTP request. Directions are available in a variety of formats: as a self-contained API as part of the Maps JavaScript API on the client-side as part of the Client Libraries for Google Maps Web Services for server-side use

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