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Station-Less Bike-Sharing System

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Abstract-Nowadays in the 21st century, Transportation has become a mandatory aspect of every individual's life. There is a constant requirement for easy, cheap and accessible modes of transportation everywhere, especially in metropolitan areas. Bikes are becoming the most affordable and efficient way of getting from point A to point B. Commuters who can't afford their own personal vehicles and in case their personal vehicle is not readily accessible to them struggle to get their commuting needs done. Tourists who need temporary transportation access can make use of bike-sharing systems for fulfilling their needs. The current system has fixed points or stations where the bikes need to be dropped off. We propose a system that does not involve any stations for the bikes and rather the user can drop off the bike at any location of his choosing and the payment process can be furnished on the mobile application.

Keywords: No stations, temporary transportation.

I. INTRODUCTION

We are in the information age where there is provision for anything to be made possible with the right technologies and technical know-how. Currently, there is high need for public transport in urban cities. As cities develop and populations rise increasingly, it is becoming harder and more difficult to find a means to active transportation which is feasible and affordable to the every-day commuter.

As vehicles prices skyrocket and the cost of fuel and insurance is not getting lower anytime soon. It is becoming a huge necessity for commuters to find a new way for transportation in a cheap and effective manner with minimal hassle. So the commuters have turned to bikes and similar two wheelers for hire for fulfilling their transportation needs. However the current system involves the use of station enforced bikes and the problem with this current scenario is the fact that the users need to drop off their vehicle at one particular location which is becoming ever increasingly inconvenient and more time-consuming which leads to overall loss in productivity and profitability.

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The proposed system amends the current system by using a station-less bike-sharing approach which minimises the last mile problem for commuters using the present application of bike-sharing, as they can basically drop off their bike at their convenient locale and finish the payment process wirelessly on their mobile application. Therefore it provides the facility for the user to go directly from point A to point B while being highly- time efficient

The current necessity for this proposed project is that it is highly customizable according to user requirements and puts user comfort first. It also helps in reducing pollution and is more of an eco-friendly approach to the current system.

This is the technology we have chosen to propose our system where it is needed. To turn an ineffective system into a more efficient and effective method to accomplish the same. The system we have chosen is Station-less Bike-Sharing System.

II. LITERATURE SURVEY

1. Related Work:

1.1 Bike-sharing-A maximal covering location approach

Ines Frade,Anabela Ribeiro and Team proposed a system where the bikes are made available to the maximum locations with a particular bike stations to improve the quality of city life and urban environment. This approach is useful for covering the maximum location.

The main defect of the system is that they have a certain capacity for storing bikes for example in a station they have a maximum of 20 bike capacity. It is hard to acquire a land for bike stations. There will be a huge amount of money spent in this system.

1.2 Uncertainty in urban mobility: Predicting waiting times for shared bicycles and parking lots

Bei Chen, Fabio Pinelli express their approach towards the waiting time for the next available bike or parking stations nearby with a vacant place. By spatial-temporal features of the bike user provide the availability and additional information to the commuters.

The demand during the abnormal time such as festivals and other activities it is basically hard to predict the parking lot availability and the waiting time for the bike also differs. This involves high maintenance cost for the people using.

1.3 Dynamic Spatial-Temporal Representation Leaning for Crowd Flow Prediction

Lingbo Liu, Jiajie Zhen, Guanbin Li and team proposed a system which is designed to predict the crowd flow in a particular location.

This will work based on the digital device they use to predict the crowd flow. Based on the proposed ACFM, they developed a unified framework to adapt merge the sequential and periodic representations with aid of fusion module. The main key challenge lies ow to integrate diverse factors such as temporal laws and spatial dependencies to infer evolution crowd flow. Huge population in the metropolitan cities brings a great challenge to the urban environment to manage

1.4 Spatial-Temporal Graph to Sequence Model for Multi-step Passenger Demand Forecasting

Lei Bai, Lina Yao propose the idea of Spatial-Temporal Graph to Sequence Model for Multi-step Passenger Demand Forecasting. In this system the long-term encoder and short-term encoder are introduced to achieve multi-step prediction without relying on RNN. It provides citywide passenger demand on a graph and employ the graph convolution architecture to extract spatial and temporal correlations equally.

In this system the chain-structured RNNs employed in the encoder iterate over one input time step at a time. Errors from the older time step are carried next and directly influence the assumptions, which results in error accumulation in each future step.

1.5 Functional Zone Based Hierarchical Demand Prediction for Bike System Expansion

Junming Liu Qiao Li and her team proposes A hierarchical station bike demand predictor which analyses bike demands from all functional location level to station level. The hourly bike check-ins and check-outs of that particular zones are predicted by New York City Bike system. In this way they can calculate every activity of bike and their locations.

The bike transition records are not available for the other area and second. Station bike demand have more variances across the metropolitan city. By identifying multiple features, assuming the station bike demands react same to the world features, which brings large prediction error when the city area is large and highly diversified.

1.6 Incentivizing Users for Balancing Bike Sharing Systems

Marco Santoni, AdishSingla Proposes a system called incentivizing users for balancing bike sharing system. The commuters in the bike repositioning process they are provided with an alternative choice to pick the bike or else return the bike in exchange for some monetary incentives. This can be accessed by user friendly application with low cost.

There comes a great imbalance problems such as the unavailability of the bikes on that current time or parking stations for the commuters who need to end the trip. The upcoming demands with such limited resource is the major challenge and recurrent problem for the operators.

1.7 Urban cycles and mobility patterns: Exploring and predicting trends in a bicycle-based public transport system

Andreas Kaltenbrunner, Rodrigo Meza and team proposes a system called urban cycles and mobility patterns. In which they can analyze the cyclic mobility patterns which lead to prediction of the number of available bikes in the station. Such prediction would allow the users to improve the current web service of bike and increases the commuter's satisfaction with the system. It informs the user in prior about the best place to pick up the bike or leave the bike and improves the distribution of bike in all stations equally.

The biggest problem is that which makes the commuters to get frustrated when impossibility to find a bike when a user wants to start journey. The impossibility is to leave the bike in the commuter's destination due to empty or full stations.

1.8 Multi-Graph Convolutional Network for Short-Term Passenger Flow Forecasting in Urban Rail Transit

Jinlei Zhang 1, Feng Chen 1* Yinan Guo2and team proposed a system called multi graph network for short term passenger flow in Urban areas. Deep-learning-based models have been widely introduced to tackle the problems such as spatiotemporal dependencies, topological information, have been proved to have great advantages than previous models. The 3D CNN was used to innovatively integrate the inflow and outflow information as well as extract high-level correlations between three patterns of inflow and outflow.

The Short-term passenger flow forecasting is a crucial task in the operation of urban rail transit.

The convolutional-neural network (CNN)-based models, which can extract spatial dependencies even when stations are far away from each other.

Table 1: Comparison of various techniques used for cancer prediction and classification

PAPER NO.	TITLE	AUTHOR	TECHNNIQUE	RESULT	ISSUE
1	Bike-sharing-A maximal covering location approach	Ines Frade, Anabela Ribeiro	Machine Learning	Presented an approach for bike sharing with particular stations for the commuters.	Bike stations will have only certain amount of storage capacity. Huge amount of money spent on acquiring land.
2	Uncertainty in urban mobility: Predicting waiting times for shared bicycles and parking lots	Bei Chen, Fabio Pinelli	Deep Learning	They proposed an approach for the waiting time to get a bike and the availability of the parking stations nearby.	In festival time it is hard to find the bike or the parking stations.

3	Dynamic Spatial-Temporal Representation Leaning for Crowd Flow Prediction	Lingbo Liu, Jiajie Zhen, Guanbin Li	Data Mining	The crowd flow of the particular location can be monitored by the digital devices used by commuters.	It is hard to monitor and track large amount of devices at a time.
4	Spatial-Temporal Graph to Sequence Model for Multi-step Passenger Demand Forecasting	Lei Bai , Lina Yao1	Internet of Things	Presented an Spatial-Temporal Graph to Sequence Model for Multi-step Passenger Demand Forecasting	Error accumulation increases in each iteration step of the process
5	Functional Zone Based Hierarchical Demand Prediction For Bike System Expansion	JunmingLiu,Qiao Li	Internet of Things	Presented a Functional Zone Based Hierarchical Demand Prediction For Bike System Expansion	Demand will be higher in some arrears which brings issues to commuters.
6	Incentivizing Users for Balancing Bike Sharing Systems	Marco Santoni, AdishSingla	Digital Image Processing.	PresentedIncentivizing Users for Balancing Bike Sharing Systems.	Unavailability of bike or parking stations will be a major issue
7	Urban cycles and mobility patterns: Exploring and predicting trends in a bicycle-based public transport system	Andreas Kaltenbrunner, Rodrigo Meza	Image Processing	Presented an Urban cycles and mobility patterns: Exploring and predicting trends in a bicycle-based public transport system	Commuters to get frustrated when impossibility to find a bike when a user wants to start journey.
8	Multi-Graph Convolutional Network for Short-Term Passenger Flow Forecasting in Urban Rail Transit	Jinlei Zhang 1, Feng Chen 1* Yinan Guo2	Internet of Things	Presented an approach Multi-Graph Convolutional Network for Short-Term Passenger Flow Forecasting in Urban Rail Transit	Not feasible correctly due to cost.

III. PROPOSED SYSTEM

I. Architecture Of The System

Figure 1.1 System Architecture

Initially, the user wants to book a bike. The user has to download and then install the app on his mobile phone. The user gives his credentials such as name, date of birth, address and also a government proof such as Aadhar card or driving license. User gives permission for the app to access the global positioning system (GPS) location service from his phone. Now the admin gets to know about the user's location. The user is also prompted to add a minimum balance in the app wallet for payment safety purposes. User request is sent to the server for bike via the app. Server checks the user credentials, submitted government proof and minimum app wallet balance. If all the credentials and proofs provided by user are correct, then the admin authorizes it. Once the admin authorizes the user request, then the user will be able to see the surrounding bikes in that locality. The user also enters its destination. The app shows the shortest path from the user to reach its destination. Once the user reaches next to the bike, the user scans the QR code on the bike. This scanned QR code is sent to server. Once this QR code is verified by the server, the bike is unlocked. The user can now successfully start riding the bike. Once the user reaches its destination, the user can make the payment via the app. In case of any error in the payment, the money is deducted from the user's app wallet

IV. IMPLEMENTATION

A. Implementation 1:

Existing systems have drivers along with bike which means that only one user can travel. This would have been better if the user can travel along with anyone else apart from the driver. This makes the ride even more cost-efficient for the user. Proposed system provides bike rental services where user can ride themselves. Also, they can travel with anyone.

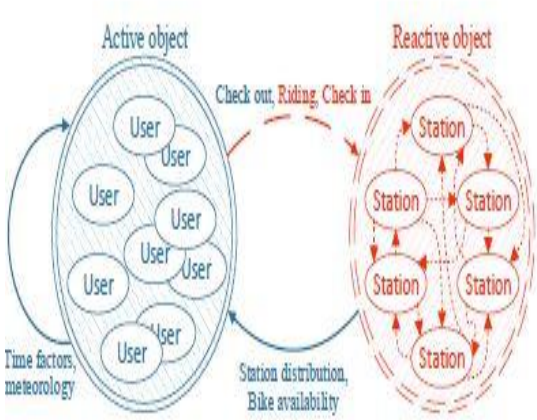

Figure 1.2 Components Of Bike Sharing System

B. Implementation 2:

The use of petrol bikes increases pollution in the environment. Also, the petrol bikes are not cost-efficient. To overcome this drawback the bikes used in this system are electric bikes which doesn't tend to cause any pollution in the environment. It is an economic way of transportation.

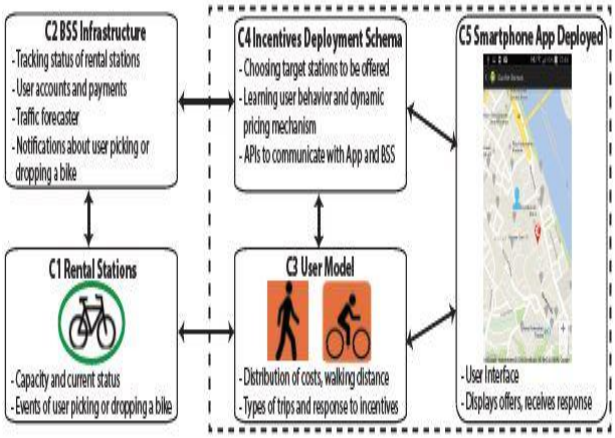

Figure 1.3 Overview of the system

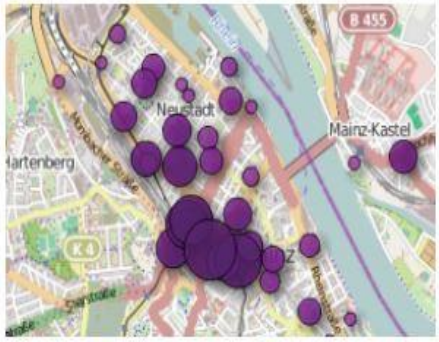

Figure 1.4 Spatial dist. of accepted offers

C. Implementation 3:

In the existing system, Bikes must be parked only at the stations and cannot be dropped anywhere as per user convenience. To overcome such inconvenience of the user, in the proposed system bikes can be parked anywhere regardless of station as per user convenience.

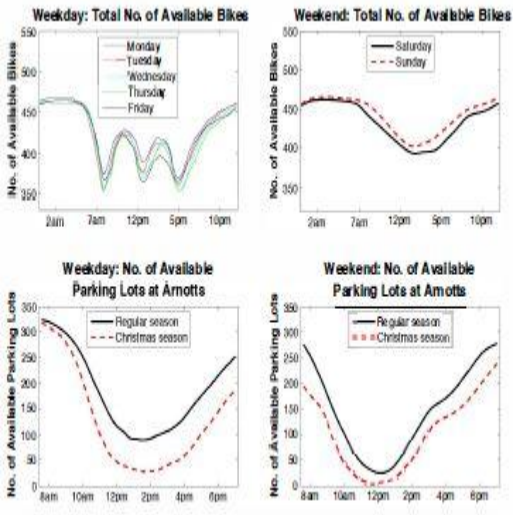

Figure 1.5 Average daily pattern of the total number of available bikes

V. RESULTS AND DISCUSSION

This system uses technologies such as java, xml, php, CSS, android studio and tomtat as server. Apart from these technologies it also uses google maps application program interface (API) and zing for QR code scanning and verification. This system proposes a cost efficient method and convenient travel for users. It brings an advantage for user to travel along with anyone.

VI. CONCLUSION AND FUTURE WORK

Station-less Bike-Sharing system is an effective and efficient approach to traditional ride-sharing applications. It would eliminate the liabilities of the current systems which would help lessen the burden of the customers in terms of their transportation needs by making point-to-point travel possible.

Further modules can be added based on additional requirements that may be necessary later. Further security improvements are also welcome. The system is highly adaptable based on end-user requirement and gives the customer the first priority.

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Rajasekaran G, completed his B.Tech information technology and M.E computer science and engineering under Anna University. He is having six years of teaching experience. He is working as an assistant professor in Department of Computer Science and Engineering, Easwari Engineering College, Chennai. His research area includes streaming service, cloud computing and computer networking.

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