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Virtual Ally: Campus Navigation System using Tableau

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Abstract:- Each year, the university admits a large number of new students. Although there are maps on the floors, it is difficult to locate administrative buildings, departments, libraries, canteens, and other locations on the campus, as well as how to locate such locations from one's current location. It makes it difficult for a newcomer to get to the required spot quickly and conveniently. A campus navigation system Virtual Ally, which is a map-based application, will be extremely useful in locating desired locations and determining the shortest route from current location to intended locations. As a result, anyone on campus will feel less frustrated and perplexed. The major purpose of this system is to create a smart phone application prototype that will guide individuals around the University campus. The proposed system is developed using Tableau and Android Studio. To locate each area, the system uses coordinates, which are determined by analysing map images and mapping each point with the tableau drawing tool.

Keywords: Campus Navigation System, Tableau, Smart Campus, Indoor Navigation, Maps Positioning System.

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1. Introduction

The main campus of Universal College of Engineering covers a large area of land. Thousands of new students enroll at this College each year. To familiarize themselves with the campus compound, these students either take a campus commuter or walk around. Visitors to UCoE may find it difficult to locate a specific spot on campus.

Navigation is the process of accurately determining the user's location and then showing directions to guide them along viable paths to their desired destination. The college campus is so large, new students and visitors are often perplexed as to where to find the administration, cafeteria, classrooms, etc. Many students become lost throughout the college during the events, causing a lot of turmoil because they don't know where to go.

The major goal of this research is to develop a system that can provide an optimal navigation solution by displaying the quickest path, which will help students, employees, and visitors in terms of location -search and route -planning. “Virtual Ally” a campus navigation system using

tableau for UCoE has been developed, allowing users to locate specific areas on campus and to display the campus area environment through this system.

Tableau is a powerful data visualization tool that data analysts, scientists, statisticians, and others may use to visualize data and form unambiguous conclusions based on data analysis. Tableau is well-known for its ability to quickly process data and provide the desired data visualization output. Tableau is being used to create a floor map and provide a path from source to destination based on the coordinates placed on the map using the Tableau drawing tool. It is also a visual analytics platform that is revolutionizing the way we use data to solve problems by empowering individuals and businesses to make the most of their data. Tableau software's primary function is to link and retrieve data from several sources. It can get information from any platform. Tableau can extract data from any database, including Excel and PDF documents. Tableau comes with ready-to-use data connectors that let you connect to any database.

Tableau Desktop can be used to connect the extracted data to the Tableau data engine in real time. A Data Analyst or Data Engineer works with the data that has been pulled up to create visualisation. End users can access Tableau Server files from any location, whether it's a PC or a mobile phone.

CBI Studio:

The user's creative experience is enhanced and completed by CBI Studio. Without having to transfer between various programmes, CBI Studio can provide you with all you need for unique shapes. CBI Studio provides a more comprehensive, user-friendly environment in which users may extend and develop Tableau with new features and a simple, streamlined process. Images or maps are the two options for working with CBI Studio. The route on the map is straightforward. Assume you wish to map the coordinates of five difficult-to-find establishments around the Tulsa metro area. CBI Studio allows you to drop in an address and use your store data location in Tableau instead of searching for GPS coordinates, typing them in manually, and converting them. The map path is as follows.

Organization of the paper is organized as follows, Section I contains the introduction of the system in detail, Section II contain the literature survey, Section III contain proposed system, Section IV contain the results and discussion, section V contains the conclusion of the system, Section VI describes the future scope of the system, Section VII contain the references.

2. Related Work

The following research articles are selected for review

Susovan Jana and Matangini Chattopadhyay presents the architecture and design of a Google Map based application on Android Platform. A university campus may be very large or it may have many campuses. Every year lots of new students get admitted in the university. Many new buildings are built, new courses are started and some departments may be relocated inside the campus. There are no facilities to find places like administrative building, departments, library, canteen, etc. in the campus and how to find those places from current location. It creates problem to the new comer to reach easily and timely in the desired location. The application has been implemented using Android SDK and has been tested for two campuses of Jadavpur University. [1]

Shir Ni Ler and Wan MohdNazmee Wan Zainondevelopedan intelligent system for mobile phones that can helps users finding the shortest path from a point-of-interest to another point-of-interest within Universiti Sains Malaysia (USM) main campus. Research is done to acquire an optimal navigation solution which primary goals is to provide shortest-path calculation. A mobile application based on Android that allows user to find a location quickly with minimum effort and collaborate with other users to enhance the experience of route-planning has been developed. [2]

Sunil Bendre, Narendra Patil, Dhananjay Kanawade, Sagar Kandekar, RutujaKirpal ,developed an application that provides functions such as finding current location of event,route direction to the particular event and gives description about it to the user. Now a day's many events takes place in a college campus and it is very cumbersome to register for such events if the number of colleges is more.So, this technology provides an android app to the participants so that they can register for such events and get real time updation for a particular event.The main administrator will edit and add events and even can delete the events.The system also provides participants with the

facility of google map so that it becomes easy for them to reach a particular event. [3]

Steven Batt, Oskar R. Harmon, Paul Tomolonis in their article Learning Tableau: A Data Visualization Tool describes a tutorial for learning to use Tableau Public, which is free, powerful, and widely used software for data visualization. Data literacy is an important component of undergraduate research projects. This paper introduces an exercise that teaches the fundamental Tableau concepts and commands needed to create charts and graphs, assemble them, and tell a story of patterns observed in data. [4]

Akhtar, Nikhat& Tabassum, Nazia&Perwej, Dr.Asif&Perwej, Dr. Yusuf in this paper gave a clear picture of growing COVID-19data and the tools which can help more effectively, accurately and efficiently. Tableau is an extremely powerful tool for visualizing massive sets of data very easily. It has an easy to use drag and drop interface. You can build beautiful visualizations easily and in a short amount of time. Tableau supports a wide array of data sources. COVID-19analytics with Tableau, you will create dashboards that help you identify the story within our data, and we will better understand the impact of COVID-19. [5]

Sungsoo (Ray) Hong, RafalKocielnik, Min-Joon Yoo, Sarah Battersby, Juho Kim, Cecilia Aragon, in this paper presented a distance cartogram (DC) is a technique that alters distances between a user-specified origin and the other locations in a map with respect to travel time. With DC, users can weigh the relative travel time costs between the origin and potential destinations at a glance because travel times are projected in a linearly interpolated time space from the origin. Such glance-ability is known to be useful for travelers who are mindful of travel time when finding their travel destinations. [6]

Ko, Inseok& Chang, Hyejung in their paper paper presents a procedure for the interactive visualization and analysis of healthcare data using Tableau as a business intelligence tool.The example data of colon cancer patients were obtained from health insurance claims in years 2012 and 2013, provided by the Health Insurance Review and Assessment Service. Results To explore the visualization of healthcare data using Tableau for beginners, this paper describes the creation of a simple view for the average length of stay of colon cancer patients. [7]

Hasan, Ahmed &Samsudin, Khairulmizam& Ramli, Abd Rahman & raja abdullah, raja syamsulazmir& Ismaeel, Salam in their paper A Review of Navigation Systems (Integration and Algorithms) presents Significant developments and technical trends in the area of navigation systems are reviewed. In particular, the integration of the Global Positioning System (GPS) and Inertial Navigation System (INS) has been an important development in modern navigation. The review concentrates also on the analysis, investigation, assessment and performance evaluation of existing integrated navigation systems of accuracy, performance, low cost and all the issues that aid in optimizing their operating efficiency. [8]

JayakanthKunhoth, AbdelGhaniKarkar, Somaya Al Maadeed and Abdulla Al Ali in their article "Indoor positioning and way finding systems: a survey" provides a comprehensive summary of evolution in indoor navigation and indoor positioning technologies. In particular, the paper reviews different computer vision-based indoor navigation and positioning systems along with indoor scene recognition methods that can aid the indoor navigation. Various evaluation criteria for indoor navigation systems are proposed in this work. The article concludes with a brief insight into future directions in indoor positioning and navigation systems. [9]

Dae Hyun Kim, Vidya Setlur, Maneesh Agrawala in their paper through a crowdsourced study, they explore how readers gather takeaways when considering charts and captions together. They then generate text captions based on the prominent features and ask participants to report their takeaways after observing chart-caption pairs. They found that when both the chart and caption describe a high-prominence feature, readers treat the doubly emphasized high-prominence feature as the takeaway; when the caption describes a low-prominence chart feature, readers rely on the chart and report a higher-prominence feature as the takeaway. They also found that external information that provides context helps further convey the caption's message to the reader. These findings were used to provide guidelines for authoring effective chart-caption pairs.[10]

3. Methodology

Virtual Ally – Campus Navigation System using Tableau works as an online portal or a webpage interface. All

visitors and newcomers can use the system to access maps of the college campus on their smart devices. This system can also be used during college events to help participants familiarize themselves with the campus. The architecture of the system is shown in Figure 1. System Architecture.

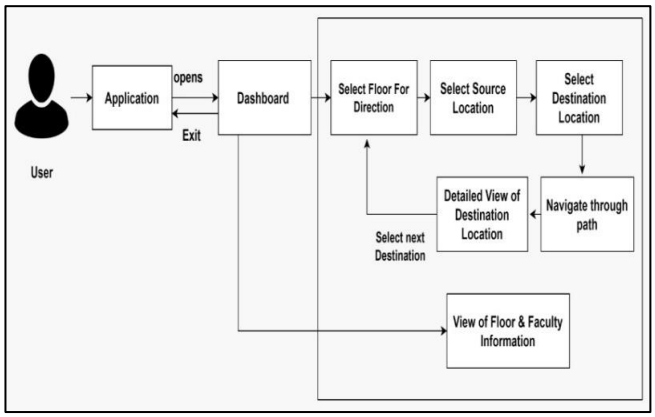

Figure1. System Architecture

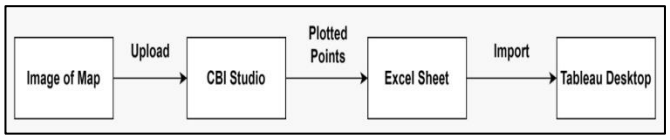

Figure 2: Procedure of getting coordinates of map

Following are the modules of the system:

a) GUI of Dashboard

The dashboard is the first thing a user sees when they open the app. The dashboard contains buttons that indicate floor numbers, which when clicked will take you to a page where you must select your current location as well as your target location.On the dashboard, there is a button to access floor and faculty information, which takes the user to a page where they may choose whatever floor they wish to view.

b) Selecting Source and Destination

The floor map will be displayed based on the user's selection of the floor. A list of labs/classrooms will appear in the right upper corner from which the user can choose the source and destination.

c) Navigating through the path

When the user selects the source and destination, the process of showing the route begins. The shortest route will be displayed, making it easy for the user to navigate along the path and arrive at their target place.

d) View Floor Information

There will be a floor information button on the dashboard. New students and visitors who want to learn more about the number of laboratories and classrooms can use their devices to do so. To help them, there will be a section in the system that displays information such as room name, room number, and a snapshot of the rooms/laboratories.

e) View Faculty Information

There will be a faculty information button on the dashboard. New students and guests who want to meet faculty members are frequently perplexed as to where they may locate them. To assist them, a section of the system will offer faculty information such as name, desk number, and photo.

f) Data Source

The Data Source is where all of the sheets relationships are displayed.

4. Results and Discussion

This section depicts the "Virtual Ally – Campus Navigation System using Tableau". The screenshots below are from the system we built to make it simple for new students and visitors to find their way around the campus. This system is simple to use because it is both cost-effective and efficient.

Figure 3 indicates how to use CBI Studio to generate the map's coordinates table.

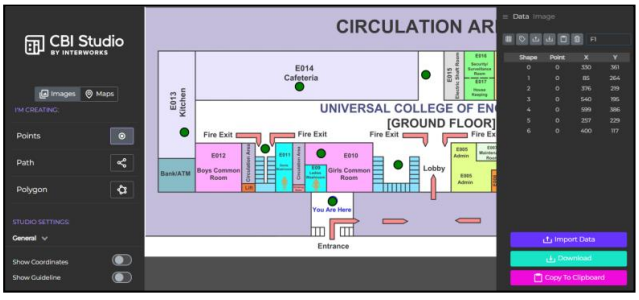

Figure 3: Plotting points on map using CBI Studio

Figure 4 depicts the Dashboard's user interface, which includes buttons for accessing floor and faculty information as well as displaying directions.

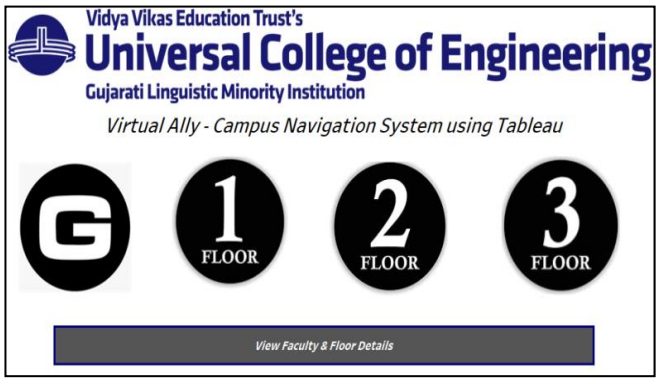

Figure 4: Dashboard

Figure 5 represents the faculty information displayed on the system. Image of the faculty and name along with the room name and room number is displayed.

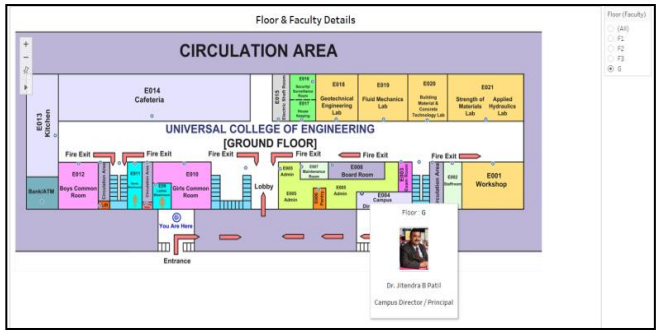

Figure 5: Faculty Information

Figure 6 shows the laboratories and classrooms information displayed on the system. Here name of the laboratories is displayed.

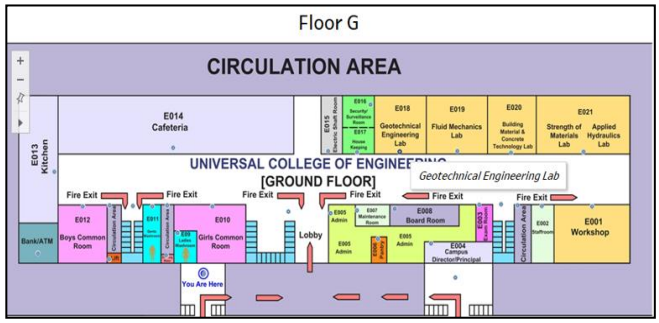

Figure 6: Floor Information

Figure 7 shows the user's list of suggested sources and destinations. Here source location is Middle Staircase and destination location is Kitchen.

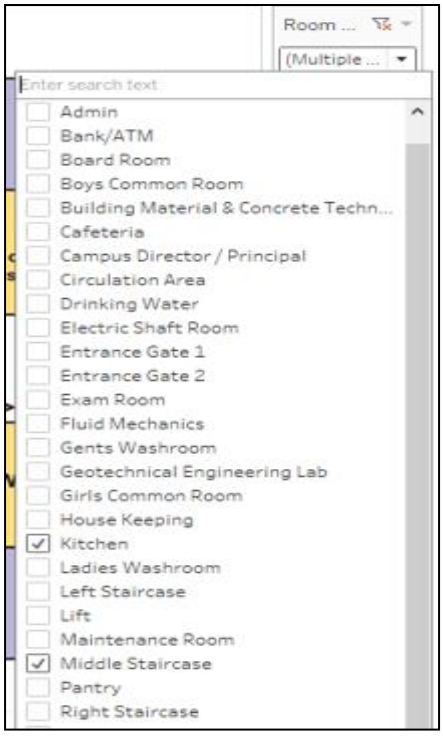

Figure 7: Selecting the Source & destination

Figure 8 depicts the shortest path shown on the system from source to destination. In the below image path from middle staircase to kitchen is shown.

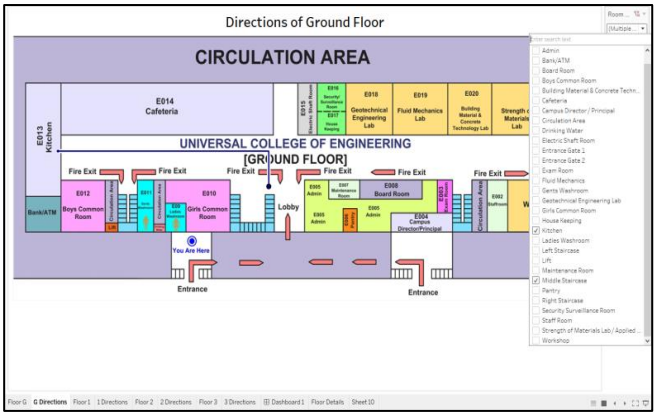

Figure 8: Showing Path

Figure 9 displays the relationship between the coordinates sheets created in tableau.

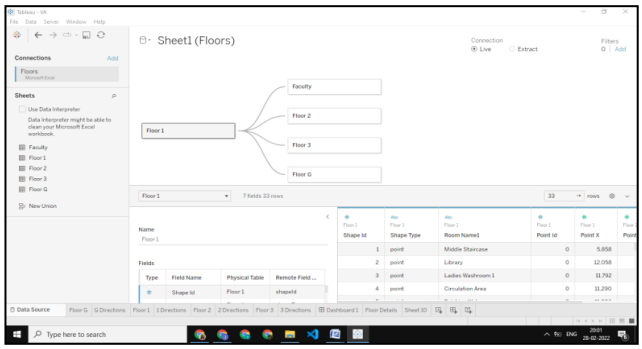

Figure 9: Relation between the sheets of Coordinates

Table 1 represents the qualitative analysis of our system which are based on numerous parameters.

Table 1: Qualitative Analysis of our system

Parameter	Description
Cost	Cost Efficient
Usability	Easy to use
Path Description	Shortest Path
Visualizing Direction	Direction according to user Source Location
Mapping Area	Co-ordinates Plotted on the map
Navigation Area	A line drawn from Source to Destination Location
User's work	Less
Time	Use Less time
Accuracy	90%

We haven't invested any money in the system yet, therefore it's cost-effective. It has an easy-to-use UI. All information of floors and faculties is at the user's fingertips.Using CBI Studio, the system plotted the mapping region, with coordinates drawn on the map. The Navigation region will then be displayed as a line drawn from the source to the destination. Visualization The direction account corresponds to the user's source location. It'll show the shortest path. It's simple to use. The amount of effort done by users will be reduced. It takes less time to complete and is less expensive. This system has a 90% accuracy rate.

5. Conclusion and Future Scope

Colleges, institutions, organizations, and offices that cover a vast area campus can use this approach. The system stores all of the data, which an authorized user can access at any time. The user can browse all of the floor maps and navigate using the system's directions based on the source and destination they've chosen. This system allows you to view staff information such as picture, name, room number, and desk number. Future scope of the work is focused on following points.

1. Floor to floor navigation:

In the system, we've made it possible to navigate via only one floor at a time. However, navigation from one floor to the next is possible.

2. Displaying current location of faculty:

Our system just shows the name and picture of the professor and the room number where he or she will be available. The faculty's dynamic location, which is where he or she is currently on campus, can be recognized by the system.

Acknowledgement

We would like to thank our Campus Director Dr.J.B.Patil, our HOD Dr. Jitendra Saturwar and our project guide Mrs.Vishakha Shelke for guiding us throughout the project and to bring the best out of us.

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