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Para: Passenger-To-Driver Pooling App Using Geographical Information System

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ABSTRACT

The Para a Ride-pooling Application using a Geographical Information System (GIS) is a mobile application that enables the sharing of tricycle journeys, allowing multiple passengers to travel together for Pagadian City as our basis of study. This system utilizes location-tracking technology to determine passenger whereabouts. When matching passengers to drivers, the system provides comprehensive trip details and proposed payment to the driver. Adhering to ISO 25010 standards, the app assures top-tier performance, reliability, and security while introducing innovative features. The proponents are optimistic about the application's future - paving the way to better transport within the city. Through in-app chat functionality, drivers and passengers can communicate for ride confirmation. This system aims to enhance the tricycle transportation experience in Pagadian City by optimizing fuel efficiency for drivers and alleviating passenger transportation challenges.

Key words: Geographical Information System, Location Tracking, Mobile Application, Pooling App.

1. INTRODUCTION

Para: Passenger Driver Pooling App using Geographical Information System (GIS) is a way to share tricycle or “bao bao” journeys so that more than one person can travel in the same tricycle or “bao bao.” This system can determine the passenger's current location. When matching passengers to the driver, it can assist in informing the driver of the complete trip details and the proposed payment for the whole trip [1]. The PARA app represents an endeavor to revolutionize commuting experiences in Pagadian City by leveraging Geographical Information Systems (GIS) to connect passengers with available drivers.

Traditional commuting methods often pose challenges regarding real-time information accessibility and transaction management [2]. PARA addresses these issues by providing a user-centric platform for efficient commuting. PARA addresses these issues by offering a user-centric platform for efficient commuting.

Pagadian City is a second-class component city and the capital province of Zamboanga Del Sur, Philippines [3]. Pagadian City is the only place in the Philippines with a unique tricycle design, and it is also known as "Little Hong Kong of the South” [4]. The city has 2,850 registered tricycle units operating under franchises [5]. The tricycle is the essential mode of transportation and a key access point to public transport [6].

The tricycle transportation in Pagadian City is characterized by a need for more communication between drivers and passengers, resulting in various challenges for both parties. Passengers frequently face difficulties using public transportation, such as uncomfortable waiting conditions [7]. On the other hand, drivers often waste time and fuel searching for passengers [8]. Most drivers will refuse to transport passengers if their destinations are far away and there is only one passenger because every tricycle or “bao bao” consumes fuel. Therefore, single occupancy or single passenger cannot make a profit. This app aims to facilitate the shortcomings of conventional commuting systems by offering a dynamic, user-friendly interface and real-time connectivity, fostering a more efficient and streamlined experience for passengers and drivers alike[9].

Moreover, PARA aspires to alleviate congestion, enhance accessibility, and optimize travel efficiency within Pagadian City, ultimately transforming the commuter landscape. This system utilizes location-tracking technology to determine passenger whereabouts [10]. When matching passengers to drivers, the system provides comprehensive trip details and proposes payment to the driver [11].

Specifically, this software development dealt with the following concerns:

1. How may the Para: Passenger-to-Driver Pooling App Using Geographical Information System model using waterfall model:

1.1 Requirements
1.2 Designing
1.3 Implementation
1.4 Testing
1.5 Deployment
1.6 Maintenance

2. How may the Para: Passenger-to-Driver Pooling App Using Geographical Information System evaluated by the IT experts based on the following Software System Attributes criteria:

2.1 Functional Suitability
2.2 Security
2.3 Performance Efficiency
2.4 Usability
2.5 Compatibility
2.6 Reliability
2.7 Maintainability
2.8 Portability

3. How might Passengers and Drivers evaluate the Para: Passenger-to-Driver Pooling App Using Geographical Information System:

3.1 Functional Suitability
3.2 Security
3.3 Performance Efficiency
3.4 Usability
3.5 Compatibility
3.6 Reliability
3.7 Maintainability
3.8 Portability

2. METHODOLOGY

2.1 Research Design

The research design for the PARA: GIS Ride-Sharing App embodies a mission to overhaul transportation in Pagadian City. Utilizing Geographical Information Systems (GIS), this innovative app redefines commuting by seamlessly linking passengers with available drivers. The research involves a comprehensive needs assessment through surveys and market analysis. It focuses on designing an intuitive interface and developing a robust back-end system using PHP and GIS technology. Rigorous testing, user feedback integration, and strategic deployment form the core phases, aiming to ensure app functionality, security, and user adoption. Success metrics center on enhanced ride-sharing efficiency, user engagement, and positive feedback, envisioning a transformed commuting experience in Pagadian City.

3. RESULTS

Implementing the phases of the Waterfall Model created the design and development of a passenger driver pooling app using geographic information systems for Pagadian City. We will discuss each of these phases below.

3.1. Requirements Specification

During this time, researchers conduct surveys to obtain much information and specifications from prospective users, passengers, and drivers. This stage sets the direction for the development process and prepares the way for later phases.

3.2. Planning

The project aligns with the app's goals and aspirations to revolutionize transportation through innovative solutions. It began with a comprehensive planning phase spanning the first 13 weeks, during which researchers gathered valuable information and specifications from prospective users, passengers, and drivers, laying the foundation for the app's development.

3.3. System Designing

This phase stage plays another vital role in software development; the gathered resources and plans for the system are visualized as the blueprint for the mobile application and appearance. Here is the process of the Para: Passenger-to-Driver Pooling App Using Geographical Information System.

a. Technical Specification

The Para: Passenger-to-Driver Pooling App Using Geographical Information System consists of components: The hardware, the user phone and admin PC, and the needed internet connection. The administrator, the developer, the end user, and the driver or the passengers are involved.

The development team meticulously crafted the platform's central interface, using specialized GIS-based software components that were thoughtfully selected and integrated to ensure a cohesive user experience, facilitating seamless interactions between users and administrators.

- Firebase
- React JS
- Dart Language

b. Use Case Diagram

A use case diagram shows how the actors or users interact with the system to achieve specific goals and tasks. The diagram consists of actors as users and uses cases as the system and user relationship. It provides a clear and concise overview of the system's functionality.

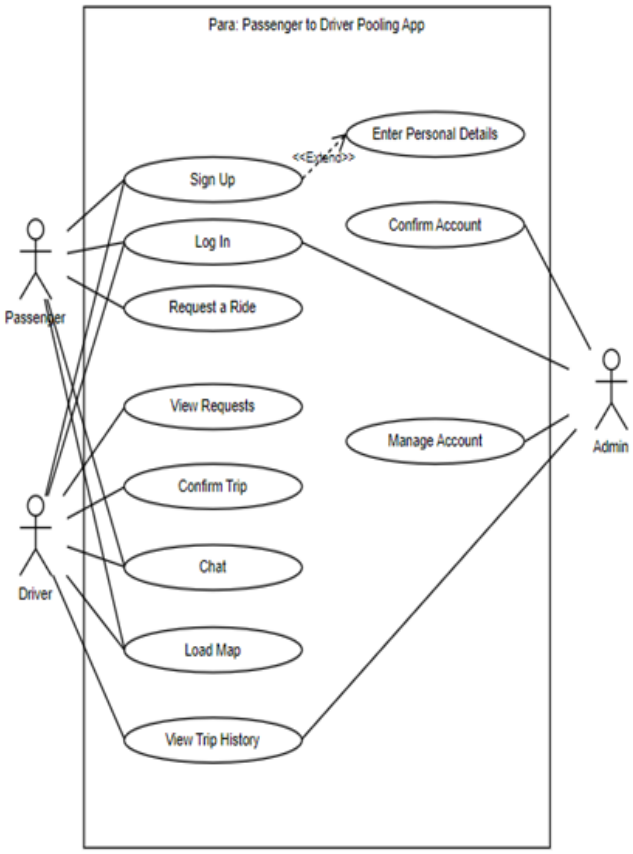

Figure 1: Passenger-to-Driver Pooling App Using Geographical Information System Use Case

Figure 1 shows the listed function of the passenger-to-driver pooling app using geographical information systems. The purpose of the Admin is to add new user information to create.

c. Interface Design

A system's interface design relates to its graphical user interface (GUI), which is how users interact with it to perform relevant tasks or access its features. This design aims to improve usability and user satisfaction by providing users with an efficient and seamless experience when interacting with the system.

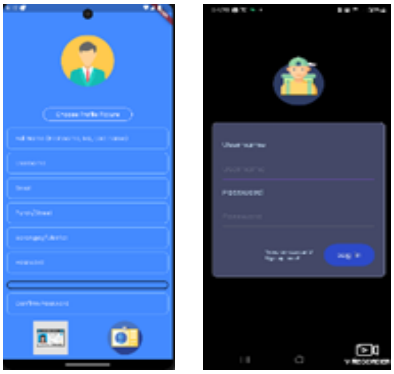

Figure 2: Account Registration and Login

Figure 2 shows the account registration and login interface of the 'Para' app. Users input personal details like name, email, and phone number to create profiles. Subsequently, they log in using their registered email or username and password. Successful login grants access to personalized features, including passenger-to-driver pooling integrated with GIS, streamlining user interaction for efficient engagement with the app's services.

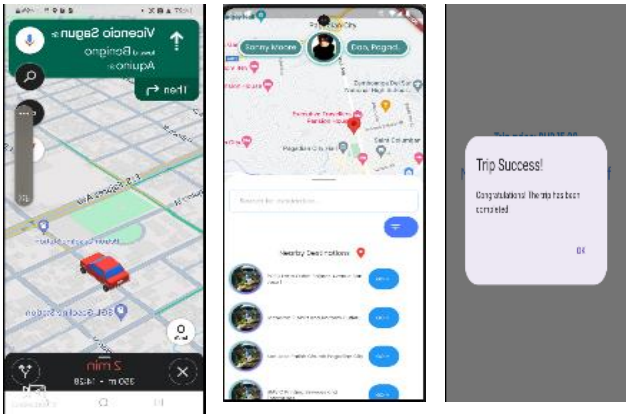

Figure 3: Drivers and Passengers Interface

Figure 3 present the passenger-driver interface. The driver and passenger can search for a potential driver and the same passenger, and the passenger can also search for a driver going to the exact location; the Passenger-Driver interface was crafted using the Dart language firebase. This interface also allows the user to determine the current location of the passenger or the driver. When matching passengers to the driver, it can assist in informing the driver of the complete trip details and the proposed payment for the whole trip.

3.4. Development Implementation

The development phase is the actual coding stage of the system. In this stage, the researchers employed various software tools to address the specific passenger and driver data requirements. The coding process involves Dart language scripting language for system functionality and Firebase for database connectivity. The entire system was created within a web-based environment, guaranteeing responsiveness across diverse devices, contingent on the presence of an installed browser. This approach ensures adaptability and accessibility for users utilizing a range of devices.

3.5. Testing

This stage is essential for verifying that the system complies with the requirements specified in the planning phase. Software testing a crucial essential process carried out at different phases of development to detect and fix bugs reliably. Overall, the functional requirements-focused testing results have been favorable and acceptable. A comprehensive examination of the test findings and the total survey responses received throughout the testing stage has been conducted.

A comprehensive examination of the test findings and the total survey responses received throughout the testing stage has been undertaken. The system scored 19.82 out of 20 points in criteria, which means that our system produced accurate and reliable results, indicating robust and dependable performance. Regarding performance requirements, the system scored 18.4 out of 20. It demonstrates the system's efficient operation by its predefined criteria. Lastly, the logical flow, which assesses the correctness and efficiency of the system's operational sequences, scored 18.44.

The system received 56.66 points in assessing critical areas such as bug-free, meeting performance requirements, and ensuring logical flow, resulting in a 94.59% effectiveness rate.

3.6. Deployment

After completing the initial development stages, the research team advanced through the final phase of the Waterfall Model. The ultimate step involved deploying the GIS Ride-Sharing App. Utilizing a dedicated server, the team successfully uploaded the app and established a robust database through Firebase for streamlined and efficient data management.

4. CONCLUSION

Based on the study's findings, the following conclusions were drawn:

1. The Para: Passenger Driver Pooling App using Geographical Information Systems was successfully developed following the Agile Model of Software Development, positioning it for future use and implementation by passengers and drivers.

2. The Para: Passenger Driver Pooling App using Geographical Information Systems adheres to the ISO 25010 Software Product Quality Standards, meeting benchmarks for Functional Suitability, Performance Efficiency, Compatibility, Usability, Reliability, Security, Maintainability, and Portability.

3. The Para: Passenger Driver Pooling App using Geographical Information Systems aligns with end-user requirements outlined in the ISO 25010 Software Product Quality Standards, emphasizing Functional Suitability, Performance Efficiency, and Usability.

4. The Para: Passenger Driver Pooling App using Geographical Information Systems is poised for effectiveness and is backed by positive responses from passengers and drivers, pivotal respondents in the app's research and development.

The Para: Passenger Driver Pooling App using Geographical Information Systems has demonstrated high efficacy based on user feedback. This indicates potential enhancements to the service, benefitting passengers and drivers alike.

REFERENCES

[1] Cao, Y., Wang, S., & Li, J. (2021). The optimization model of Ride-Sharing Routes for ride-hailing considers both system optimization and user fairness. Sustainability, 13(2), 902. https://doi.org/10.3390/su13020902

[2] Rasca, S., & Saeed, N. (2022). Exploring the factors influencing the use of public transport by commuters living in networks of small cities and towns. *Travel Behavior and Society/Travel Behavior & Society*, *28*, 249–263. https://doi.org/10.1016/j.tbs.2022.03.007

[3] Wikipedia contributors. (2024, January 11). Zamboanga del Sur. Wikipedia. https://en.wikipedia.org/wiki/Zamboanga_del_Sur

[4] Serafica, R. M. (2017, January 23). WATCH: What makes Pagadian tricycles unique? RAPPLER. https://www.rappler.com/moveph/159226-inclined-tricycles-Pagadian-city/

[5] Pagadian City sets drive vs. “bao-bao” trikes. (n.d.). Philippine News Agency. https://www.pna.gov.ph/articles/1083279

[6] Marcelo, J., Parco, E. G., & Golpere, K. L. (2023). Acceptability of Electric Tricycle as a Public Transportation at Bonifacio Global City: Basis for its. Research Gate. https://www.researchgate.net/publication/369882611_Acceptability_of_Electric_Tricycle_as_a_Public_Transportation_at_Bonifacio_Global_City_Basis_for_its_Implementation

[7] Field, M. J., & Jette, A. M. (2007). Transportation Patterns and Problems of People with Disabilities. The Future of Disability in America - NCBI Bookshelf. https://www.ncbi.nlm.nih.gov/books/NBK11420/

[8] De Jesus, F. S., & Villanueva, W. C. (2022). Effects of Environmental Regulations among Tricycle Operators and Drivers Association (TODA) in Cabanatuan City: Its Implication to the New Normal. OAlib, 09(07), 1–15. https://doi.org/10.4236/oalib.1108915

[9] Adalyn, N. (2023b, June 27). Revolutionizing Transportation-The Power of On-Demand Ride-Sharing App. https://www.linkedin.com/pulse/revolutionizing-transportation-the-power-on-demand-app-nav-Madaly

[10] SEEWORLD. (2023, September 1). Utilizing GPS trackers for vehicle location tracking in extreme weather conditions. https://www.linkedin.com/pulse/utilizing-gps-trackers-vehicle-location-tracking

[11] Grab Singapore. (2023, June 21). How does Grab match trips and orders to drivers and delivery partners? | Grab SG. Grab. https://www.grab.com/sg/blog/public-policy/how-does-grab-match-trips-and-orders-to-driver-and-delivery-partners/