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Global Positioning System – The use of the Achar Driving App to assist in the search for school driving in Manaus

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Abstract

The use of GPS - Global Positioning System is used as a parameter for the search for school transport in the city of Manaus/AM. In this article, a proposal for a software project will be presented where it is possible for parents to search for their children's school driving, taking into account the journey from the student's home to school. The search for school transport is extremely necessary given the high degree of urban violence and traffic accidents in the city of Manaus/AM. The search for technology for the safety of children and adolescents is important so that crimes that occur daily can be inhibited, bringing tranquility and security so that parents can carry out daily activities with tranquility. The present brings the proposal of developing an application that facilitates the location of parents in finding a school bus for their children in the neighborhood where they live. This application will use GPS technology to search for drivers according to their respective record.

Keywords: Gas stations; Prototype; Mobile app;

1. Introduction

What is known by the vast majority, if not everyone with a minimal perception, and that Brazil is a country of continental proportions. And that due to this size and diversity in every sense: cultural, geographical, economic and demographic, many challenges arise. Such as good public management, income distribution, education and we can classify without much difficulty as a colossal challenge would be mobility urban.

We can add that any solution that provides an acceptable level of quality and comfort to the population, is worthy of consideration. Mainly, in our city, Manaus, the metropolis and great center of the North Region, owner of great part of the companies that benefit from the incentives coming from the Free Zone.

The city of Manaus has developed economically, through great cycles, and the Free Zone, is still the main fuel for our development. However, with a disorderly growth, management with only political thoughts, unconcerned with the infrastructure, which enables satisfactory urban mobility, not committed to the sustainable development of our city, leads to several other problems and one of these is directly related to education, not precisely in the already known problems of our teaching, but in the transport of students safely.

To understand a little better about the complexity of this problem, we can

consider that there has been a significant change in family composition where we could highlight the families considered "traditional", which had the father figure as the only provider of family support and the mother being responsible for the upbringing and education of sons.

Currently, this is no longer the case in most families, this role that was once exclusively from the father, now it can be from both, where it is common for some family compositions the two work all day to supplement the household income. With their different routines and schedules, increasing the difficulty of taking their children to school, which can become very costly and difficult due to the chaotic traffic of large cities with poor road infrastructure. Therefore, knowing this difficulty, which applies to the city of Manaus, a study for the development of a mobile device application, AcharConducao App, which connects parents, the school and a school bus service provider in a platform, provides services: search for the service provider, location of the real-time car service, the classification of users of the service provided and a safety mechanism for transporting students to school.

2. Theorical Reference

The Global Positioning System - GPS is used to receive information to indicate the user's position on the planet exactly, in degrees of latitude and longitude, indicating the hemispheres. When it comes to this positioning, three segments are taken into account: control, spatial and user. The Global Positioning System brings information about location and geographic orientation, providing the geographic position at any point on the planet.

One of its main points is the basic function of identifying the location in real time of a receiver, which captures signals emitted by satellites that can be identified by a geographic positioning system, bringing

the coordinates of a certain place on Earth, thus, so that parents can know the real-time location of the school bus. (Paz, S.M., & Cugnasca, C.E. (1997)).

API stands for application programming interfaces are groupings of protocol identification to produce and integrate application software. APIs allow applications to communicate without knowing how they were developed. What facilitates the construction of applications, saving time and financial resources. APIs make it possible for multiple applications to communicate without the need to know how they were implemented. Facilitating application development, saving time and money. When developing new applications, APIs contribute by offering agility that simplify the design, administration and use, increasing the chances of provide unprecedented services. APIs make it easier to integrate new components of applications to an existing architecture, helping companies that develop applications to cooperate.

APIs are a simplified way to connect your infrastructure through the development of cloud-native applications. However, they also make it possible to share data with customers and other external users. Public APIs add business value because they simplify and extend the way you connect with partners and potentially monetize your data. A famous example is the Google Maps API.

Firebase is a tool that can significantly contribute to the quick and simple creation of high-performance applications. And a digital app development platform launched by Google. With it, you can create and expand APPS very simply, quickly and easily for ANDROID and WEB. In addition, its features allow you to improve the performance and performance of applications, make them more secure and offer a richer and more complete user experience. Firebase is considered as a backend as a service (BaaS), this is a service model that offers the entire infrastructure aimed at the inner workings of the software, such as systems, database, sending and receiving information, storage, among others. The purpose of firebase is to allow the development of applications in a simplified and practical way. In addition, with its resources it contributes to the creation of quality software with high performance and security.

2.1 The Use of GPS in School Transport

One of the ways in which GPS can be used effectively is to determine the geographic location of a particular vehicle in real time, more precisely school transport. In Brazil, hundreds of parents allow their children to use school transport as a viable option on a daily basis, but they are still afraid of the high rate of urban violence and traffic accidents.

Given this reality, technology can be used as a way of increasing the security that parents can have in relation to their children, and it can be used in school transport and increase the safety of students.

Technology can be a great ally in the safety and control of school transport vehicles, in addition to reducing costs for operators and users. It can help to solve the Vehicle Routing Problem (VRP), where each vehicle involved in school transport has a predefined route, considering the need to visit a set of bus stops for boarding or alighting students to their final destination, which can be the student's home or school (STEINER et al., 2000).

Therefore, the problem being addressed in this work is a PRV, which is configured in a routing problem for school transport vehicles.

The integration of GPS in school driving allows parents to monitor the geographic location of their children in real time, and can also be implemented in schools as a way to control the entry / exit of students, so that

they can be safe in the commute to/from school. As used by ClipEscola, which invests in the digital transformation of schools:

As used by ClipEscola, which invests in the digital transformation of schools: The parent's GPS is synchronized with the app, when the doorman releases the student, he will know that the child is getting into the right car. Even if the doorman does not remember the person responsible, the technology will show the professional that he is the right person, as he will have authorization through his registration on the platform (GRAZIELA BALARDIM, 2019).

This method is still not a reality in several schools in the State of Amazonas, but it is possible to understand that the use of systems that bring the advancement of technology and how it can be applied in everyday life is one of the most applied forms of GPS. For children to go to school safer, effective routing is needed. The Vehicle Routing Problem (PRV) can offer solutions to solve the school transport routing problem, since the PRV is a combinatorial optimization problem, whose main objective is to find the best possible path, taking into account some lateral restrictions, to serve a series of customers (GOLDEN; RAGHAVAN; WASIL, 2008).

The use of this information is crucial so that parents can be automatically notified on their mobile device and improve the safety of schools, which can offer a better way of communication between parents and children.

According to GOLDEN; RAGHAVAN; WASIL exists a category of vehicle routing problems called "rich" VRPs, which are close to the problems addressed in the real world. The main characteristics of these VRPs comprise the large number of restrictions not present in the original problem, such as multiple depots, trips to be carried out by the vehicles, various types of vehicles or other operational issues, such as loading restrictions (LEMOS, 2019). The use of this information can be crucial so that it can be used as a way to reassure parents in the face of everyday problems, no matter the age of the child, all methods that can be used to reassure are valid, but getting the child's geolocation in real time and the most effective way to reassure parents. The advantages of using technology in favor of parents is the agility in tracking and accompanying their children, whether children or teenagers, it is verified in real time by GPS.

3. Methodology

3.1 App Find Driver

The application is an effective solution to find a route to neighborhoods far from the school, and the general behavior of the application is defined from the construction of the requirements used for the proposal of the development and parameters necessary for the use and functionality of the app.

In Figure 01, you can see how the login of the child's guardians will work on the platform.

Figure 01: Home screen and login screen.
Source: Authors 2022.

One of the main objectives of the app is to identify the driver's personal and professional qualifications, in addition to the documents relating to the vehicle, through the driver's registration, and the attachment of supporting documents is mandatory to ensure the safety of children. It can be seen how this process will be carried out in figure 02.

Figure 02: Driver registration screens.
Source: Authors 2022.

From there, the app can perform the search so that the best route can be identified along the route from the child's residence to the school, if necessary, parents have the chat to answer any questions about driving. In Figure 03, you can see the screen where the search for the driver will be carried out and the results showing the registered drivers and their profile.

Figure 03: Location driver profile and chat screens.
Source: Authors 2022.

3.2 Tools and technologies used

3.2.1 Application Programming Interface

In addition to GPS, the API - Application Programming Interface or Application Programming Interface was used for the development of the application, being the way we have to communicate with the pre-programmed functions defined by the supplier, in this case, Google.

The pre-established set of actions that are used by applications that integrate the service, that is, this tool was used to integrate the software with the third-party system.

A good example of this process is the use of Google Maps by other platforms, as the Achar Driving app is used, as Google Maps is available, so that the best route can be identified during the driving route, this process is only possible by through an API.

In addition, it is possible that the search in the app can be performed based on the location of the parents and the driver, increasing the functionality of the app.

3.2.2 Firebase Realtime Database

The Firebase Realtime Database was the database used to store the data registered in the system, a tool for the persistence of data in the application, such as: driver registration data (personal data, address, documents proving aptitude to be a school vehicle driver, etc...) and on-going routes, such as (the route used from school to student's home).

The Realtime Database will sync data in real time to all devices that are linked to the app whenever data changes on the Firebase server. One of the main points of this tool is that if the application goes offline, the local data is stored and when the connection is reestablished, the Realtime Database automatically updates the device and merges the conflicts, thus being faster and more efficient.

During the journey, the driver and parents can communicate through the app, as mentioned earlier by Chat, and any change in the seat is then reflected on all connected devices, which makes it possible to use Chat in a practical way. and efficient.

3.2.3 Use Cases Diagrams

After gathering the requirements, the use case diagram was created in order to model the behavior of the system, identifying the interactions between the application and its functions.

"Use Cases make clear what the system will do and, by intentional omission, what it will not do" (Ivar Jacobson, 2011).

The diagram presents the general external view of the functions and the system, defining what the system does and not how it does it. The following figures represent the general use case diagram of the system, where it is possible to identify the registration flow of the student's father/mother, so that the information can be stored in the database and the other screens where they can verify the location of driving, driver assessment and other features.

The driver registration diagram is also presented, where it is possible to identify the driver's external view, it is possible to verify that after registering the vehicle, he can register the route and register the assistant who will be on the route, the assistant has the objective of to check during the route that the children are wearing a seat belt, seated, etc.

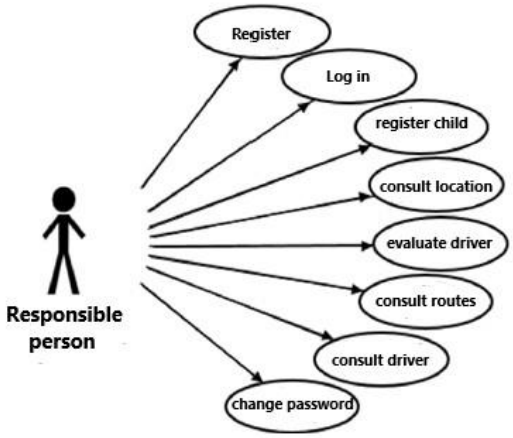

Figure 04: Father/mother registration diagram.
Source: Own authorship

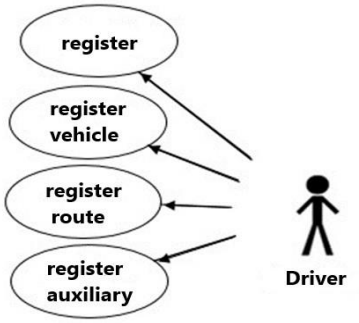

Figura 05: Driver registration diagram.
Source: Own authorship

For the development of this work, an application for use on android was presented to bring an effective solution in which it needed to raise requirements, in addition to implementing an app interface using the application's Use Case diagram, the google maps API and the FireBase API, The registration of parents, children and drivers will be saved in the Firebase database.

The requirements survey was based on the daily needs of parents, from the analysis of prerequisites so that the driver can be approved as a driver after delivery of the necessary documents to the option of sharing the route.

The main purpose of the application is to facilitate the search for a school bus, where parents can contact the drivers and have information about the person who will be taking their children to school.

4. Results

The main points of discussion were focused on the need to create an application where parents can easily find a school transport for their children, taking into account the difficulty of parents today in relation to the dynamics of finding a transport.

The interface of the project presented refers to the creation of an application where parents can easily find a school transport for their children, taking into account the difficulty of parents today, especially in finding a transport to neighborhoods further away from the school and in relation to the dynamics of finding a lead. The search parameters will be the location data of each one, the GPS and API, as they are the technological tools that enable the searches.

5. Conclusion

This article brought up the current problem in Manaus about the lack of ease in finding accessible school transport for all neighborhoods of the city. During the development of the project, the GPS - Global Positioning System was used as a parameter to share the location in real time during the journey.

The application proposal was based on the project interface API - Application Programming Interface, a tool used to communicate pre-programmed functions to bring information from the supplier's database - Google.

The app will provide parents with a structured environment with the necessary information so that parents can identify drivers and routes, with the main objective of optimizing search time.

The interface of the project presented on the creation of an application taking into account the difficulty of parents today in relation to the dynamics of finding a driving, in this sense the GPS and the Google maps API is used as a parameter for the search.

To use the application, parents must register on the platform. With the registration done, it is possible for them to access the application and thus register their children, in addition to registering children, it is possible to consult the real-time location of the driving, consult routes that will be traced by drivers, evaluate drivers and search by new drivers based on their location.

The need for the app is due to the growing increase in problems related to the lack of information from parents and the route, bringing more security to parents in the face of the lack of a place where to find a more certain, objective and reliable way for their children to drive.

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6. References

ARAÚJO, M. V. M. Monitoramento de celular por GPS. 2011

BALARDIM, G.B. 5 vantagens de usar a tecnologia para acompanhar o transporte escolar e o acesso à escola. Publicação de conteúdo. ClipEscola, 19 de junho – 2019.

BORGES, K.A.V., Modelagem de dados geográficos. UFMG, 2002

CARVALHO, E.A. ARAUJO, P.C. Noções básicas de sistema de posicionamento global GPS. Natal. 2009

ClipEscolaB. L.; RAGHAVAN, S.; WASIL, E. A. The vehicle routing problem: latest advances and new challenges. [S.l.]: Springer Science & Business Media, 2008. v. 43.

Cordeiro, A. T., & de Mello, S. C. B. Entre a casa e a escola: articulações discursivas em torno do transporte escolar privado. 2018

JACOBSON, I.J. SPANCE, I.S. BITTNER, K.B. Use-Case 2.0. The Guide to succeeding with Use Case, 2011.

LEMOS, M. T. Web solution for the management of data related to the school bus routing problem. 2019.

NOGUEIRA, R. L. Utilização do Banco de Dados Firebase realtime para a criação de uma aplicação para controle de manutenção da frota de veículos em Android persistente. 2018

Oliveira, A. M. Tutorial funções básicas do CANVA: para qualquer uso. 2021

Oliveira, S. R. L. D., Carvalho, M. D. D. B., & João, P. R. D. Normas de segurança para o transporte de crianças em automóveis. 2007, 129-143.

De Oliveira Filho, D. C. UM PASSO A PASSO PARA A ELABORAÇÃO DO DIAGRAMA DE CASO DE USO DA UML.

Paz, S. M., & Cugnasca, C. E. Uma ferramenta para desenvolvimento de equipamentos que utilizem um receptor do Sistema de Posicionamento Global (GPS). Universidade de São Paulo, São Paulo. 1997.

Sousa, E. P. M. D. Emulação de um Gerenciador de Dados Orientado a Objetos através de uma Interface de Programação de Aplicativos sobre um Gerenciador Relacional (Doctoral dissertation, Universidade de São Paulo), 2000.

STEINER, M. T. A. et al. O problema de roteamento no transporte escolar.

Pesquisa Operacional, SciELO Brasil, v. 20, n. 1, p. 83–99, 2000.