Android application for tracking the garbage collection vehicle in Huauchinango Puebla

Aplicación Android para el rastreo del vehículo recolector de basura en Huauchinango Puebla

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Abstract

The present investigation deals with the development of an application for Android devices to monitor in real time the garbage collection vehicle in the municipality of Huauchinango Puebla, the objective of this is to propose a solution for the collection problems in the city of Huauchinango Puebla, and thus be able to avoid sources of infection, bad appearance and accumulation of animals that can be dangerous for the general public. The application will be developed in Android Studio, using the extreme programming methodology for its development. The satellite tracking will be through an Android application which will constantly send the geolocation of the vehicle to a server that in turn will be accessed by a second application to indicate the location of the vehicle, as well as this will show the warnings when the collection vehicle does not Make your route, go late, when you are close and at what time you will be arriving at the collection area in order to remove the waste in a timely manner.

Android, Geolocation, Collection. Application

Resumen

La presente investigación aborda el desarrollo de una aplicación para dispositivos Android para dar seguimiento en tiempo real al vehículo recolector de basura en el municipio de Huauchinango Puebla, el objetivo de esto es proponer una solución para los problemas de recolección en la ciudad de Huauchinango Puebla, y así poder evitar focos de infección, mal aspecto y acumulación de animales que pueden ser peligrosos para la ciudadanía en general. La aplicación será desarrollada en Android Studio, utilizando la metodología de programación extrema para su desarrollo. El rastreo satelital será a través de una aplicación Android la cual mandara constantemente la geolocalización del vehículo a un servidor que a su vez será accedido por una segunda aplicación para indicar la ubicación del vehículo, así como también esta mostrara los avisos cuando el vehículo recolector no realice su recorrido, vaya retrasado, cuando este cerca y a qué hora estará llegando a la zona de recolección para así sacar los residuos en tiempo y forma.

Android, Geolocalización, Recolección, Aplicación

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Introduction

In the municipality of Huauchinango Puebla there is the problem that people are not sure of the moment in which the garbage collection car will pass, that is why, not knowing the correct moment to take their garbage out to the street, they take it out from the tomorrow either because you have to work, or leave your home for any reason.

Given this situation, people leave their garbage in the middle of the public road waiting for the garbage truck to pass, this generates points of infection, accumulation of animals such as dogs, rats, etc., which are also carriers of diseases, in addition to giving a bad appearance to the city and obstruct pedestrian crossings.

Given the above, an application is proposed that notifies citizens on their cell phones, the real time in which the garbage collection vehicle will be passing to their neighborhoods, as well as for some fortuitous reason, such as the breakdown of the vehicle, the absence of the driver etc., do not take the tour. The user will be able to have a better overview of the itinerary of the collection vehicle, and thus only take out their garbage at the right time or even not take it out if the vehicle does not pass.

This document will explain the analysis for the development, the design, the initial programming and the results of the first phase of the mobile application in order to treat the problem posed.

This first phase consists of the development of an application that shows the current coordinates at the moment of pressing a button. Subsequently, it will be verified that the values are correct directly in Google Maps, using the coordinates shown by the application.

Analysis

An initial analysis was made, in which the types of technologies to be used to carry out the project were compared, comparing costs, device size, and characteristics. Table 1 show the technologies that were compared.

	Android Device	GPS	Arduino
Tracking	X	X	X/Add on
GSM Network	X	X	X/Add on
Power source	Battery	Battery	USB/ Battery
Using time	Depending of device	4 a 6 days	---
Price	Depending of device	$400	$250

Table 1 Technologies comparison
Own Elaboration

At the end of the first analysis of technologies, it was decided to use a GPS tracker, since the cost was the lowest, adding that being a dedicated device, it should have the best response.

The selected device was the "GF7 mini magnetic tracker" due to its size and price, however, after doing the communication and response time tests, the results were not as expected. Since if response time ranged between 5 and 7 seconds, and its accuracy was not correct. For these reasons, the use of GPS trackers was ruled out, since several devices would have to be tested to find out which one best meets the expectations of the project.

Knowing this, the option that was chosen was the development of a mobile application. Taking advantage of the fact that cell phones already have their own GPS tracker and are programmable. Making this more adaptable to the project.

For the development of the mobile application, it has been selected that the first version should be for Android devices. Since in the city of Huauchinango approximately 80% of people use this platform.

Its development will be in Android Studio since this IDE is the native one for developing Android applications, using JAVA language, with Google maps API to be able to have a more exact geolocation of the device.

First configurations

In order to use the Google API, a key is required, which is configured from Google Cloud Platform, for this we must go to the drop-down menu and select API and services as shown in figure 1.
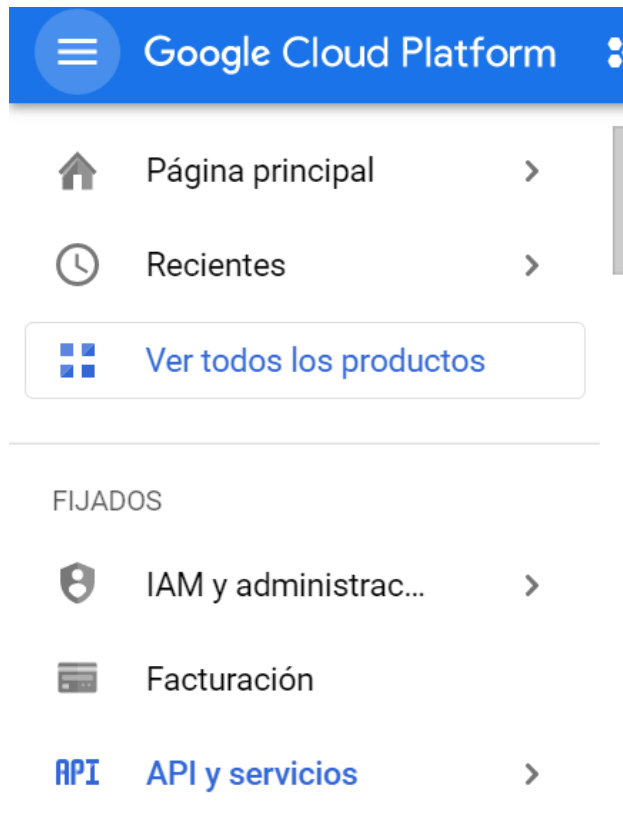
Figure 1 Services and API selection
Google Cloud platform

Once the API and services section has been selected, the library option must be selected and then the MAPS SDK, PLACES API and MAPS Java Script API services must be enabled, as shown in figure 2.
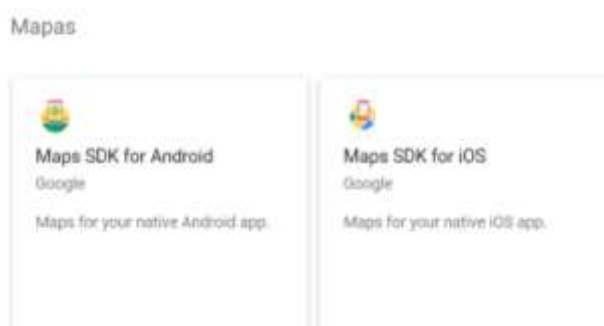

Figure 2 Google services
Google Cloud platform

After having enabled google services, an API key must be created, which is necessary to be able to use google services, for this you must select the credentials section and then select create credentials as shown in figure 3.
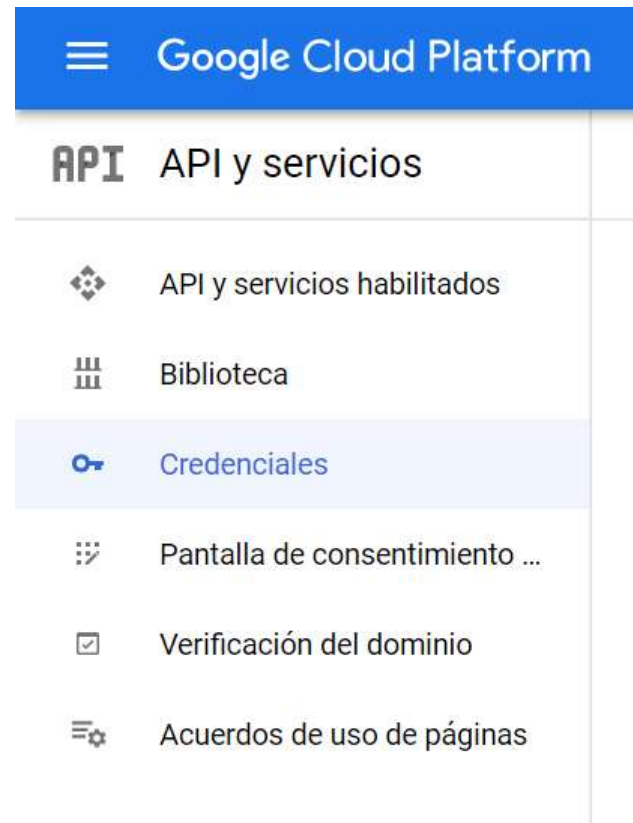

Figure 3 API credentials.
Google Cloud platform

At the end, a key will be obtained which must be included in the Android application manifest.

Programming

To be able to use google maps. The key that will obtain after the configuration of the APIs must be used, this key must be used in the Google manifest, as well as the necessary permissions so that the application can use the geolocation of the device and the internet, as shown in the following figure 4.

Figure 4 Android manifest, Key API uses
Android studio

Once the manifest is finished, the screen is developed, in this case the application must show the real location of the device when pressing a button, which we call coordinates, then the design of the first version of this application is shown.
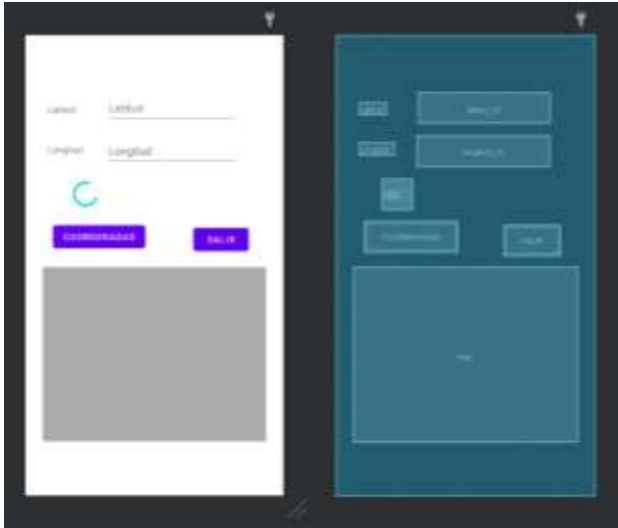
Figure 5 Application initial design
Android studio

After having designed the application, we proceed to develop the java code to make the application work.

Variables of type object found in the design screen must be created, this to make a connection between the code of our application and its design, as well as the global variables necessary for the development of our program as shown in figure 6.

Figure 6 Global variables creation
Android studio

In the *OnCreate* method, the connection of the objects with the design of the application will be made, followed by the *GetCoordenadasActual* method, in which it is checked if the application already has the necessary permissions for the execution of the program. In case of not having permissions, the application ask to the user if he grants permissions for internet use and geolocation, see figure 7.

Figure 7 Permissions and variables initialization
Android studio

Finally, the main method is created, which is going to be the one used by the button of our application to obtain the current coordinates of the device. This also checks that you have the necessary permissions to be able to use the *locationRequest* classes that allow us to use the geolocation of our device. And show the current coordinates on the screen of our application. As show in the following figure 8.

Figure 8 Main method
Android studio

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Results

The application was tested to know the accuracy of the current location, once the *coordenadas* button is pressed, it gives us the current location of our device, as shown in figures 9 and 10.
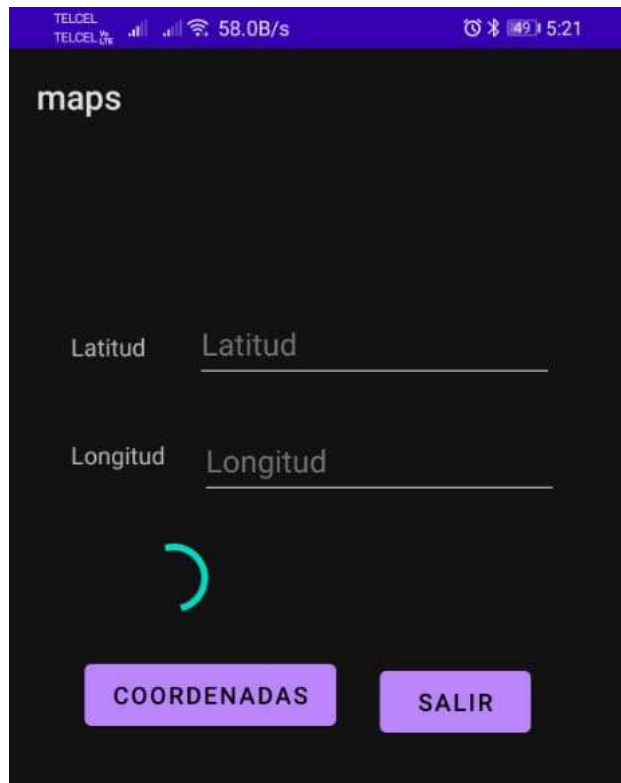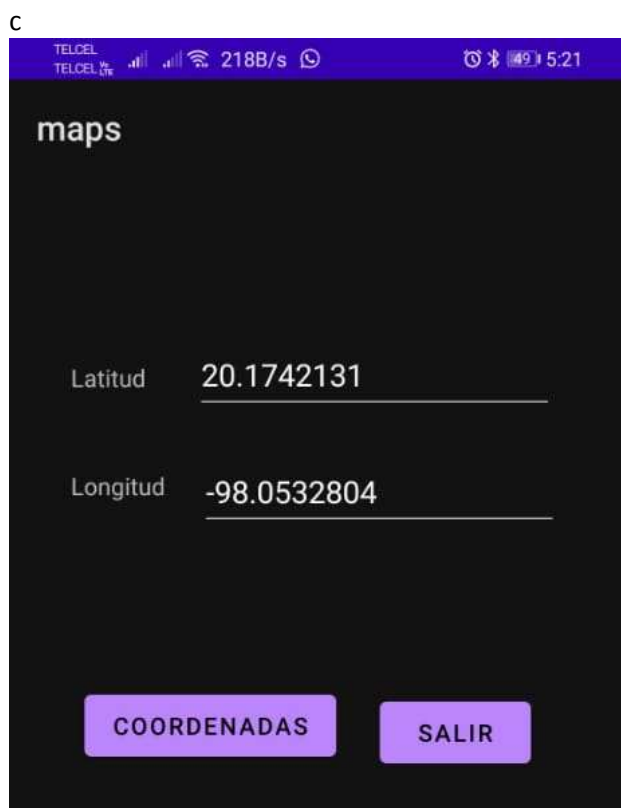

Figure 9 Main Screen
Android OS

c

Figure 10 Program running.
Android OS

The location are checked from Google maps, figure 11, to verify that they are correct and precise.

Figure 11 Real time geolocation
Google maps

The results of the application are as expected, since it shows us the location quickly and quite accurately, with a difference margin of approximately 5 meters, this does not affect the result of the purpose of the application, which indicates that it is the most viable technology, for the execution of the project using an application that must be carried by the Android device of the driver of the garbage collection vehicle.

For the next phase, this application will cyclically send its current location to a server, so that it can then store it and thus be able to have a log, to which there will also be a client application, which will be the one that shows the map obtaining the last stored location. on the server constantly to monitor the collection vehicle in real time. As well as showing the necessary notices so that the user takes out the garbage at the right time or, if necessary, not to take out their garbage. As shown in the following figure 12.
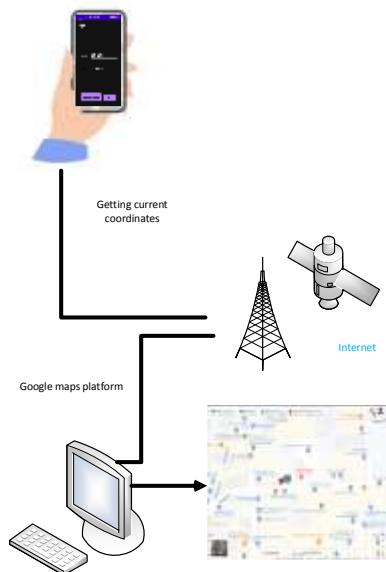
Figure 12 General diagram
Own elaboration

Gratitude

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Conclusions

This article introduces the real-time satellite tracking of an Android device.

This gives us certainty that the most appropriate technology for the garbage vehicle tracking project will be to use the Android device that the vehicle carries. Since its response time and accuracy are adequate, adding that the device being programmable, better functions can be added in future versions which are useful depending on the needs of the users.

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