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THEME:

"GEOGRAPHIC INFORMATION SYSTEM FOR PRIVATE PARKING MANAGEMENT USING PHONEGAP FRAMEWORK AND MOBILE-D DEVELOPING METHODOLOGY"

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GEOGRAPHIC INFORMATION SYSTEM FOR PRIVATE PARKING MANAGEMENT USING PHONEGAP FRAMEWORK AND MOBILE-D DEVELOPING METHODOLOGY

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Abstract. *The continuous advancement of technology and the massive use of smart mobile devices, provide the possibility to implement new solutions for everyday problems and optimizing efficiency in the utilization of resources. One of the problems in big cities is the lack of information about the available parking spaces and the difficulty to find a parking lot. The purpose of this research is to develop a technological system that uses the theory of geographic information systems (GIS) in the processing of parking services information, tools for the management and administration of the squares of parking making use of the framework Laravel that is written in PHP language, is also implemented a mobile application hybrid developed with technologies web and compiled to the platform Android using the Phonegap framework. For process control and follow-up of the project it makes use of the methodology Mobile-D, ensuring the quality of the software.*

Keywords

Geographic information, Laravel, Phonegap, Android, Mobile-D, Parking.

1. Introduction

The constant increase of vehicles in cities causes relatively greater demand for parking spaces (Krugman, Olney, Wells, & Apilanez, 2008). Currently parking services do not make use of technological means to deliver information to the user about the location or availability that offer. Certain random parking, located in the Centre of the city of Ibarra has taken as an object of study. Ibarra there is implemented a system for the management and administration of public places called "Sistema de Estacionamiento Municipal Rotativo Tarifado" (SISMERT), In the year 2016 the project has been started and has developed a mobile application identified as "sistema integral de parqueo" (SIP),

Available for Android and that its objective is to show the squares that are governed by the SISMERT program (Aguas Herrera, 2015).

The accelerated use of smart mobile phones to carry out everyday tasks (INEC, 2013), It is a fundamental point for the realization of solutions that counteract the problem of immediate search of parking. It is also necessary to highlight the increase of people accessing internet and implementation of geolocation on mobile devices.

The continuous advancement of technology has allowed that geographical information systems are implemented and executed on low-cost computers that are available to people of most low to medium economically speaking and which becomes vital to the education process (Vázquez-Cano & Sevillano, 2015). Thus developed GIS projects that offer services of geo-location, maps, geocoding, among others, and can be used by a mobile device. One of these services is Google Maps, which offers tools that allow working with geographic information and maps from around the world (Dincer & Uraz, 2013).

Laravel framework is written in PHP language and is open source, is oriented to the development of web applications, in addition its components supported in other frameworks such as; symfony, codeigniter. And that due to its characteristics of modularity, scalability, robustness, is among the major frameworks used by developers and requested by companies (Murthy, 2015).

A hybrid Mobile application is the combination of native application and a web application, collects the best of each and the advantages of this kind of applications we can mention that they occur with web languages; HTML, Java, CSS, and that can be distributed to mobile platforms; Android, iOS, and others. PhoneGap It is a framework designed for the development of hybrid applications belonging to Adobe, provides a compilation in the cloud service called Phonegap Build, the entire

project is based in Cordova of belonging to the company Apache, its code open source and additional libraries are freely distributed through the repository of npmjs libraries (Ghatol & Patel, 2012).

This research is based the development of a system that uses geo-referenced of the parking information and sends the information through web services, the hybrid Mobile application reads these data and using a map from Google Maps, there are drawn the parking positions markers. This would also improve the efficiency in the use of the parking service, there would be savings in resources of time, money, and would implement a culture in which the streets would not be infested car.

2. Materials and Methods

NetBeans extensions development environment was used for the development of project for the support of PHP, and at the same time the word processor Atom with the support of JavaScript language plugins, each for the coding of the web system and the mobile application respectively.

2.1 Openshift

The web system for management and administration of parking lots, is hosted on the service platform as a service (PAAS) of Openshift. The small server features are: 1cpu, ram memory 512mb and 1 gb storage. In terms of software service, openshift offers the deployment of applications developed with the framework Laravel version 5.0, mysql 5.5 and PHP 5.4.

Proceeded with the creation of an account in openshift, the establishment of the components of software and then cloning project in a local environment for development. The above mentioned process was used to ensure that local development had problems at the time of deployment of the system on the server, attempting to find problems at an early stage.

TYPE	CPU	RAM MEMORY	STORAGE
SMALL GEAR	1	512 MB	1 GB

Table. 1. Small gear server configuration.
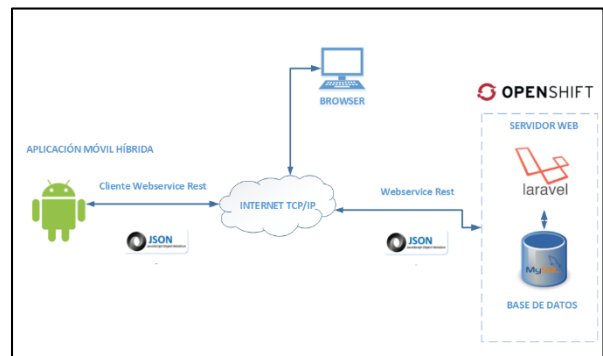
Source: Own

2.2 System Architecture

Figure. 1.   System Architecture.

Source: Own

It is used as a platform Openshift and MySql database, to run the framework model view controller Laravel, which offers web services information in JSON format and this is consumed by the mobile application for further processing.

2.3 Hybrid Mobile app build

For the compilation of a hybrid application, there are two possibilities, the first; PhoneGap has a paid service known as online PhoneGap Build to perform this process, and the second is to compile locally through the shell of Cordova. For this application has been chosen by the local compilation.

2.4 Methodology

Mobile-D agile development methodology was used for this project, this methodology poses five phases: exploration, initialization, production, stabilization and testing. All stages except for the first work according to three days, on the first day are plated tasks, objectives, on the second day the issues raised is developed and on the third day a not final version of the product is released.
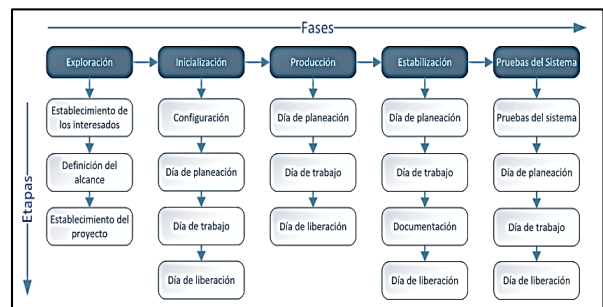

Figure. 2.   Mobile-D Methodology.

Source: Own

3. Results

They managed to successfully develop a web system that manages and administers the services of private parking, with tools to establish price per hour, types of eligible vehicles, users control and registration of geographic information and control of parking spaces.
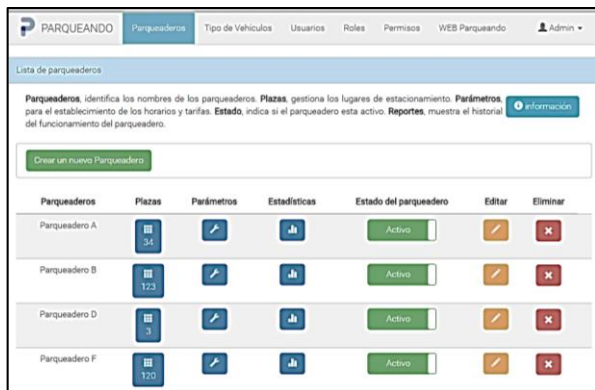

Figure. 3. Web system, management and administration of parking.

Source: Own

With colors implementation and bootstrap style design, manages to make the system adapt to any screen size, allowing a greater acceptance and usability.

The coding of the project with web technologies enables parking search service can also be used in a common web browser.
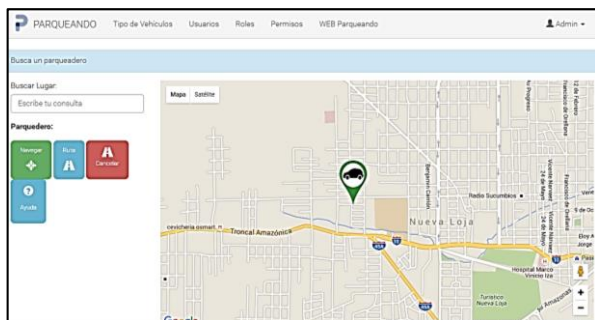

Figure. 4. Web system, search parking spaces.

Source: Own

The hybrid Mobile app was compiled only for the Android platform, is called "AndoParqueando" and is located in the store of Google Play available for download free of charge. It was possible that coding with web technologies through the PhoneGap framework can be run by the mobile platform.
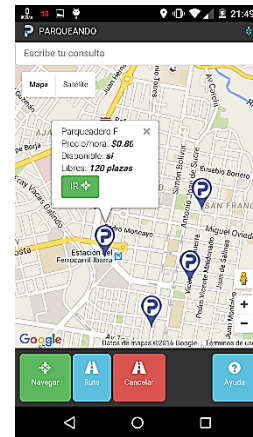

Figure. 5. AndoParqueando mobile application.

Source: Own

4. Conclusions

Parking services registered in web system information can be query immediately and in real time.

With the use of components based on web technologies; HTML5, CSS3, jQuery, JavaScript, Ajax and the bootstrap framework, managed to have the interface of the system 100% acceptance in the handling of functionality and visual adaptation from any device.

Development based on the three days according to the Mobile-D methodology allowed to easily recognize the priority of tasks, was also perfected capabilities due to the recognition of errors at an early stage.

Mobile-D methodology provides flexibility in the use of information from your basis methodologies, is so we used information from the Extreme Programming methodology for the development of user tasks.

The use of the JavaScript Api v3-Google Maps allowed a better user experience due to the use of the functionality of Google Street View.

Bibliography

[1] Krugman, P., Olney, M. L., Wells, R., & Apilanez, G. P. (2008). *Fundamentos de economía*. Editorial Reverté, S.A. Retrieved.

[2] Aguas Herrera, C. (2015). No 1, Parqueo digital se inicia en la ciudad. Recuperado Abril 11, 2016, de http://www.elnorte.ec/ibarra/actualidad/60649-parqueo-digital-se-inicia-en-la-ciudad.html.

[3] INEC. (2013). *Tecnologías de la Información y Comunicaciones (TIC´S) 2013*. Ibarra. Recuperado Abril 11, 2016 de http://www.ecuadorencifras.gob.ec/tecnologias-de-la-informacion-y-comunicacion-tic/

[4] Vázquez-Cano, E., & Sevillano, M. L. (2015). *Dispositivos digitales móviles en Educación: El aprendizaje ubicuo*. Narcea Ediciones.

[5] Dincer, A., & Uraz, B. (2013). *Google Maps JavaScript API Cookbook*. Packt Publishing.

[6] Murthy, I. S. (2015). 7 Best PHP Frameworks for 2015. Recuperado April 11, 2016, de https://www.linkedin.com/pulse/7-best-php-frameworks-2015-winspire-web-solution

[7] Ghatol, R., & Patel, Y. (2012). *Beginning PhoneGap: Mobile Web Framework for JavaScript and HTML5*. Apress.

About the Author...

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