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LOCATOR SYSTEM FOR LOST PETS BASED ON A CELL PHONE APP AND THE GPS PLATFORM

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Abstract: The objective of this project is to design and develop a geolocation system (GPS), and an APP software applied to mobile objects, especially pets, generating dignified treatment in the care and protection of a pet (dogs, cats, birds etc.). A pet finder mobile application (app) is a program designed to be downloaded for free on a device and which can be accessed directly from your cell phone or from some other mobile device (tablet or smartphone or some other mobile device with Internet access) and with With little programming knowledge, a user could download this application in stores such as Play store, app store, etc., from their device, generate their data and locate in real time or in delayed spaces the object (pet) that has been chosen, thus the system will It is based on the design of a proven electronic communications device (hardware) that searches, communicates and finds the Geolocal position of a lost pet.
Keywords: Apps, smartphones, Play store, gps, geolocal.

INTRODUCTION

APPLICATION BACKGROUND

Applications – also called apps – have been present on phones for a long time; in fact, they were already included in the Nokia or Blackberry operating systems years before. The mobile phones of that time had small and often non-touch screens, and they are what we now call feature phones, as opposed to the more current smartphones.

In itself, an application is still software. To better understand the concept, we can say that applications are for mobile devices what programs are for desktop computers.

Today we find applications of all types, shapes and colors, but in the first phones, they were focused on improving personal utility: they were alarms, calendars, calculators and email clients, etc.

There was a big change with the arrival of the iPhone on the market, since with it new business models were generated that made applications somewhat profitable (3), both for developers and for application markets, such as the App Store, Google Play and Windows Phone Store.

GPS

On the other hand we have GPS systems (Satellite positioning systems). The Global Positioning System (GPS), and originally Navstar GPS, is a system that allows the position of a device to be determined throughout the globe. object (a person, a vehicle) with a precision of up to centimeters (if differential GPS is used), although a few meters of precision is typical. The system was developed, installed and used by the United States Department of Defense. To determine positions on the globe, the GPS system uses 24 satellites and uses trilateration.

GPS works through a network of 24 satellites in orbit above planet Earth, at an altitude of 20,200 km, with synchronized trajectories to cover the entire surface of the Earth. When you want to determine the position, the receiver used for this automatically locates at least three satellites in the network, from which it receives signals indicating the identification and clock time of each of them.

Based on these signals, the device synchronizes the GPS clock and calculates the time it takes for the signals to reach the equipment, and thus measures the distance to the satellite using the inverse trilateration method, which is based on determining the distance from each satellite to the measurement point. Once the distances are known, one's own relative position with respect to the satellites is easily determined. Also knowing the coordinates or position of each of them from the signal they emit, the

absolute position or real coordinate of the measurement point is obtained. Extreme accuracy is also achieved in the GPS clock, similar to that of the atomic clocks that each of the satellites has on board.

METHOD DESCRIPTION

PET GPS TRACKING AND CONTROL

Our GPS devices track the location of objects (pets) at any given time and display them in the most user-friendly GPS app (mobile devices). The user will know when they arrive at any place and how those objects move. You can even get automated alerts based on when someone removes or takes the designated object (pet) from a location.

INTEGRATION WITH MOBILE TELEPHONY

Currently within the mobile phone market the trend is for manufacturers to integrate GPS technology into their devices. The use and massification of GPS is particularly widespread in smartphone mobile phones, which has given rise to an entire software ecosystem for this type of device, as well as new business models that range from the use of the mobile terminal to traditional point navigation. -to-point until the provision of the so-called Location Based Services (LBS)3.

A good example of the use of GPS in mobile telephony are applications that allow you to know the position of close friends on a base map. To do this, it is enough to have the respective application for the desired platform (Android, Bada, IOS, WP, Symbian) and allow it to be located by others.

DGPS

DGPS (Differential GPS), or differential GPS, is a system that provides GPS receivers with corrections to the data received from GPS satellites, in order to provide greater precision in the calculated position. It was primarily conceived due to the introduction of Selective Availability (SA)4.

The basis lies in the fact that the errors produced by the GPS system affect the receivers located close to each other equally (or in a very similar way). The errors are strongly correlated in the nearby receivers.

A fixed GPS receiver on the ground (reference) that knows exactly its position based on other techniques, receives the position given by the GPS system, and can calculate the errors produced by the GPS system, comparing it with its own, known in advance. This receiver transmits the error correction to the receivers close to it, and thus these can, in turn, also correct the errors produced by the system within the signal transmission coverage area of the reference GPS equipment.

APPOSITION RELIABILITY AND POSITION ERROR CORRECTIONS

For DGPS corrections to be valid, the receiver has to be relatively close to some DGPS station; generally, less than 1000 km. The precisions handled by differential receivers are centimeters, so they can be used in engineering.çç-allows the position of an object, a person or a vehicle to be determined worldwide with a precision of up to centimeters3.

DEVELOPMENT

To implement the development of the proposed system, it has been decided to separate the software system for designing an application into two blocks or forms of design, in which a program is chosen for the design of the app and, on the other hand, a module is chosen at the hardware level. which has been searched within a set of several modules at the IC (integrated circuit) level that meets the characteristics posed by an end-user need.

We first begin by analyzing an IC model known by a recognized patent, namely Digikey-electronics is a recognized patent brand in the telecommunications market with which certain user requirements are satisfied 4.

USER REQUIREMENTS

In order to choose a model at the hardware level, it was necessary to satisfy the following:

Have tiny physical dimensions (length, width and thickness in millimeters), light in weight (5 to 10 grams) and compact and possible to encapsulate, electrical characteristics such as: low energy consumption, latest generation battery and low electrical power (Retrievr) and if the model allows it, it must be self-rechargeable. The final model must be in appropriate ergonomic shapes depending on the user, it will be designed in various ways that adapt to the object (pet), an example of that in Figure 1 and 2.

Figure 1: IC M10478 is used for testing.

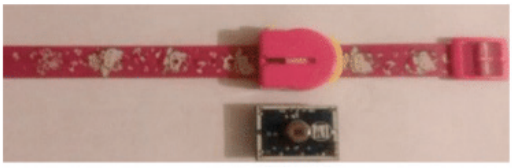

Figure 2: An example for testing and functionality.

For such experiments, some technical characteristics of the chosen model are observed, we present a summary of the GPS technology model used.

GPS technology is increasingly integrated with low power modes, meaning tiny receivers can now be powered by solar cells. One example is Retrievor (figure 3), a collaboration of American, Australian, British and Chinese companies raising funds through crowdsourcing to develop a coin-sized GPS tracking device. A small, self-powered GPS system can be used to track valuable items and even pets, using Android and Apple iOS apps that provide location information.

The Retrievor unit measures 28 mm (1.10 in) in diameter and 10 mm (0.39 in) thick, and the antenna is integrated into the module to keep the footprint small. It uses the SiRFstarIV GPS processor which allows operation in difficult GPS environments such as indoor tracking or when the end user is on the move. This high level of GPS performance is achieved through innovative GPS firmware, which can detect changes in context, temperature, and satellite signals, and updates its internal data whenever possible, providing near-permanent navigation.

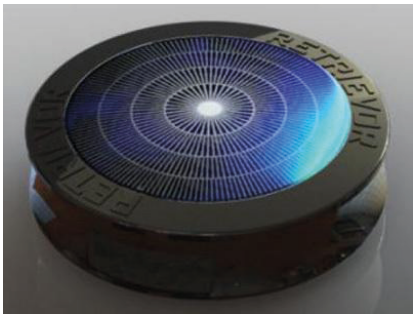

Figure 3: The coin-sized Retrievor GPS receiver.

Power for the Retrievor comes from a solar panel integrated into the motion charger that powers a 3.7V lithium-ion battery, which can also be charged via micro USB. User-defined ping rates can be adjusted every second once a day so that the Retrievor never needs a recharge, in the same way that the retrievor our minisystem will look for an alternative to self-power Figure 1 and 2.

MODULAR STRUCTURE OF A GPS RECEIVER

Highly compact modules (figure 1) that combine RF (radio frequency) and antenna can be mixed with energy harvesting and power management transducers to provide the same kind of small system that is independent of power supplies. Solar cells like those from Sanyo can cover all energy needs, with special attention to the system's available energy. With these small form factors, it is also vitally important to avoid problems with RF distribution that can consume power and render the energy harvesting source insufficient.

The integrated circuit C.I. Used on the Retrievor is Antenova's M10478 is a highly integrated GPS, RF and antenna module suitable for GPS L1 band and A-GPS systems. The device we used for testing has the same electrical characteristics, is based on the same SiRFstarIV GPS architecture used in the Retrievor, combined with high-efficiency antenna technology from Antenova, and is designed to provide optimal radiation patterns for the reception of GPS.

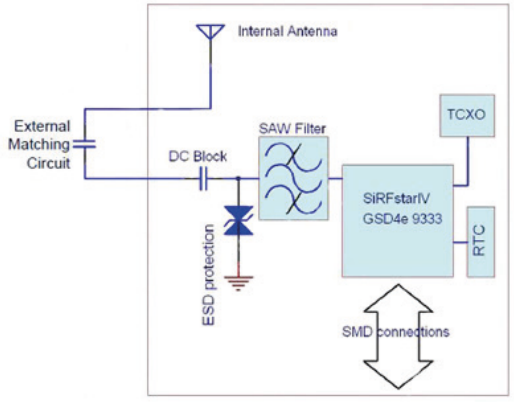

Figure 4: Block diagram of the M10478 GPS module.

All front-end and receiver components come in a single laminated package base module, providing a complete GPS receiver for optimal performance. The M10478 (Figure 5) operates on a single 1.8 V positive supply with low power consumption and in several low power modes for greater power savings, allowing it to be powered by a 3.7 V lithium battery that It is supplied by the solar cell. A precise 0.5 ppm temperature compensated crystal oscillator (TCXO) ensures a short time to first positioning for mobile applications, and the self-contained software supports the module that supports UART (Universal Asynchronous Receiver Transmitter), SPI (Interface Peripheral in Series), and I^2C (Inter Integrated Circuits).

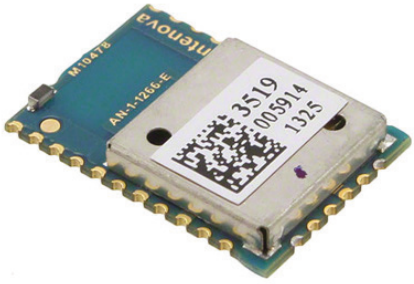

Figure 5: Antenova's M10478 GPS GPS module integrates the antenna system.

For a small design, it is common to encapsulate the product, and there is a wide variety of encapsulated components with varying dielectric properties. Since these components can significantly affect the RF performance and the ability to rework or maintain the product, the designer must exercise caution in the choice and qualification of such material.

SOFTWARE CASE

Types of application according to their development

The design and development process of an application ranges from the conception of the idea to the analysis after its publication in stores. During the different stages, designers and developers work—most of the time—simultaneously and in coordination.

We have summarized the phases of this

process only from the perspective of design and development, that is, without taking into account the coordination roles, customer participation, or the company's shareholders.1

Each of the stages—except development—.

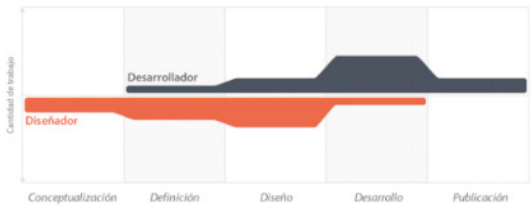

FIGURE 6: The design process covers different stages where designer and developer work simultaneously, with more or less workload depending on the moment.

CONCEPTUALIZATION

The result of this stage is an application idea, which takes into account the needs and problems of users. The idea responds to a preliminary investigation and the subsequent verification of the viability of the concept.

Ideation

Investigation

Formalization of the idea

DEFINITION

In this step of the process, the users for whom the application will be designed are described in detail, using methodologies such as "Personas" and "User Journey". The foundations of functionality are also laid here, which will determine the scope of the project and the complexity of the design and programming of the app.

Definition of users

Functional definition

DESIGN

In the design stage, the previous concepts and definitions are brought to a tangible plane, first in the form of wireframes, which allow the creation of the first prototypes to be tested with users, and later, in a finished visual design that will be provided to the developer, in form of separate files and model screens, for code programming.

Wireframes

Prototypes

Test with users

Visual design

DEVELOPMENT

The programmer is in charge of bringing the designs to life and creating the structure on which the operation of the application will be based. Once the initial version exists, he spends much of his time fixing functional errors to ensure proper performance of the app and prepares it for approval in stores.

Code programming

Bug fixes

PUBLICATION

The application is finally made available to users in stores. After this momentous step, monitoring is carried out through analytics, statistics and user comments, to evaluate the behavior and performance of the app, correct errors, make improvements and update it in future versions.

Launch

Follow-up

Update These stages are crucial in the project of interpolating the software and giving functionality to the app, which we will briefly point out in the development stage, once this takes place the testing and unification stage with the hardware.

CONCEPT (Idea)

DEFINITION (functionality)

DESIGN (wireframes)

DEVELOPMENT (create structure)

PUBLICATION (Store launch)

FIGURE 7.1.Wireframes, even when they are on paper, are essential before starting visual design.

FIGURA 3.1.Los *wireframes*, aun cuando sean en papel, son fundamentales antes de comenza el diseño visual.

FINAL COMMENTS

SUMMARY OF RESULTS

In this investigative work, a combination of a positioning system with micro modules at IC GPS level was studied. The results of the research include the electrical analysis and signals in L1 band of the signal responses are in continuous analysis and will be presented in a section for more information.

CONCLUSIONS

The results demonstrate the need to focus on the development level and a software application for the app. It is essential that the good use of programming and design combine with the needs of the end user and place its functionality on the final market.

RECOMMENDATIONS

Researchers interested in continuing our research could focus on our proposed literature and experiment with the electrical features that manufacturers provide by improving the application. We could suggest that there is an abundant field yet to be explored when it comes to geolocation systems with unimaginable utilities, they must be developed and made in the future.

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