Control of Assistance and Monitoring GPS for Workers and Vehicles of the Sistemas de Automatización y Control Company in the Ibarra City

Evelyn C. Torres

Universidad Técnica del Norte

`edtorres@utn.edu.ec`

Summary— **This project aims to design a *GPS system of Assist Control and Monitoring for workers and vehicles of Sistemas de Automatización y Control company located in the Ibarra city.***

Initially described previous research to determine the different systems, tools and supported software that will serve for the development of the project; it was chosen based on this to use GSM network, GPS system and App Inventor, MySQL and LabVIEW software.

It was designed a mobile application for Android devices in App Inventor with the aim to collect and send the worker's location by text message through the GSM network to the server of the company to be recorded and stored. On the other hand, the GPS / GSM module installed in the vehicle obtains the position thereof, and with the help of a microcontroller sends via text message to the server to be displayed on the google map.

***GPS system of Assist Control and Monitoring* is developed in LabVIEW supplemented with MySQL, allowing you to store, edit and delete data of workers and vehicles, while only their location of thereof is stored and displayed.**

*Index Terms—***GPS, GSM, GPS/GSM module.**

I. INTRODUCTION

T he control and monitoring of people is an administrative procedure whose purpose is to register, control and ensure the personnel working in a company or institution. Companies have used employee tracking for several decades to track production, inventory or, in general, improve their efficiency. Initially mechanical counters of keystrokes were used and in recent years the old methods of supervision have been changed by modern technological methods.

Supervision is not only used to control the safety and productivity of employees, but also helps companies financially, since it allows the employer to know the time of entry and exit of their staff and thus determine how committed and responsible each employee with their work, in promotions, academic scholarships, concession rights, compensation for time of services, rotation movements or relocation.

In the same way companies take care of the assets they have, that is, machinery, technological devices or vehicles. They use monitoring systems to improve the services they offer, such as tracking a vehicle in case of theft, monitoring the route of an aircraft or boat in case of emergency or finding an address to increase productivity, efficiency and reduce costs.

At the same time, the monitoring of assets and personnel of companies can be complemented by other specific systems such as speed control, gasoline monitoring, audio, cameras, among others to improve and secure the economic interests of the company.

The new technologies are helping in the monitoring process, allow to control the entry, exit and location of the personnel inside or outside the company and are designed to be configured according to the requirements of the employer. There are many mechanisms such as fingerprint detector, card control systems, biometric systems, GPS geolocation, satellite tracking and mobile applications. Some of these systems use short-range wireless technology such as RFID or NFC and wireless transmission networks such as GSM and WCDMA, in turn the devices are connected through corporate LANs and can even connect with other devices located in different parts of the world and De This way is recorded in a database the control information of each employee, there is also control software based on WEB.

II. THEORETICAL FOUNDATION

A. Global Positioning System

GPS developed by the United States Department of Defense is a global navigation system consisting of 24 artificial satellites of which 21 are regular and 3 are backed up as shown in Fig. 1, in addition to their respective earth stations, this System provides positioning information 24 hours a day, regardless of weather conditions.

The GPS system is based on the measurement of distances from radio signals transmitted by a group of artificial satellites whose orbit is known precisely, these signals are captured and decoded by receivers located at the points of the position to be determined. GPS uses artificial satellites as a reference point for calculating positions on the surface of the earth, precision
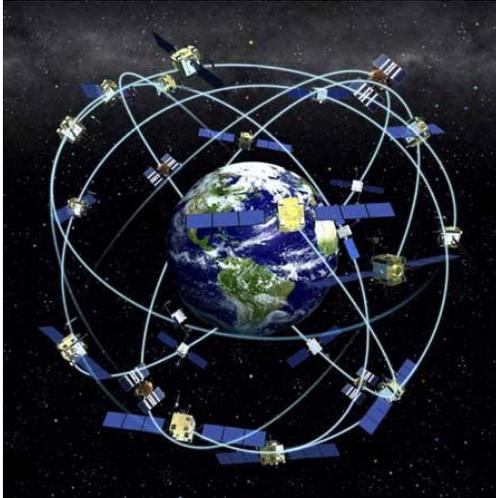
has been improving over the years.

Fig. 1. Constellation Global Positioning System.

Obtaining the exact location of an object or person is achieved by measuring the distance of the GPS receiver to three satellites, allowing triangular position anywhere on the earth.

The satellites have a very precise atomic clock, which helps to obtain the distance that exists to the GPS receiver by measuring the time it takes to get the signal emitted by the satellite to the GPS receiver, the signal emitted by the GPS and by the satellite is called the Pseudo Random Code.

Each of the three satellites calculates the distance that exists between the GPS receiver and its position for later using virtual spheres to locate the point of intersection that gives rise to the location. Finally the satellites correct possible errors in the measurement resulting in a more accurate location.

The location of a point on the Earth's surface is done by the latitude and longitude coordinates. These coordinates are two angles measured in degrees, arc minutes and arc seconds, allowing you to specify a position on the map.

B. Global System for Mobile communications

GSM is a standard for digital mobile communications that can be used in different frequency bands (fourteen bands), is present in a large number of countries supporting both voice and text and data by including GPRS. Its main advantage is to allow roaming in countries that have adopted the standard and therefore have agreements with each other, registering the mobile device in the next GSM network and being immediately available for use.

This system can be used in any of fourteen defined frequency bands, the most common of which are 900 MHz, 1 800 MHz and 1 900 MHz.

In GSM 900 the available bandwidth is 25 MHz for each direction of the transmission, since the separation between carriers is 0.2 MHz a total of 124 carriers are offered; while for GSM 1 800 with a bandwidth of 75 MHz there are 374 carriers.

TABLE 1
MAIN CHARACTERISTICS OF THE MOST COMMON GSM SYSTEMS

	GSM 900	GSM 1 800	GSM 1900
Uplink	890 – 915 MHz	1 710- 1 785 MHz	1 850- 1 910 MHz
Downlink	935- 960 MHz	1 805- 1 880 MHz	1 930- 1 990 MHz
Bandwidth	25 MHz	75 MHz	60 MHz
Carrier separation	200 KHz	200 KHz	200 KHz
Duplex distance	45 MHz	95 MHz	80 MHz
Number of carriers	124	374	299
Typical cell radius	300 m-35 Km	100 m- 15 Km	100 m- 15 Km
Power of the terminal	0,8-2 W	0,25-1 W	0,25-1 W

GSM has the SMS Short Message Service which is a style "storage and forwarding" mechanism to transmit short messages to and from mobile phones using the mobile phone network, messages can be sent between mobile devices or over the Internet to phones Mobile phones and vice versa.

The message sent from the source mobile is stored in an SMC Short Message Center to be sent to the destination mobile, in case the receiver is not available the message is stored for later sending.

The system delivering the messages from the BSS to the destination mobile uses a signal channel instead of a dedicated channel to guarantee SMS delivery even though the destination mobile is in use.

C. App Inventor

App Inventor is a Google Labs application used to create Android applications, these applications can be created from any smartphone with Android system or from a computer that supports Android for PC.

This application has been available since November 2012 and has been one of the great innovations in application development, allows newcomers in programming to make their own applications for personal satisfaction and comfort or even to market them in Android Market.

As shown in Fig. 2, to create an application with app inventor must be done:
- The design of the application, in which the components for the application are selected.
- The block editor, where the required blocks are chosen according to the application to be performed.

The application will appear step by step on the phone screen as the user adds pieces, when finished the package should be packaged and produce a separate application to

install. You can build applications from a computer using the Android emulator, the software behaves like the phone.
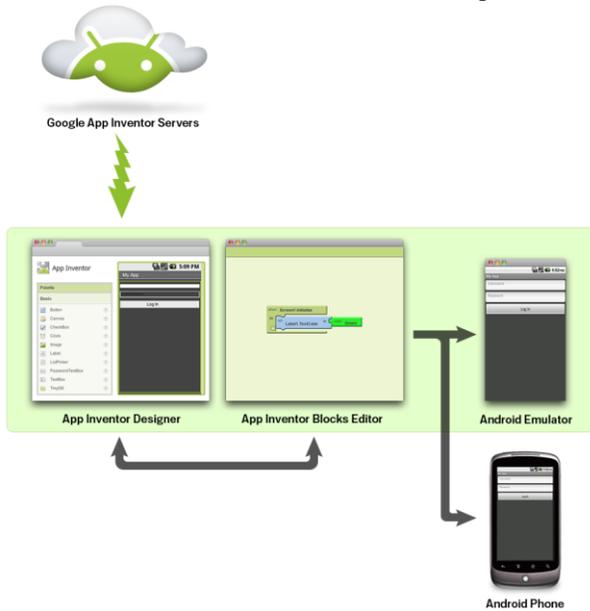

Fig.2. App Inventor Performance Diagram.

D. LabVIEW

LabVIEW is a tool that helps you solve today's problems faster and more efficiently by offering integration of hardware, existing software and IP by leveraging the latest computing technologies.

This tool has a development environment designed with a graphical programming syntax that makes it easy to visualize, create and encode engineering systems. It also helps reduce test times and offer business analysis based on collected data.

It allows designing applications using graphical icons instead of writing lines of code, developing a program is faster than in traditional languages because the representation of the flowchart is simple to develop, maintain and understand.

It integrates commercial hardware for maximum flexibility when connecting to a variety of embedded hardware platforms, plus contains over 100 interchangeable I / O modules live. It allows you to quickly add and reconfigure while generating the prototypes to move the final code to a robust or profitable object.

E. MySQL

MySQL is an open source relational database management system (RDBMS) based on the SQL language. It is a relational database management system, that is, stores the data in separate tables, this provides speed and flexibility when working with data.

MySQL database software consists of a client / server system consisting of a multi-threaded SQL server, client programs and libraries, administrative tools, and a variety of programming interfaces. It is fast, secure and easy to use since it was originally developed to handle large databases.

III. DEVELOPMENT AND SYSTEM VERIFICATION TESTS

A. Current Situation

Sistemas de Automatización y Contol company or S.A.C located in the city of Ibarra, is an entity that is dedicated to the design, maintenance and installation of electrical and electronic systems for users, institutions or companies in the northern part of the country. It has available to several casual workers to comply with different contracts, the number of workers vary between 10 to 15 depending on the works to be performed.

The workers comply with business obligations in different parts of the province or the north of the country as the company assigns them daily, weekly or monthly until culminating with the work assigned; so that the workers are paid depending on the hours worked to culminate with the work.

For the control and registration of workers' attendance, the company installs a personal key device in the work with greater execution time so that the workers who attend there register their time of entry and exit, but for workers who attend a different work the attendance register is done manually, that is to say, the person in charge of the personnel calls to each worker to consult the time of entry and exit and in this way to register them.

On the other hand the company has a vehicle for the transfer of material that similarly circulates in the north of the country, the vehicle has no monitoring system so the location is unknown during the course of the day.

B. Choice of Design Software

After the investigation of data transmission technologies, mobile operating systems, development software and databases, the GPS Assistance and Monitoring for Workers and Vehicles will be performed using the GSM system for the transmission of the location, the system Operating Android, the LabVIEW tool and MySQL as database.

GSM technology being a multi-operator system has an extended coverage in Ecuador, according to Arcotel covers 76.7% of Ecuadorian territory including the northern area, territory by which the workers of the company S.A.C carry out the activities entrusted. It offers the short message service which facilitates the transmission and reception of the positioning of workers and vehicles through this service, without an excessive cost for each message sent to and from a mobile terminal in this case from the mobile phone and the GPS / GSM from the vehicle to the GPS / GSM module of the server; the short message service uses own systems of the network for what guarantees an effective sending and receiving.

The company provides each worker with a mobile phone with the Android operating system as it is the system most used by users because it occupies 78.4% of the world market and being free has free IDE's as App Inventor so that anyone can develop their own applications. App Inventor allows you

to develop intuitive mobile applications with minimal programming knowledge because it offers a graphical programming in blocks, the applications can be adapted to the needs and requirements of the user according to the utility that will be given to him.

On the other hand, LabVIEW is a graphical programming software that is easy to develop and understand, integrates G-programming that is easier to understand and develop by providing a more intuitive programming experience since it is easier to graph an idea than to write one line of code. In addition, it combines the power of graphical programming with hardware that includes extensive analysis and signal processing libraries, offers customized graphical user interfaces and allows to implement these systems to a platform that uses a new and advanced technology; in the same way allows to complement the systems with the integration of databases.

Finally MySQL is an open source database easy to install and configure with high availability on platforms, supports a variety of operating systems. Facilitates the management of relational databases because it archives data in separate tables instead of placing all the data in a large file, this allows speed and flexibility. The tables are connected by defined relationships that make it possible to combine data from different on-demand tables.

These systems and tools were chosen because their characteristics and operation are coupled with the needs and requirements to meet the proposed objective, then the block diagram to follow for the realization of the GPS Monitoring and Control System is defined.

C. Block Diagram

The System Control of Assistance and Monitoring GPS for Workers and Vehicles of the Sistemas de Automatización y Control company located in Ibarra city will be developed based on the diagram of blocks that are shown in Fig.3.
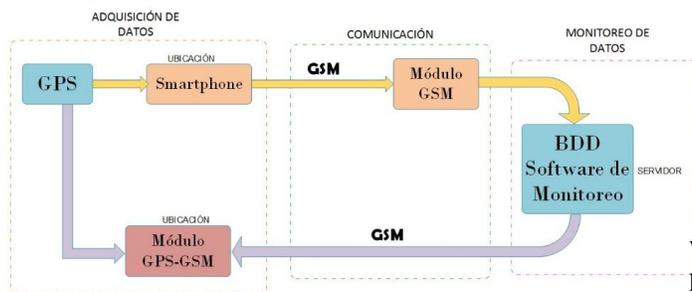

Fig.3. Block diagram of system development.

D. Data Acquisition

1) Mobile App in App Inventor

The mobile application allows the employees of the company S.A.C to know its location and send it as a text message to the server located in the company, the location is displayed in coordinates of length and latitude, also allows to visualize the position in Google Maps.

The development of the application was made in the application development platform known as App Inventor under the android operating system, to access this IDE is necessary to have a GMAIL account because Google owns android.

It is necessary to take into account that the operating system of the computer is compatible with the development environment and that the mobile device in which the application will be installed has at least 250 MB of RAM.

a) Mobile Application Design

Access to the App Inventor IDE is done with a GMAIL account by logging in to the address http://ai2.appinventor.mit.edu, logging in and creating a new project.

Once the project is created, the design of the interface is continued. For the application three screens were created, the first one will allow to enter with a previously registered user name and password, to the screen that displays and sends the location as shown in Fig. 4, also has the buttons Register and Exit.

Fig.4. Design of mobile application screen 1.

The second screen is the Registration in which the worker's data is entered as the name, surname, ID and password so that the user can enter the screen that allows sending the location as shown in Fig.5.
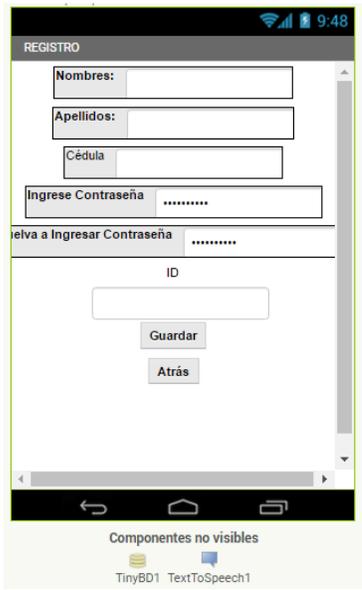
Fig.5. Design of mobile application screen 2.

The third screen indicates the location in latitude and longitude coordinates by means of the Location Sensor component and the respective coordinates expressed in direction, in addition to the time and date. The location is sent as a text message or displayed on Google Maps as shown in Fig. 6.
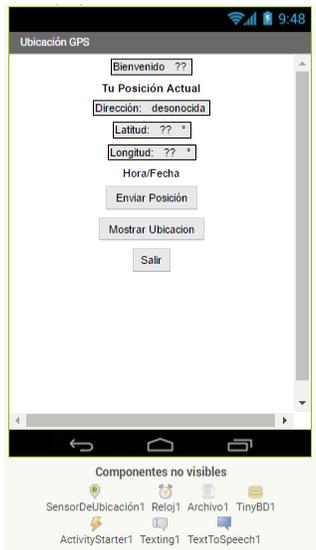

Fig.6. Design of mobile application screen 3.

b)   Programming in Blocks of the Application

App Inventor has a block editor which facilitates the programming of components that were linked to the screen viewer in the application design.

The different components will be programmed in block allowing the application to fulfill the function for which it was created, that is, send the location of the worker by text message. Then, by means of the flowchart of Fig. 7, the logical operation of the application is explained generally.
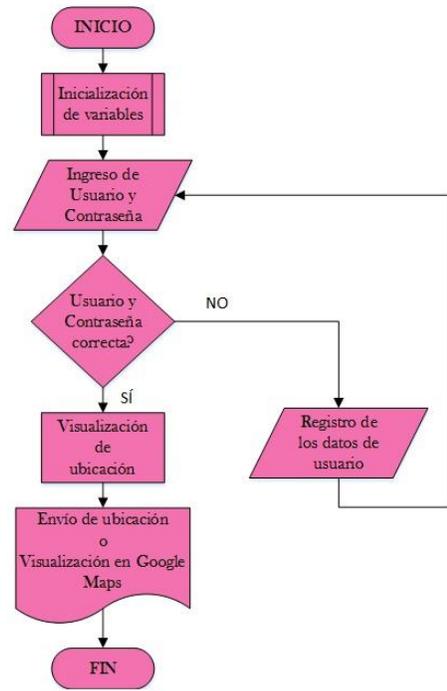

Fig.7. General block diagram of the mobile application.

The Send Position button is programmed so that the location is sent to the server module number in a format compatible with the created database. The data is sent in a string of characters that create a command to insert a data in the table assists of MySQL, which is the following one:

INSERT into asistencias (ID, fecha, hora, latitud, longitud, direccion)

VALUES ('   ')

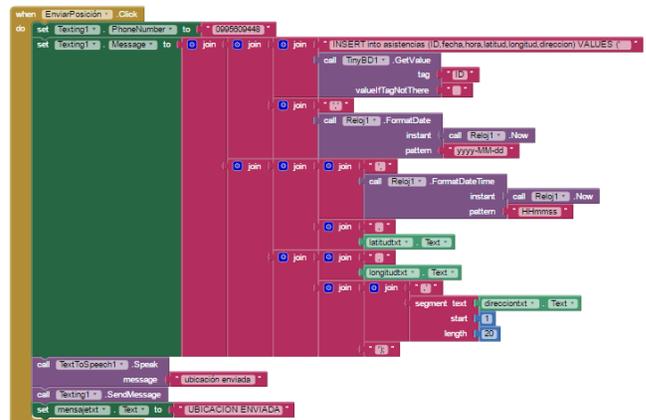The programming of the Send Position button is shown in Fig.8.

Fig.8. Block programming of the Send Position button.

2) Installation of the GPS / GSM Module in the Vehicle

The module used for this project must have several features that meet the communication requirements of the system.

TABLE 2
COMPARISON BETWEEN DIFFERENT MODULES.

	NEO - 6	SIM 808	SIM 900
FREQUENCY BANDS	not support	850/900/1800/ 1900 MHz	850/900/1800/ 1900 MHz
GPS	Integrated	Integrated	not integrated
GSM	not integrated	Integrated	Integrated
SMS	not support	support	support
VOLTAGE	3.0 V – 5.0 V	5.0 V – 26.0 V	3.2 V – 4.8 V
AT COMMANDS	Not compatible	Compatible	Compatible

After the comparison between the different modules it was determined to use the SIM808 module as shown in Fig. 9. This module has been selected because it has integrated and is compatible with the features and functions necessary to meet the stated objective.

Fig.9. SIM808 module.

The SIM808 module has integrated GPS, GSM systems in the frequency bands of 850/900/1800/1900 MHz and also has sending and receiving SMS. The module is multivoltaic with an input power of DC5V to DC26V, therefore the connection in the vehicle will be made to a connection of DC12V since the vehicles handle this type of voltage. The block diagram of the module connection in the vehicle is shown in Fig. 10.
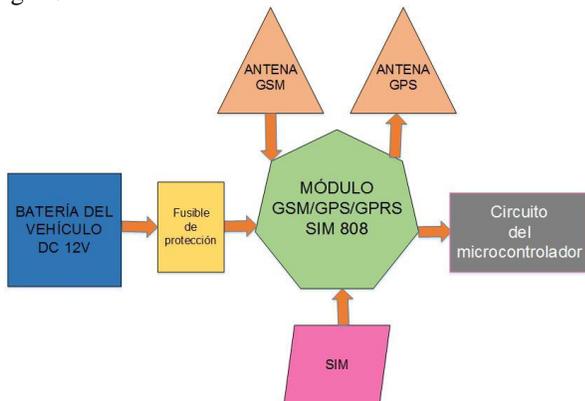

Fig.10. Block diagram of the monitoring circuit connection in the vehicle.

3) Acquisition of Location Data

In order to be able to send the vehicle's location to the company's server, the module is complemented by a microcontroller which will enable the sending of such information.

In this case, the microcontroller PIC 16F887 was chosen, it is used because of its easy access, high performance and features such as memory and pin number, as well as incorporating an indispensable serial communication module to achieve micro-controller communication and Device. In Fig.11 we can see the different pins of the micro-controller and the use of each one of them.
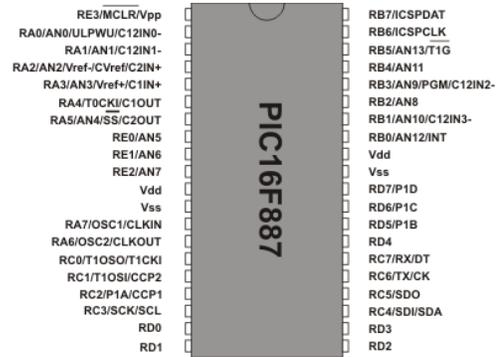

Fig.11. Connecting pins PIC 16F887.

The microcontroller is connected to the MAX232 circuit which helps the communication of the system by adapting the signals coming from the PIC to the PC as the signals in the opposite direction, this circuit is conformed by the integrated MAX232 and by capacitors of 10uF, in Fig .12 the circuit connection is observed.
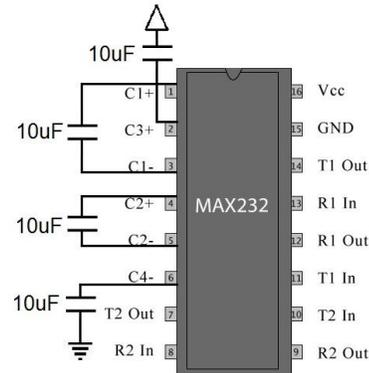

Fig.12. Circuit MAX232.

Because the power supply is provided by the vehicle battery (12V), a voltage regulator circuit is required since it has the ability to regulate the voltage from the vehicle battery to 5V which work the electronic elements and the microcontroller. The regulating circuit consists of 2 electrolytic capacitors of 10uF necessary for a good filtering of the voltage, 2 diodes 1N4148 as protection in case of there is voltage reverse or short circuit. The voltage regulator circuit is shown in Fig. 13.
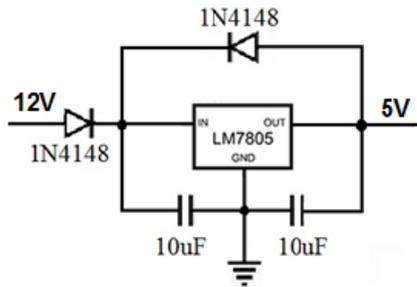
Fig.13. Voltage Regulator Circuit.

The monitoring system consists of the SIM808 module that is connected to the micro-controller via the transmission and reception pins, as well as the MAX232 circuit for communication in the system and the voltage regulator circuit that regulates the voltage to the Electronic elements. It is worth mentioning that as protection of the system a fuse was used as it will be fused when a larger current flows through the one it is designed to avoid damaging the elements of the system. The circuit of the monitoring system is shown in Fig. 14.
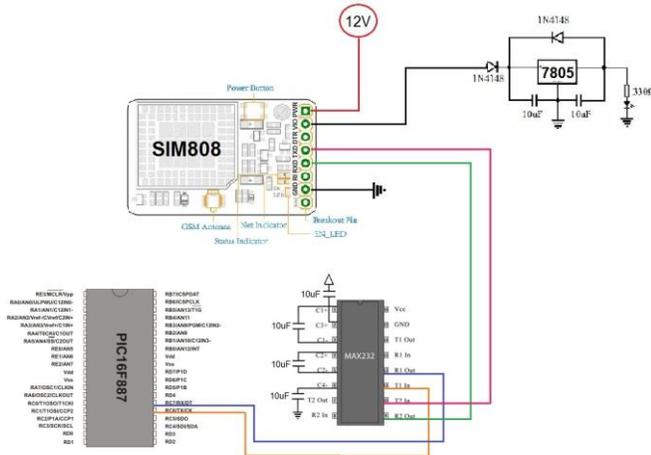

Fig.14. Diagram of connection of the micro-controller, the electronic elements and the module SIM808.

After establishing a connection with the server module, the vehicle module by means of its GPS system obtains the location of the same expressed in latitude and longitude coordinates. The microcontroller stores the location obtained by the vehicle module in a vector and then sends it as a text message, as shown in the following lines of code.

```
1) if (UART1_Data_Ready()) {
2) uart_rd = UART1_Read();
3) if(uart_rd == 'R'){
4) j=0;
5) UART1_Write_Text("ATA\r\n");
6) delay_ms(500);
7) UART1_Write_Text("ATH\r\n");
8) delay_ms(500);
9) UART1_Write_Text("AT+CGNSINF\r\n");
10) delay_ms(500);
   }
11) if(j<=68){
12) text[j] = uart_rd;
```

```
13) j++;
14) if(j==68){
15) UART1_Write_Text("AT+CMGS=\"0995609XXX\"\r");
16) delay_ms(500);
17) for(i=33;i<=68;i++){
18) UART1_Write(text[i]) ;
```

The code is designed to establish communication between the vehicle module and the server module to send the position of the vehicle. The function of the lines of code is described below.

1) Detects if data is received.

2) If there is a data, proceed to read the data.

3) If there is an "R" in the received data, perform the following steps (the comparison with the letter "R" is performed because when there is a connection between the modules via call, the received data is the word "RING").

5) Answer the call.

7) Hang up the call.

9) Gets the positioning information in latitude and longitude coordinates.

12) Read the positioning information.

15) Recognition of the number to which the text message is to be sent with the location, in this case it will be the sim module number of the server.

18) Write the text message with the location.

E. Communication System

In order to process the location of the worker and the vehicle acquired by the mobile application and the vehicle module respectively, a GSM reception module is required, in this case due to the complete characteristics that the SIM808 module has, it will be used the same one connected to the computer of The company so that the location data are collected and monitored.

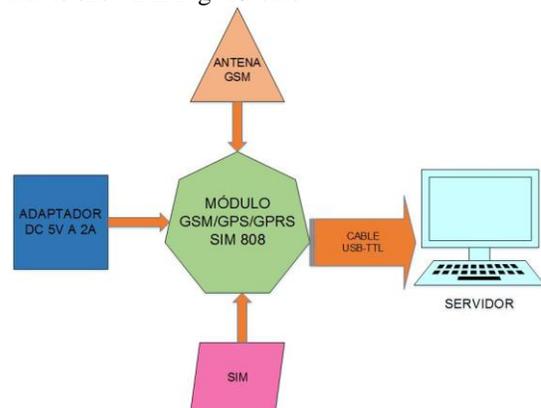A block diagram of the connection of the module to the computer is shown in Fig. 15 below.

Fig.15. Diagram of connection blocks of the module in the computer.

1) Creating the Database

The GPS Monitoring and Assistance Control system is designed to store worker and vehicle data so the name database sac was created in MySQL.

Four tables were created which are:

- **users:** stores employee data.
- **assists:** stores employee attendance.
- **cars:** stores the data of the company's cars.
- **posauto**: stores the location of vehicles.

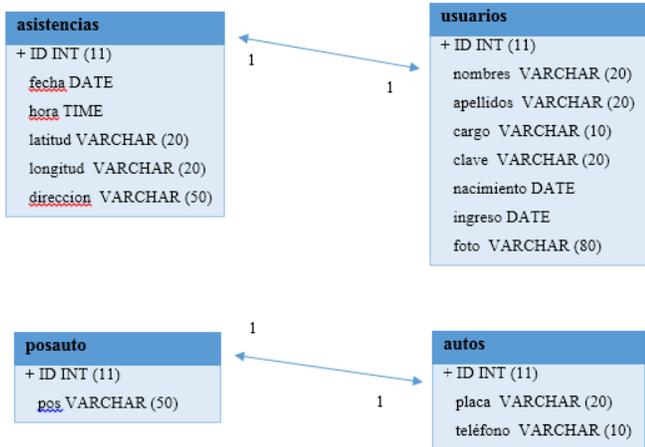The relational model of the sac database is described in Fig.16.

Fig.16. Relational model database sac.

2) Attendance System

As mentioned previously the mobile application obtains the location of the user and sends it via text message to the module number of the server, the message is composed of a command in charge of inserting the user's data and the location in the table Assists created in MySQL. The message arrives as follows:

INSERT into asistencias (ID, fecha, hora, latitud, longitud, direccion)

VALUES ('1 ', ' 2016-04-26', 092310, 0.35949, -78.1108, ' General Jose Maria Ibarra Ecu')

The database recognizes the storage command and processes the data by storing each one in the Assists table.

3) Monitoring System

The communication between vehicle module and server module is established when the user manually initiates communication by pressing the View in Map button in the monitoring window designed in LabVIEW.

The server module makes a call to the vehicle module, it responds to the call and after about 1 second hangs up, this way a communication between the modules is established. Once the communication is established, the monitoring circuit sends the positioning data to the server via text message to be processed and display the location in the google map.

F. Data Monitoring

The GPS assistance and monitoring software made in Labview and complemented with the MySQL database registers the assistance of the workers and perform the monitoring of the vehicles.

The assistance system is linked to the database to have a permanent record of the recorded assistance. Through the database the software designed in LabVIEW allows storing, searching, editing and deleting user data in addition to storing the daily attendance of workers and obtain daily, weekly or monthly reports of the same. The assistance of entry or exit for each worker can be visualized in the map of google regardless of the day of registration since the assists are stored in the database.

Similarly, the monitoring software created in LabVIEW is linked to the database to store, search, edit and delete the vehicle data, as well as store the position sent by the vehicle module. Unlike the assistance system, the monitoring system allows you to view the last location of the vehicle stored in the database approximately 30 seconds after requesting the position in the map of google because of the time of establishment and processing of the communication.

1) Graphic Interface

For the graphical interface Labview was used since it is a very complete software that has all the necessary components for the realization of the project, among the functionalities that stand out is the connectivity with databases, specifically supports MySQL and the serial communication that allows to communicate with the module.

The interface designed in Labview is divided into windows according to the functionalities required, using a software tool called Tab Control that is in Controls / Containers, later the following windows are created:

- Create user. - Displays a log to enter users.
- User Search. - Provides options for searching user data.
- View / Modify / Delete user. - View, modify and delete data.
- Assists. - Displays the attendances of the users.
- View map assistance. - Shows the location of a specific assistance in Google Maps.
- Reports. - Generates reports of assists.
- Create Auto. - Displays a log to enter vehicles.
- View / Edit / Delete auto. - View, modify and delete data.
- View car on Map. - Shows the location of a specific vehicle in Google Maps.
- Search for auto. - Shows the cars entered in the database.
- Com Serial.- Contains the parameters of serial communication.

Next, the different program windows created in LabVIEW are shown in Fig.17.
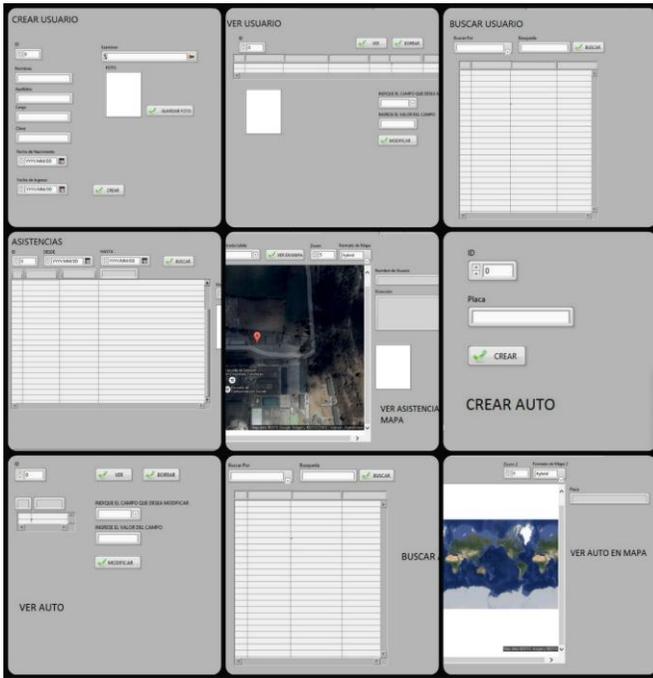
Fig.17. Windows designed in LabVIEW.

2) General Operation Flow Chart

Each window is composed of different fields to be later armed in a String that completes a command of MySQL, in this way it will be able to be storing the data in the different tables created in the database.

Below is shown in Fig. 18 and 19 the general flowcharts of the Worker Assistance system and the Vehicle Monitoring system.

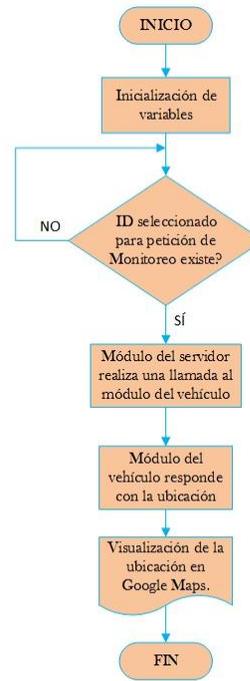Fig.18. General flow chart of the assistance system.

Fig.19. General flow chart of the monitoring system.

G. Verification Tests

The GPS Monitoring and Assistance Control System was tested with two users and a vehicle to confirm that the system works correctly and meets the established requirements.

1) Attendance System

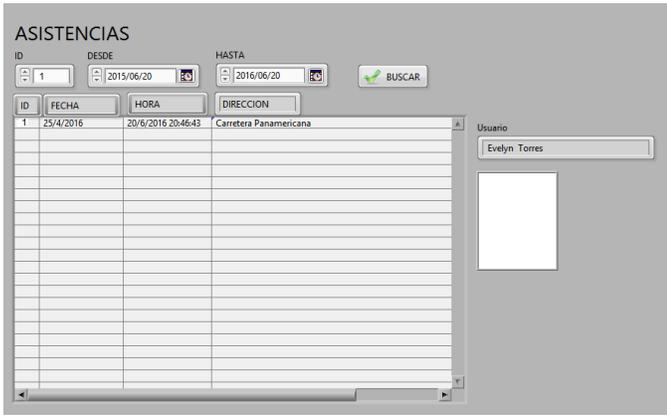Fig.20. View the location of the user in the mobile app.

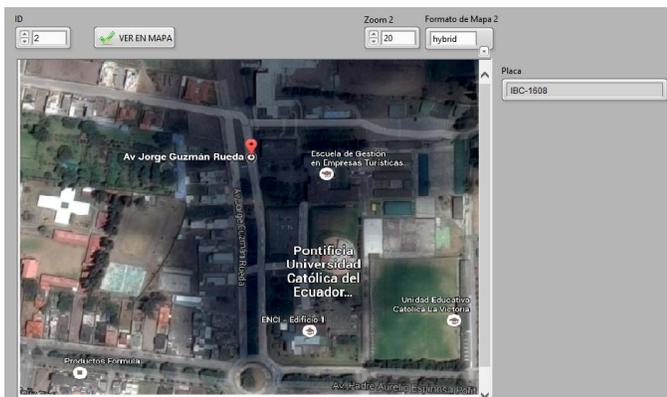Fig.21. Registration of the user's location.

2) Vehicle Monitoring

Fig.22. Display of vehicle location.

IV. ANALYSIS COST BENEFIT

The actual cost of the system is $ 2 809, 60 dollars but given that the company has the computer that will serve as a server and that previously provided each worker with a mobile phone these costs will not be taken into account, in addition the software cost is zero due To which were used licenses of the Technical University of North and own of the company reason why the current cost of the project is of 811, 60 dollars.

TABLA 3
TOTAL SYSTEM COST.

DESCRIPTION	REAL COST	CURRENT COST
Monitoring and Control System	249,10	249,10
Workforce	562,50	562,50
Technological devices	650,00	0,00
Software Licenses	1 348,00	0,00
TOTAL	2 809,60	811,60

This analysis entails describing all the costs involved in the final design of the GPS Assistance and Monitoring System for Workers and Vehicles of the company SAC and determine if the project is profitable, taking into account that the costs must be tangible, that is to, that it can be measured in some economic unit, in this case they are US dollars; while the benefits are determined by the advantages and improvements that will provide the company S.A.C when implementing the system.

The company Sistemas de Automatización y Control to register and control the attendance of its employees installs a device of personal code in the work with greater execution time, so that the workers who attend there register their time of entry and exit; but for the workers who are located in a different work, the chief of staff records the attendance manually, that is, calling each worker and consulting the time of entry and exit. On the other hand the vehicle circulates in the north of the country and does not have a monitoring system so its location is unknown during the course of the day.

So the system offers great advantages to the company:
- Automation of personnel registration process.
- Actual and accurate attendance record information.
- Labor Equity.
- It improves the productivity of the company.
- Control of the use of company resources.
- Help the economy.

The GPS Monitoring and Assistance Control system allows management of employee attendance, allows automatic control of attendance by the personnel manager without having to be present in the different assigned workplaces or as it was previously done through several telephone calls, In addition it allows to evaluate in a real way who is punctual and who arrives late since the assistance registered through text message with the location of the worker is recorded with the exact time and immediately.

It benefits the company S.A.C by automating one of its internal processes, since it is not reasonable that being an entity that automates other institutions does not have technological systems for itself.

In fact an investigation carried out in Spain, determined that 60% of the employees in the companies perform overtime illegally, that is, they are not remunerated for the hours worked outside the normal hours. So the system will benefit workers since having a daily attendance record can rest assured that the hours worked will be paid, the software allows you to generate daily, weekly or monthly reports and thus you can count the hours worked and verify Whether or not extra hours exist. Employees will be charged for the actual time worked.

It improves the productivity of the company because on the one hand the company has a real record of attendance and on the other the employees will feel that their work done will be well valued and remunerated and thus they will feel comfortable in the work and their performance will be good, this is a huge benefit for the company since the essential asset of any business organization is its people. With the control of labor assistance the company can monitor its business productivity to know if it will meet its objectives, and if not analyze and improve to achieve it. Time control is a transparent tool aimed at solving productivity problems.

On the other hand the monitoring of vehicles will help the company to control and know the location of their vehicles and thus determine if the vehicle is being used exclusively for work purposes since otherwise would be a loss for the company because the Long gasoline costs and maintenance will be greater by including personal routes during work hours making use of company assets.

In fact, a study by the company GPS Tracker, found that companies that use GPS as monitoring their employees and assets increase their productivity up to 23% and according to Carlink companies that use monitoring software as security for their vehicles has an effectiveness of 97% find the same.

As can be seen after analysis of the total cost of the system taking into account the costs of software licenses and technological devices in the total budget as well as excluding these costs, it is determined that the project is viable for the company being a justified investment Compared to the benefits you get.

V. CONCLUSIONS

The collection of necessary information about requirements and especially compatibility between transmission technologies, mobile operating systems, development software and databases ensured the operation and correct transmission and reception of data by achieving the interconnection of the entire system.

The IDE, App Inventor being an intuitive software that has graphical programming in blocks allowing to design quickly and efficiently the mobile application for android devices, which reduced design time and programming.

The GSM network has a coverage of 76.7% in the country, which guarantees the reception and transmission of data from the company's computer and vehicle through the GPS / GSM module respectively, using bands 850MHz and 1900 MHz. The installed module in the vehicle and the mobile application have a quick response of positioning data which ensures accuracy in obtaining the location.

The graphical interface was created using LabVIEW software as it offers integration of existing hardware and software, resulting in interaction with the database developed in MySQL allowing to manage and store the personal and location data of workers and vehicles in tables Separated, guaranteeing flexibility and speed when working with data.

The assistance systems are aimed at companies to solve productivity problems, since when they know the time of arrival and departure of their employees, they can analyze how much production time is lost to try to minimize it, just as vehicle monitoring ensures compliance with The goal of work set.

The use and implementation of ICTs in companies contributes to improve and streamline their internal processes and thus improve productivity and services to society.

VI. RECOMMENDATIONS

Transmission technologies, mobile operating systems, development software and databases must be compatible with each other to ensure the correct operation of the project and for the data in the transmission - reception process to arrive correctly for later storage.

It should be taken into account that the mobile application is designed exclusively for Android mobile devices, also verify that the version of the device is compatible and that has 512 Mb of internal memory and 250 Mb of RAM. The mobile device must have the GPS sensor, otherwise the application will not work.

It is recommended to use a relational database to facilitate the interconnection between stored tables, just as it is necessary to have a basic knowledge of the storage software, in this case MySQL, to facilitate the process of creating and storing tables and data.

Although LabVIEW is a graphic software facilitates the learning of it, it is advisable to have basic knowledge of the use and functions of the software to facilitate the creation of the program and thus develop the same in less time.

It is necessary to verify that the computer meets the hardware requirements before installing the database and the system created in LabVIEW, in addition to installing the components and modules that LabVIEW requires so that it does not generate errors.

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Evelyn Del Carmen Torres España
She was born in Ibarra-Ecuador on April 4, 1991. Her primary studies were taken at the "Sagrado Corazón de Jesús" school and her secondary studies took place at the "Nacional Ibarra" high school where she obtained her bachelor's degree in Informatics in 2008.
Currently holds the degree of Engineer of Electronics and Communication Networks at Universidad Técnica del Norte.