SAFETY DEVICE FOR ALERT MANIPULATION, TRACKING AND MOTORCYCLE LOCATION BY WIRELESS TECHNOLOGY SMS AND GPRS.

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Summary.-By means of the project "Device of security for alert of manipulation, tracking and location of motorcycle" is has made a study of sensors for know them features and features of them same, is makes a study of the technology GSM / GPRS for know the operation of such technologies and see them benefits that has for the use in this project , is performs designs of circuits that is used for the operation of the device of security, configurations of modules GSM / GPRS / GPS, configuration of micro controller ARDUINO, and the development of the device of security of alert of manipulation, tracking and location of motorcycle by means of technology SMS and GPRS.

I. INTRODUCTION

Currently is has registered an increase of theft to motorcycles respect to years earlier because there are 3,613 complaints of motorcycle subtracted since these are lightweight and easy of handling when is are parked in any place. These vehicles are used by criminals for the ease they have time to flee in the middle of traffic congestion or to pass through places of difficult access.

According to statistics the abduction to these vehicles increasing by that don't have an alert mechanism to prevent theft of the motorcycle and worse still not have some means which indicate where find the stolen vehicle; the ease that the motorcycle can be removed is because it depends only on a lock of rudder, which is vulnerable to criminals for easy release and the drag of the automotive since they are light to carry.

II. SENSORS.

Are devices that capture information from a signal of the medium outside and it transforms in another signal, this signal normally is electric that is can quantify and manipulate to.

A. Types of sensors.

There are two types of sensors that is can use depending on the medium that is go to use, these are:

- Passive: recorded the radiation emitted by the surface land, need of a source auxiliary.
- Active: generate them same the radiation that measure after being reflected, not requires of source any of power.

1) Pressure and force sensors.

The sensors of force transformed the magnitude mechanical in magnitude electrical, force exerted in voltage (see is Figure 1).

- Micro switch. - Device that allows divert or disrupt the course of a current power.
- Sensor of pressure. - Is a valve that receives the data of the flow of air when penetrates in the collector's admission.
- Force sensor. - Measures tension and compression in any circumstances.

- Sensors of contact. - Obtained data with the contact between her hand manipulative and the object in the space of work.

Pressure sensors are elements that transform the physical magnitude of pressure or force per unit area in another electrical magnitude. The ranges of measurement are very broad, from a thousandth of bar to them thousands of bar**.**

Figure 1. Pressure sensor and force.

2) *Sound sensors.*

Facilitate the conversion of an acoustic signal into electricity (see Figure 2).

- Microphone. - Transforms the waves sound in power electric and vice versa.
- Sensors piezo. - Device for measuring tension, pressure, force or acceleration; transforming those data in signals electric.
- Ultrasonic sensor.- Detects the proximity of objects at distances of up to 8 m

Account with adjustable resistance which manually controls the sound level limit or trigger the sensor threshold, can be activated or disabled with a single impulse sound.

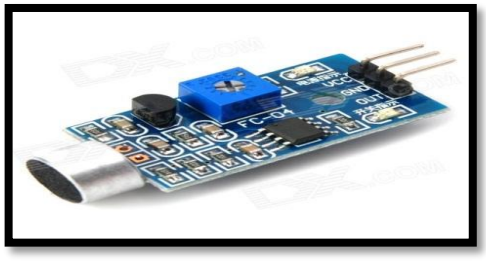

Figure 2. Sound sensor.

3) *Sensor for measurement of distance.*

These sensors perform the measurement of distance linear or scrolling linear of form automated (see is Figure 3).

- Meter of distance ultrasonic-through a pointer laser be known quickly the distance, area and volume of a room.
- Meter of distance by get of infrared-is emits a get of light and is reflected through an object to measure distances.

Provides an electrical signal according to the physical variation (the distance). The ranges of measures depend of the type of sensor of distance, few microns (unit of measure) or hundreds of meters.

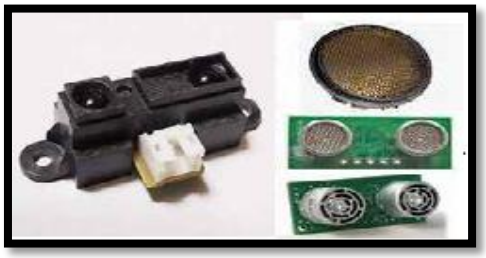

Figure 3. Sensor in measurement of distance.

4) Sensor of magnetism.

Detect the field magnetic that cause the magnets or the current electric (see is Figure 4).

- Effect hall. - Is the formation of a field electric by separation of charges.
- Transistor. - Semiconductor electronic device that delivers output in response to an input signal.
- Compasses electronic. - Is an instrument of orientation with a needle magnetized to indicate the North magnetic land.
- Switches magnetic. - Is operated by current of a winding of copper that produces a field magnetic and closes or opens the contacts.

Have high sensitivity. Are detection of a distance more wide with a shape more reduced. The object to recognize must be with a magnet because the detector reacts only to

this. (Superrobotica, 2016).

Figure 4. Sensor magnetic.

5) Sensors of location geographical.

Are devices that detect the position of the object (see is Figure 5).

- GPS.-serves to detect in all the land the position of an object (a person, a vehicle).
- Receiver of radio beacons.-serve to perform detection and location of boats, aircraft, and people in danger.

These devices can provide data as: latitude, length, altitude, speed, time and date and position satellite.

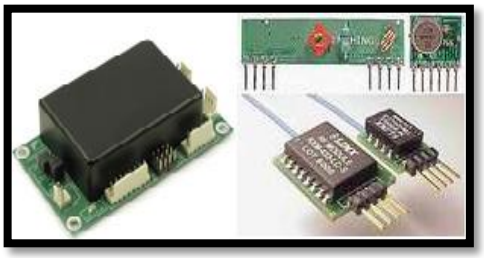

Figure 5. Sensor of location geographical.

6) Proximity sensor.

This sensor is a transducer to detect signals or objects that are found near the element sensor (see is Figure 6).

- Sensor capacitive-are switches electronic of feature static for the detection of objects.
- Sensor inductive-serves to detect objects with materials-ferrous.
- Sensor end of career-electrical devices, tyres or mechanics located at the end of the tour (a belt conveyor), to send signals that modify the State of a circuit.

The distance to which is will detect an object depends of several factors, as:

- Object detected is more or less clear.
- Object with color glossy or matte.
- Value of the resistance adjustable or potentiometer for adjustment (sensitivity).

Figure 6. Sensors of proximity.

III. MICRO CONTROLLER ARDUINO.

Is a plate with circuits electronic of code and hardware open based on a micro controller Atmega 328 (see is Figure 7), contains circuits of support, that includes, regulators of tension; a USB port connected to an adapter module, USB-serial allowing programming the micro controller from any computer easily and tests communication with the own chip; contains libraries for different components external that you can attach.

Plate uses an ATmega16u2 circuit programmed as a USB-to-Serial converter, they can have power via USB connection or with an external power supply. The card can operate with a supply outside of 5 to 12 volts.

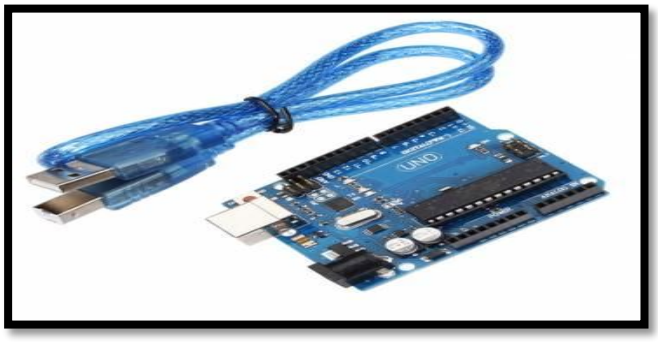

Figure 7. Micro controller ARDUINO.

A. Characteristics of plate arduino.

1) *Inputs and outputs.*

- It has 14 digital pins (pin 0 to pin 13), they can be used as inputs and outputs that operate at 5 volts with a supply up to 40mA. Each pin has of a resistance pull-up internal of between 20 and 50 Kilo ohms.
- It has 6 pin of inputs analogue (pin A0 to the pin A5) .that moved the signal to a converter analog / digital of 10 bits (binary digital).
- It has 6 pins of outputs analog (pins 3, 5, 6, 9, 10, and 11) that really are outputs digital that mimic to outputs analog.

2) *PIN special of input and output.*

- Rx and TX (PIN 0 and 1): Are used for transmissions in series of TTL signals.
- External interruptions (pins 2 and 3): Can generate an interrupt on the atmega. Interrupts are triggered when a low value can be found in these entries.
- PWM (press Width Modulation): Has 6 outputs for generation of signals by modulation of width of pulse, which modifies the separation between them different pulses of signal of up to 8 bits; (example: vary the intensity of an led or operating a servo).
- SPI (Serial Peripheral Interface): The pin 10, 11, 12 and 13 is can use for communications serial, with transfer of information full-duplex in an environment master slave.
- I^2C (Inter-Integrated Circuit): Is an interface for interconnection of embedded systems, which can connect devices such as LCDs, memories, sensors, etc.

3) Power supply pin.

- IOREF (reference of voltage): serves for the plate recognizes the type of food that require those shields.
- RESET (restart): Pin to restart the plate.
- VIN (Input voltage): voltage of input, also you can feed the plate by this pin.
- 3, 3v: provides output voltage of 3.3 volts. (
- 5v: supply voltage of output of 5 volt.
- GND (Ground): pin grounding plate.
- AREF (reference voltage): this pin is used to supply a voltage to 5v by digital pins.

4) *Memory.*

- The Atmega 328 has 32 KB (with 0.5 KB occupied by the Manager of boot). Has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the library EEPROM).

5) *Voltage and current.*

- Operating voltage: 5v.
- Recommended input voltage: 7-12 volt.
- Voltage of input limit: 6-20 volts.
- Current continuous pin I/O: 20mA.
- Current DC to pin 3, 3v: 50mA.

6) Programmes.

Arduino offers an environment integrated with functions pre-established that reduce it logical to reading of entries, control of times and outputs of a manner intuitive.

Plate connects directly through cable USB to PC serial to load the programs without the risk to damage the card due to its additional protection.

Programmable basic structure of arduino into 2 parts:

- Setup (): preparation of the program, includes the Declaration of variables and is the first function to be executed in the program.
- Loop (): is the execution, contains the code to be executed continuously.

B. *Applications in arduino.*

- Development of different varieties of projects requiring a code-based control.
- Development of automation systems.
- AVR programming learning.

- Level of input from design of circuits.
- Domotics
- Robotics.

IV. SYSTEM GLOBAL OF COMMUNICATIONS MOBILE (GSM).

The network GSM appeared in the century XXI. It is a second generation (2 G) standard since communications are produced from digital mode.

In 1982, is called by first time "Groupe Special Mobile" and in 1991 was changed to a standard international called "system Global of communications mobile".

The standard GSM has a performance maximum of 9.6 Kbps, transmission of voice and data Digital's volume low, example, messages of text (SMS) or messages multimedia (MMS).

A. Characteristic de GSM.

TABLE I.

Bands GSM.

Bands GSM.				
System.	Towards the BS Mhz	Since the BS Mhz.	Channel width Khz	Number maximum of channels.
GSM-900	890-915	935-960	200	125
E-GSM	880-915	925-960	200	175
GSM-1800	1710-1785	1805-1880	200	375
GSM-1800	1850-1910	1930-1990	200	300

It is composed of four main systems (see table I):

- GSM 900, original cellular network and operate at 900 Mhz and is for large areas so it requires more power to operate.
- EGSM is an improved version of GSM-900 which stretched the band of operation and is reduced the area of coverage with less power for operation.
- GSM-1800 and GSM-1900, which incorporate service of personal communication, which work in 1800 and 1900 Mhz frequencies respectively. GSM-1800 is designed to operate in Europe while GSM-1900 works in the Americas.

With the technology GSM the customer is can communicate from any country that can have "ROAMING".

GSM is a technology with high degree of flexibility and efficiency spectral, has great quality of signal and integrity between the networks.

The efficiency spectral is a measure to take advantage of effectively a determined band of frequency that is used to transmit data. When more is this value, best it exploited the band.

B. Services GSM.

- *Service of voice-calls telephone.*
- *Service of messages-messages of texts.*
- *Service of entertainment-games.*
- *Service of video-Video lectures.*

C. Architecture of the GSM network.

GSM network architecture consists of the following subsystems (see Figure 9):

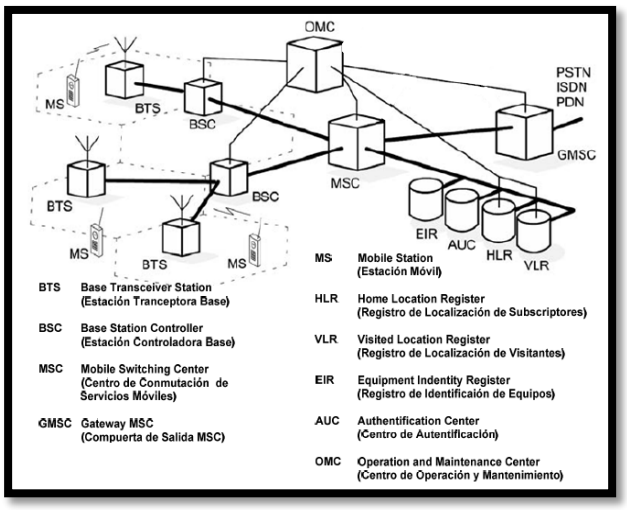

Figure 9. Architecture GSM.

1) *Subsystem of station of Radio (RSS) or subsystem of station's base. (BSS).*

This network layer provides and controls the terminals access to the available spectrum, sending and receiving data in a region.

Is subdivided in:

- Base transceiver station (BTS)-station transceiver base is that manages the link of communication between users and the network within the area of coverage.
- Base Station Controller (BSC)-base station controller is which keeps the link of communication between (BTS) and mobile terminal equipment, is in charge of the "handover" process that allows the call link without interruption at the time that the mobile equipment change communication cell to move to another place. The BSC takes decision to the start the process handover to assign the control of the cell that is located the mobile.

2) *Switching subsystem (SSS).*

Switching subsystem of divided in:

- Services Mobile Switching Center (MSC).-mobile services switching Center controls the "handover" process between the BSCs, sets, controls and completes any call.
- Location register (HLR)-register of positions with database that stores the State of the line of a user within the network.
- Visitor Location Register (VLR).-registration of visitors of location that contains information of State of all the users registered within a zone.
- Authentication Center (AC or AuC).-Center of authentication that provides parameters for authentication and encryption for the identification of the user and ensure the reliability of the so-called telephone mobile.
- **Equipment identification register (EIR). -** Teams of registration of identification is a list of equipment mobile that is are registered in the network. List of validated IMEI.

3) *Operation and maintenance subsystem (OMS).*

Subsystem of operation and maintenance offers to the client activities of maintenance, billing to those subscribers and support technical required by the network GSM.

D. Services of messages short (SMS).

Is a service available on mobile phones and GSM modems, this service allows the sending and receiving of text messages in short length, with 140 or 160 characters in length between mobile phones, landline phones and other handheld devices. SMS was created as part of the standard of telephony mobile digital GSM, the service can include images and sounds as is the case of messages multimedia.

1) *Evolution of the system SMS.*

In the evolution of the system SMS will introduce new formats EMS and for the third generation is introduces the MMS.

- **SMS:** Is a service of messages short (alphanumeric) on the networks GSM.
- **EMS:** Is a service that extends the possibilities graphs of the SMS, incorporating sounds polyphonic and animations graphics, thanks to the bonding of several messages short.
- **MMS:** Is a service standard for the third generation (3 G). This service is on the infrastructure of network (GSM), is necessary that support the capacity multimedia in them terminals mobile.

E. Structure of the system SMS.

The structure of the system SMS is formed by (see is Figure 10):

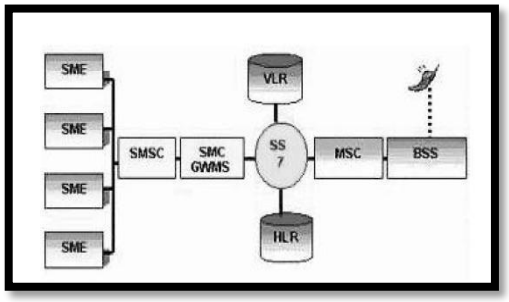

Figure 10. SMS network architecture.

- **Short Messaging Entities (SMC or SME). -** Entities of messaging short are elements that send and receive messages short, to locate is in the network fixed, station mobile or others centers of services.
- **Center Short Messaging Service (SMSC).-** Center of services of messaging short is an element that stores and sends them messages short between different SCM and a station mobile.
- **SMS-Gateway. - T**his element allows make a consultation to the record of location of home when arrives a message to obtain information that allow addressing the message to the destination end.
- **Home location register (HLR). -** Home location register is a database for the storage, user management and service profile. Provides information for routing to the user indicated.
- **Visitor location register (VLR). -** Registration of localization of the visitor is a database with information temporary of the users. This information it uses the center of switching mobile to give service to the user's step.
- **Mobile switching center (MSC). -** Center of switching mobile is the switching of the system and control of calls from other device mobile or system of data.
- **Base station system (BSS). -** System of station base is the responsible of transmit the traffic of voice and data between the different stations mobile.

F. Sending and receiving of messages short.

For the shipping and reception of messages of text in the network GSM is performs the following steps:

1) Steps for the sending of SMS.

- The message short is sent from the entity of messaging short to the center of services of messaging.
- Service Center reviews home location registers and receives the mobile user routing information.
- The Centre of service of messaging sends the message short towards the center of switching mobile.
- Mobile switching Center draws the information of the user of the temporary database. This operation can include a procedure of authentication.
- Mobile switching Center transferred the short message to the mobile station.
- The center of switching mobile forwards to the center of services of messaging them results of operation that has led to out.
- If you request the entity of messaging, Messaging Services returns a report indicating the output of short message.

2) Steps for the receipt of the SMS.

- The station mobile transfers the message short to the center of switching mobile.
- The center of switching mobile question to the database temporary to verify that the message transferred not evades them services supplementary or the restrictions imposed.

- The Centre of switching mobile sends the message short to the center of services of messaging, using the mechanism message short towards forward.
- The center of services of messaging delivers the message short to the entity of messaging short.
- The center of messaging short reports to the Centre of switching mobile the success of the shipment.
- Switching Center returns the result of the operation of sending the message to the mobile station.

G. Short Message Classes

- Class 0 or Flash SMS-the text message is displayed on the screen of your mobile device and is not stored in the memory of the device.
- Class 1-the text message is stored on the mobile device.
- Class 2-the message of text is stored in the card SIM.
- Class 3-the message of text is stores in the card SIM of the device mobile that it receives and in an application external that is running on a computer connected to this device mobile.

H. Plot SMS.

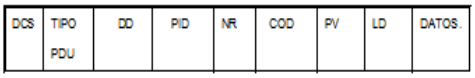

Figure 11. Plot SMS.

The plot SMS is composed by the following elements (see is Figure 11):

- DCS-address of center of service.
- PDU-type of plot.
- DD-address destination.
- PID-protocol identification.
- NR.-number of reference.
- COD-encoding of raster data.
- PV.-field of period of validity.
- LD-length byte strings.
- DATA-message to send hexadecimal.

V. GPRS (GENERAL PACKET RADIO SERVICES).

GPRS is a system of switching of packets that share the range of frequencies of the network GSM. The switching of packages serves to transmit data of best way and greater efficiency, uses the network when is necessary.

Through GPRS facilitates the sending and reception of information using the same equipment cell through the browser WAP (wireless Access protocol).

A. Characteristic of GPRS.

- Speed of data of transfer 144 Kbps, using 8 channels of time of GSM.
- The user remains in connection standing to the network GPRS.
- Use of different channels at the same time.
- Reservation of channels to the share the network between different users.
- Service of point to.
- Service of point to multipoint.
- Security against errors in packets transmitted by the GEA (encryption algorithm) encryption with secret algorithm.
- Available in devices mobile.

B. Classes of GPRS.

- **Class A-** Supports simultaneous GPRS and GSM.
- **Class B-** Can register is and activate is simultaneously GSM and GPRS, but in a call the connection GPRS is stopped.
- **Class C-** Only is recorded and supports services GPRS or GSM of form alternative.

The manufacturers implemented in those devices the class B, since has priority the traffic of voice.

C. Advantages of GPRS.

- The user can connect is all the time that want to, since not will make resources of the network when not receive or transmit information.
- Payment only by the amount of information transmitted.
- Increased speed of transmission by use scheme of encoding.
- Possibility of make and receive calls from voice while is connected to another application of GPRS.
- Transmission asymmetrical adapted to the type of traffic of navigation HTML (4 slots of rise and 1 slot of fall).
- Allows connection to the internet, instant messaging, video conferencing of low-end, etc.
- New terminals offering the user a graphical interface more focused on applications of data.
- Efficient use of the resources of the network by sharing of the channels of communication between different users.

D. Applications.

- Rare transmissions of small or large amounts of information.
- Transmissions intermittent of traffic of information.
- Telemetry and tele alarm.
- Control of traffic.
- Notice of receipt of mail on your mobile.
- Downloads of files.
- Access to internet.
- Access to database.
- File transfers.

E. Network GPRS.

The system of GPRS, introduced by ETSI (European Telecommunication Standard Institute) for the evolution of the GSM system, access to the Web through packages.

The networks GPRS is divided in four parts key (see is Figure 12):

1) The station mobile or Mobile Station (MS).

Consists at its time of two elements Basic, the terminal or equipment mobile and on the other hand the SIM or Subscriber Identity Module.

El SIM is a small card that is able to identify the characteristics of the mobile terminal device, is authenticated by four-digit numbers known as PIN or Personal Identification Number. (

2) The station Basbtse or Base Station Subsystem (BSS).

This station connects mobile stations to switching subsystems, it is responsible for transmitting and receiving, they consist of two distinct elements: the Base Transceiver Station (BTS) or Base Station and Base Station Controller (BSC). The BTS has transceivers and antennas in each cell of the network, is found in the center of the cell. The BSC are drivers of the BTS, its function is to be in charge of the handovers and control the BTS radio frequencies. (

3) Subsystem of switching and network or Network and Switching Subsystem (NSS).

This system directs the communications of them different users of the network, is divided in:

- **Mobile Services Switching Center (MSC**): The center of switching of services mobile performs those switching's internal of the network, and performs connectivity with different networks.
- **Gateway Mobile Services Switching Center (GMSC):** Gateway mobile switching Center's services are translators (either software or hardware) that link two networks.
- **Home Location register (HLR):** Registration of location is a database with data of the users connected to a particular MSC.

- **Visitor Location register (VLR):** Location of the visitor log has all the data of a user and thus go to the network services.
- **Authentication Center (AuC):** Center of authentication contains the measures necessary so that the user is authenticate within the network.
- **Equipment Identy register (EIR):** Registration identification of the team provide security in GSM networks, contains the International Mobile Equipment Identity or IMEI from each terminal, if it is located in the database you can use the network.
- **GSM Interworking Unit (GIWU):** Unit of interconnect GSM serves as interface for communication between different networks.

4) Subsystems of support and operation or Operation support and Subsystems (OSS).

The OSS are bound to different NSS and BSC to monitor and control all of the GSM network. (Sanchez, 2005)

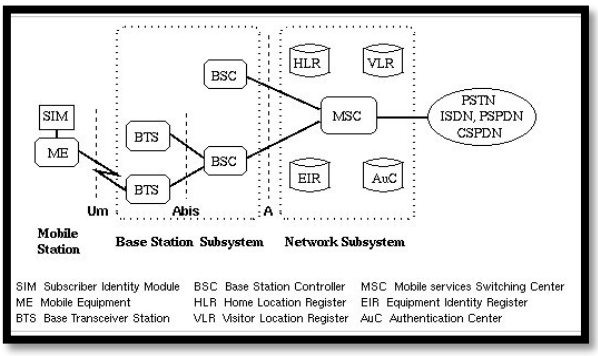

Figure 12. GPRS network.

F. Arquitectura GPRS.

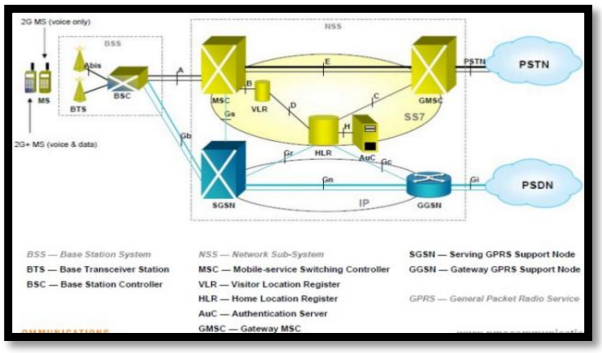

Figure 13. Architecture GPRS.

1) Service support node (SGSN).

The SGSN is connected to the BSC by an interface and provides a point of access to the terminal mobile with the service of the network GPRS (see is Figure 13).

Functions are:

- Retransmission of data between the GPRS terminal and the corresponding SGSN. It is done in both directions, depending on the data source.
- Manage the authentication of those terminals mobile GPRS, recorded data in the network GPRS and of its management of mobility.
- Notice (page). The SGSN changes the terminal Mobile of the State STANDBY at the READY to Exchange data.
- Collects data to generate CDRs (Call Detail Recordings) billing and transmit them to the CG.
- Runs IP protocol conversion (Protocol internet) used in the backbone network, controls the encryption and compression of data.

2) GPRS gateway node support or Gateway GPRS support node (GGSN).

The GGSN interconnects the GPRS network and external packet data networks (see Figure 14), as for example Internet, corporate Intranets, etc.

The GGSN hides the GPRS network networking infrastructure external.

The GGSN receives information intended for a specific GPRS terminal, checks the address that is active and sends data to the SGSN of the terminal.

Functions that performs are:

- Receive user data from an Intranet or Internet and transmit it to the SGSN that controls the terminal.
- Includes a GPRS core network data packets (from SGSN) and routing information of the users to the Intranet or Internet.
- Receive signaling data from the backbone and perform corresponding operation configurations.
- Provides privacy and security to the network and the GPRS terminal, the GGSN generates a

gateway between the networks.

- Gives IP addresses to GPRS terminals when using dynamic addressing.
- Provides services for access to ISPs.
- Perform the handover between SGSNs.

3) *Other elements of the network GPRS.*

Other elements are:

- **Border Gateway (BG):** Door of linkage of rim establishes a sure connection.
- **Domain name System (DNS):** Names system to take the physical directions of the GSNs.
- **Charging Gateway (CG):** Door of linkage of load gathers CDRs generated in the SSGNs and GGSNs, consolidates them and pre it processes before spending them to the invoicing system.
- **Firewall:** It is a sure barrier between two networks. It maintains the intruders out of the network GPRS.

G. Functioning of GPRS.

The GPRS functioning has the following operation capacity (see it represents 14):

- **GPRS Tunneling Protocol (GTP). –** Protocol of tunnel GPRS transports the bundles and signs of the user linked between the nodes of support of GPRS.
- **Sub network Dependent Convergence Protocol (SNDCP). -** Network of Sub Protocolo of Dependent Convergence they transfer information bundles between the mobile stations and the SGSN.
- **Air Interface. -** It relates the communications of the mobile station and the subsystem of base station. It relates the layer of linkage of information (It dates Link Layer) and the physical layer (Physical Layer) like part of the Interface Angers.
- **Data Link Layer. -** Layer of linkage of information. It is located between the mobile station (the mobile GPRS) and the network.

It subdivides in:

The layer LLC (Control of logical linkage): It offers a reliable linkage between (MS – SGSN) is provided with sequence control, delivers of bundles in order, control of flow of information, detects errors of transmission and transmission.

The layer RLC/MAC (between MS - BSS): RLC has the division and the assembled re of the plots LLC in blocks of information RLC. The layer MAC controls the accesses of a mobile station to a channel of radio shared by several manual stations.

- **Physical Layer. -** Physical Layer between MS and BSS. It splits in:

Layer of physical linkage delivers a physical channel. He takes charge of the codification of the channel (errors of transmission).

The layer of linkage of radio frequency works below the physical layer contains the modulation and the demodulación.

- Interface BSS-SGSN. - The protocol of application BSS GPRS (BSSGP) proposes the addressing and the belonging thing to information of the QoS between BSS and SGSN.

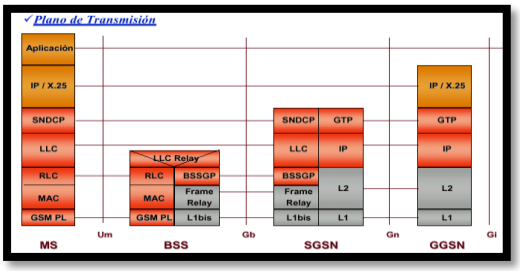

Figure 14. Plane transmission.

H. Data flow.

Package or network layer protocol data unit, it receives from the network layer and transmitted through the air interface between the mobile station and the service GPRS (SGSN) support node using the (LLC) logical link control protocol (see Figure 15).

First Protocol Sub network dependent convergence (SNDCP) changes in frames LLC packets, this process compresses the header data, segmentation and encryption.

A plot LLC is divided into blocks (RLC) radio link control, formed within the physical layer, each block are of 4 normal blasts similar to the TDMA.

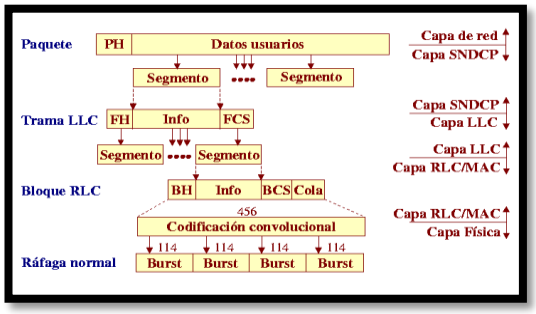

Figure 15. Data flow.

I. GPRS terminals.

Figure 16. GPRS terminals.

GPRS combines 8 channels for the transfer of data, and each channel transfers at speed of 8 to 12 Kbps. This technology extends the transmission of voice and data in different channels transmitting in parallel, thus allows the conversation without cutting the transmission of data.

There is GPRS cards that connect laptops to the Internet, cards that connect desktop, etc.

GPRS terminals allow the display of content and use Internet services on their monitors reduced.

The terminals are classified according to the use that will give the user (see Figure 16):

- Mobile phones, which allow the use of written or graphic information concisely.
- Terminal type electronic calendar, with mixed voice and data features.
- Terminal type personal handheld computer with display large-format and great graphic capability.
- Laptops with wireless connection of a mobile phone GPRS.

VI. DEVELOPMENT OF THE SYSTEM OF SAFETY INALAMBRCO FOR MOTORCYCLES.

Raises an electronic design to provide a security to two-wheeled vehicles and thus prevent or know when someone unauthorized to handle the vehicle. This device will be the owner of the bike via a SMS alert functionality and also give the location of the vehicle by means of a web page.

VII. DIAGRAM OF GENERAL OPERATION.

By a diagram of operation (see Figure 17) shows the process of warning system from the handling of the bike by any unauthorized person, until the receipt of the SMS alert to the owner of the vehicle.

This process is to alert the owner of any attempted theft of the motorcycle and go immediately to the vehicle to prevent the theft of the same.

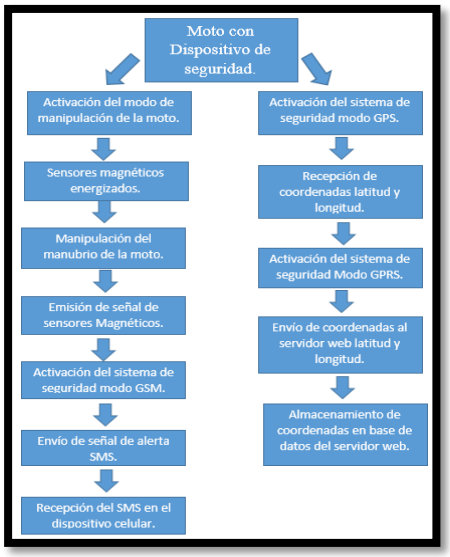

Figure 17. Diagram of operation of the security system.

With respect to figure 17, the owner of the bike parked the vehicle and proceeds to turn the security system, if an unauthorized person manipulates the vehicle, the sensors emit a signal to the security system. The security system

sends an SMS to the mobile device cell of the owner of the bike, alerting the vehicle handling by some unknown event; the owner receives the SMS alert and proceed to verify the condition of the vehicle.

VIII. ELECTRONIC CIRCUIT DESIGN.

Using a block diagram (see Figure 18) is displayed as warning system is composed from power supply until the receipt of the SMS to the cellular device and the reception of the GPS coordinates to the web server.

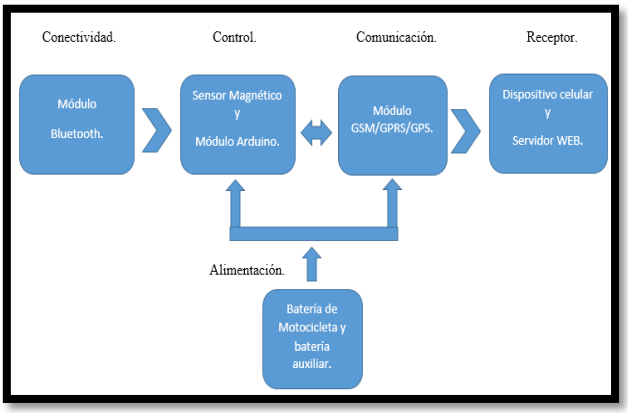

Figure 88. General block.

A. *Block of control.*

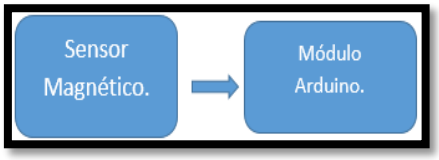

Figure 19. Control diagram.

Control block consists of the sensor and arduino module (see Figure 19), are responsible for sending signals for the execution of the warning system.

Magnetic sensor high sensitivity and detection distance wider with a more reduced form is used, captan magnetic fields produced by magnets or electrical currents, they work normally closed, this means, that remain as closed circuit contacts and with only to separate them is passed to open circuit. This makes that the warning device works with magnetic sensors in CCTV and when someone handle the handle of the bike you will separate the magnetic and will open the circuit causing the send signal to the arduino module.

The arduino module receives the signal from the sensors and send orders commands to activate the GSM communication system.

One arduino module has the ability of EEPROM memory and RAM needed for the same programming and this makes the device work at a speed suitable for the execution of the project, has little space physical and lower cost for the purchase of the device.

Arduino one module has connectors type female which facilitates for the growth of modules for your embedded system and saving physical space, has a PIN of power that are used to power other devices, for this project will provide power to the bluetooth module and the magnetic sensor, using the same resources of the arduino Board.

Circuit of magnetic sensor connection - Arduino.

In Figure 20 you can see that the magnetic sensor will connect to module arduino by means of the pin (2) serving for the reception of the alert signal when you separate the magnetic sensors.

Magnetic sensor will feed through the arduino module pin 3.3V, which supplies the voltage and the current necessary for your respective operating.

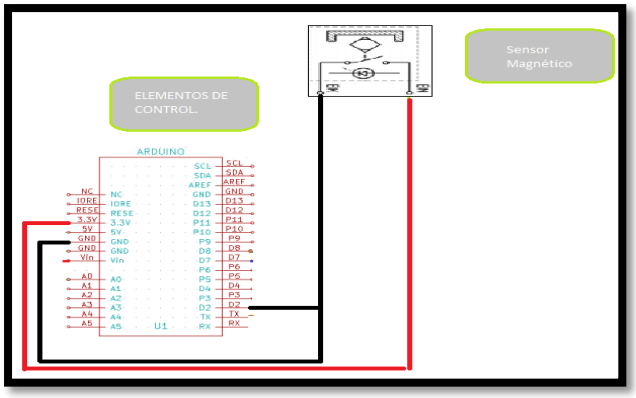

Figure 20. Bluetooth connection circuit.

If the alert system is activated, the magnetic sensor comes into operation when the sensors are separate and they

emit a signal to the arduino, otherwise module, sensors do not emit any signal.

B. Block of connectivity.

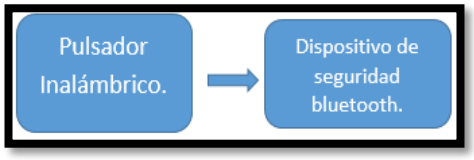

Figure 21. Connectivity diagram.

Connectivity block consists of a wireless push button and the security system bluetooth device (see Figure 21), the wireless Bell push is based on an application installed on the cell phone of the user who will establish a communication with the alert device bluetooth module to turn on or turn off the signal of sending SMS which will be broadcast to mobile cellular device from the owner of the bike as a sign of manipulation of the handle of the vehicle alert.

In the wireless device's owner will install an application (see Figure 22) for the activation and deactivation of the safety alert system.

Figure 22. Application of control.

Considering the features of the bluetooth modules, single safety device will use the reception of data from the mobile device to the bluetooth module, so it will be used the module bluetooth H06 which operates in slave mode for receiving data of power-the security system.

Module bluetooth H 06 has a basic configuration and does not require a complex configuration or a pin control since it only receptor basic data (1 and 0), works to 5 volts and frequency to 2. 4 GHz, has a range of 10 meters for the establishment of the connection with the security system.

Bluetooth connection circuit- Arduino.

In Figure 23 you can see that the module bluetooth will connect to the module for arduino by means of pins (0 and 1) which serve for communication Rx and Tx respectively with the following connection (Rx with Tx Arduino, Tx bluetooth bluetooth with Rx Arduino).

Bluetooth module will feed through the arduino module pin 5v that supplies the voltage and the current needed for their respective operation.

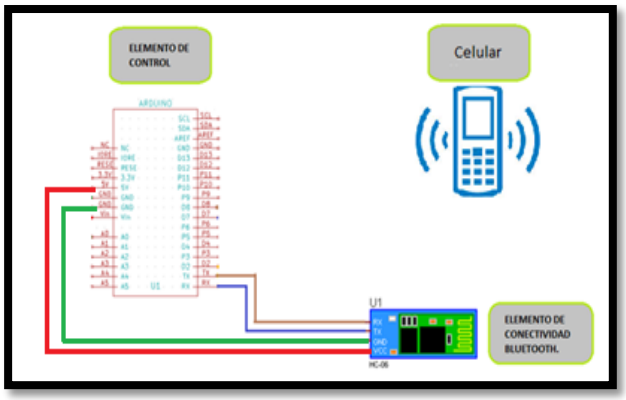

Figure 23. Bluetooth connection circuit.

Established after connection bluetooth cell phone and safety device, if it is activated the alert system by means of the application installed on the phone's owner, received an SMS when the handle of the bike been tampered with for any reason, if it is off the warning system will not be sent an SMS to the mobile cellular device from the owner.

C. Block of communication.

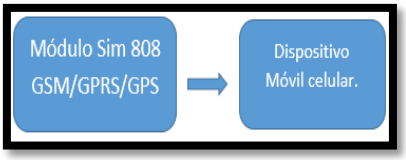

Figure 24. Communication diagram.

Communication block consists of a module sim GSM/GPRS/GPS and cellular mobile device (see Figure 24).

Works with the module sim 808 have the GPRS technology for this project, configuration makes it commands AT facilitating its programming, supports 26 5 volt power voltages, with GSM network in the bands used in the country.

Has included a GPS system integrated with an accuracy of 2.5 meters which makes the town detected more visible. With its integrated system does not need another GPS module and this helps in physical savings project. It has other integrated systems including the use of microphone and speakers that will serve for future improvement of the project and make maximum use of this module.

Communication module connection circuit - Arduino.

In Figure 25 you can see that communication module will connect to the module arduino using the pins (7 and 8) that serve for communication Rx and Tx respectively with the following connection (Rx Tx Arduino (pin 8), Tx communication module module communication with Rx Arduino (pin 7)).

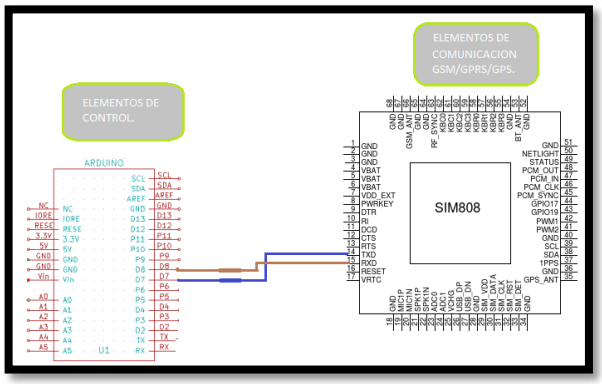

Figure 25. Connection module SIM 808 and arduino.

This module serves to alert device communication with the owner mobile cellular device, since it will emit an SMS when you tell the control module to alert the user of the vehicle, the vehicle been tampered with by someone not authorized.

This module has a GPS system that receives signals from coordinates of location (latitude and longitude) and will be sent via GPRS technology so that it is stored in a database on a web server.

D. Block receiver.

Receiver block consists of a wireless mobile device and a web server. The cellular device will be who received the SMS alert when order control module and the owner shall verify the State of the vehicle.

The web server is responsible for receiving data from the GPS through GPRS technology coordinates and store it so that the owner can access and verify the routes that have been made by time and date by viewing a web page.

Web server- Is a program that runs an application for establishing one-way links as also bi-directional links with the customer. It serves for the stay of a web page. They are waiting for any request made by a client or a user on the internet.

Hosting 000webhosting is used by its storage capacity disk 1.5 Gb enough for reception of the coordinates for a period of one year, has 100 Gb monthly transfer enough to send the coordinates.

Has database and use of PHP programming language providing its programming, to make performance tests it uses a database for storage and a subdomain for the accommodation of the web page where the user can view data remotely.

Settings Panel is easy to use since it is friendly for the user having several configuration options.

1) Connection of the receiving devices.

Safety through technology GSM device will send a text message to the mobile device of the owner (see Figure 26).

The safety device will send coordinates of latitude and longitude to the web server using GPRS technology.

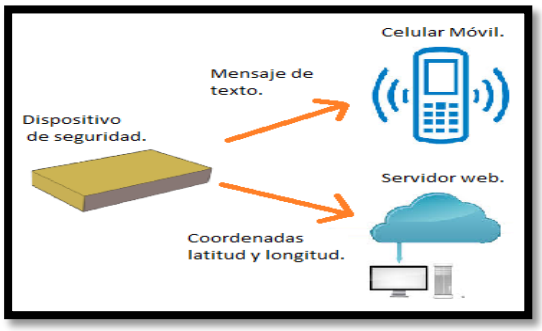

Figure 26. Receiving devices connection.

2) Analysis and calculation of data submission.

For the analysis of sent data by means of technology GPRS has taken into consideration a distance that runs along a two wheeled vehicle taking into account the

capacity of the thief in case of theft of the vehicle, and within the city in populated area.

Has taken an initial reference point and a distance travelled 300 meters, in Figure 27 speed that can have depending on the capacity of the same offender; in a straight line can move at a speed of 70 Km/h and on a curve can move at a speed of 50 Km/h.

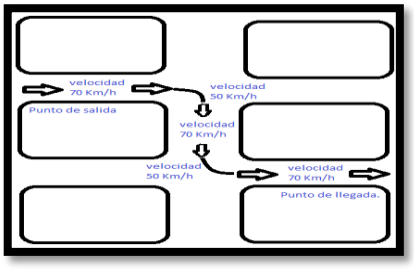

Figure 27. Reference speeds.

Within a populous city takes a speed of average starting of the bike of 60 Km/h with a distance of 250metros with which we proceed to calculate the coordinates sending transmission time for a bike tracking. To know the time of transmission of GPS data is calculated by the formula 1 where the distance (d) is equal to speed (V) by time (t).

d = v x t. **(1)**

t= (d / v)

t= (250 m/(60 Km/h)) ((1 Km/h)/1000 m)(3600 s / 1 h)

Time = 15 seconds.

A bike theft at a speed of 60 Km/h average within a city populated by different variation of speeds on curves will travel a distance of 250 meters in a time of 15 seconds. This time of 15 seconds will be taken to send coordinates via GPRS.

Every 15 seconds, data is sent to the web server of the coordinates of GPS (latitude and longitude). Coordinates (latitude and longitude) are given in alphanumeric characters (number or letter), is made up of 8 bits, the data of latitude (6 characters) and length (8 characters) more a comma (,) of separation between the two values given at the end 15 characters that will be sent through GPRS every 15 seconds.

3) Calculation of sending data.

With the value obtained from 15 seconds make the calculation of data to send:

Package = shipping characters by 8 bit.

Package = 26 x 8 = **208 bits.**

A day 86400 seconds, for our case is sent every 15 seconds.

86400/15 = **5760 times.**

The server receives data by day:

5760 x 208 = **1198080 bits by day.**

A rule of three is made to convert the bits in megabits and view their consumption at megabit:

1 Kb equal to 1024 bits, 1198080 bits how many Kb?

$$xKb = \frac{1198080\ bts}{1024\ bts} = \textbf{1170 Kb.}$$

1 Megabit equal to 1024 Kb, 1170 Kb how many Mb?

$$xMb = \frac{1170\ Kbs}{1024\ Kbs} = \textbf{1.1425 Megs by day.}$$

Reception of data per month is:

1.1425 Mb x 30 = **34.277 Megs by month.**

Consumption in dollars of 1 Mb equals $0.23 cents, this means:

34.277 Mb x $0,23 = **$7.883**

Consumption in dollars a month the user must take is $ 7 with 88 cents monthly for the delivery system of the GPS coordinates to the web server is running.

The user will receive the coordinates of the vehicle (latitude and longitude) location every 15 seconds or every 250 meters having a cost of $7.88 dollars recharge. Therefore if the user requires to obtain GPS data to a lesser or greater distance will vary the consumption in balance of recharge (see table II).

TABLE II.

CALCULATION OF CONSUMPTION IN DOLLARS ACCORDING TO DISTANCE AND TIME.

Distance (meters).	Time (seconds).	Consumption in dollars.
100	6	19.70
250	15	7.88
400	24	4.93

E. Power supply unit.

Power block is the main part of the project because it provides the energy necessary for the functioning of the security system, consists of an own motorcycle battery 12 volt, 5 amp's current main source for the safety device, and will be implemented a backup battery to be used as a source of AC power.

Warning system consists of multiple devices and each one uses a different power (see table III).

TABLE III.

CURRENTS OF THE ELEMENTS USED.

Device.	**Current.**	**Voltage.**	**Current**	**Voltage.**
Arduino module one.	120mA	5V.	103mA	7.4v
SIM 808 module.	250mA	5V.	205mA	7.4v
Bluetooth module.	36mA	5V.	36mA	5v
Sensor Magnetic.	15mA	3.3v.	15mA	3.3v
TOTAL	**421mA.**		**359mA**	

Verified the amount of current for each element of the safety device step by energy consumption tests with a multimeter (see table III), with which the safety device will operate a rating of 7.4 volts for power consumption that is optimal for the operation and less use of current in each of the elements of the security system.

Module arduino uses 1 pin I/O to read the magnetic sensor, which has a current of 15mA, the current consumption of the bluetooth module is 36mA and consumption of communication between Arduino and the GPRS module pins and bluetooth module is used approximately 52mA giving a total power consumption of the module 103mA arduino and a power of 0. 76W.

Module SIM 808 supply voltage is in the range of 4.8 V to 12V (manufacturer data), with a current consumption of 205mA a rating of 7.4 volts and a power of 1. 51W, this maximum current is during transmission bursts.

For the bluetooth device supply voltage is 5 volts retrieved module arduino with a stream of 36mA and a power of 0. 18W.

Magnetic sensor works with a voltage of 3.3 volts and a current of 15mA and a power of 0. 049W.

1) Regulator circuit of voltage of 12 volt 7.4 volts.

Has been established that the security system work a rating of 7.4 volt by low consumption current obtained previously.

Sets a circuit that regulates the input voltage (see Figure 28) battery 12 volt motorbike 7.4 volts for the operation of the safety device.

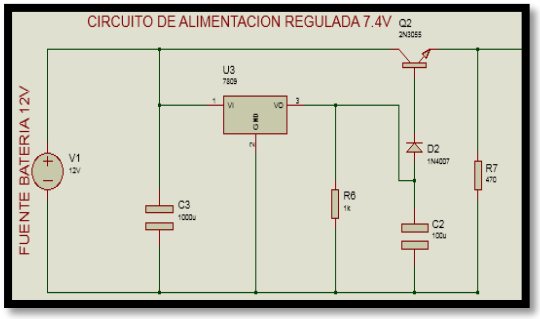

Figure 28. Regulated power supply circuit.

D2 (1n4007) diode which serves the power circuit protection to avoid the return current and cause damage to used items.

7809 TTL output to 9-volt voltage regulator.

(100 uf) C2 Capacitor to rectify and maintain a constant current.

(1000 uf) C3 Capacitor to improve the transient response that is the current extinction at the time.

R6 (1 K ohm) are used to adjust the tension of exit 1Kohm with 0.054 W power.

2n3055 to increase the current in the output and output voltage regulation.

2) Backup battery supply circuit.

By means of a power supply circuit (see Figure 29) is the feedback of the battery backup so that it is always powered power and when disconnected the main source (12v motorbike battery) to operate the back-up battery and the security system follow in operation.

Sets a LIPO battery of two cells have a voltage of 7.4 volt that will feed to interlock without any inconvenience and has a 2000 current mili amp which gives more durability of download time. This battery with a low footprint and has great size of current storage.

For the design of the power circuit is needed output voltage 7.4 volts for charging LIPO battery.

R4= 100 ohm Vout= 7.4v Vref= 1.25v

R5= (R2/1.25) (Vout-1.25) (1)

R5= (100ohm/1.25) (7.4-1.25)

R5= (80ohm) (6.15)

R5= 492 ohm.

After the performed calculation of R5 is used a 510 ohm which are available in commercial heating resistor.

$$P = V^2/R = (7.4*7.4) / 510 = 0.10 \text{ W}$$

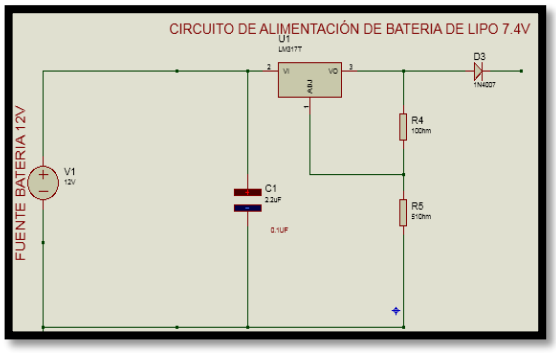

Figure 29. Battery power circuit.

D3 led that serves as a protection of the power supply circuit to avoid the return current and cause damage to used items.

C1 (2.2 uf) Capacitor which is put at the beginning of the circuit to rectify and maintain a constant current.

Lm317 regulates the voltage of output from 1.25 volts up to 37 volts.

R4 100 ohm reference resistor to get the value of the resistor R5 (510 ohm) by a voltage divider.

If at any moment is cut of the motorcycle battery power, alert device will continue to operate since comes into operation the LIPO battery because it is a source of support.

3) Security system power supply circuit.

With battery power circuit and voltage regulator circuitry can feed the safety device by direct 7.4 controller circuit Volt or battery LIPO 7.4 volts.

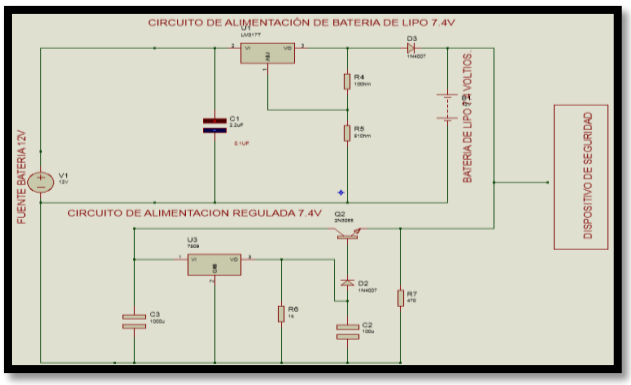

Figure 30. Power supply circuit.

As shown in Figure 30, the safety device will have a power of 7.4 volt either by the regulator circuit designed for low power consumption or the use of battery 7.4 volt that will be replenishing and will become operational when it ceases to operate the regulator circuit. The safety device will have a constant voltage operation of 7.4 volts and a low current consumption. The design of this circuit for the power supply of the security system and LIPO battery charging circuit is performed in bakelite.

IX. CONNECTIONS OF THE ELECTRONIC CIRCUIT.

In Figure 31 shows the electronic connections and elements used for the development of the system of alert, handling, tracking and location of a motorcycle.

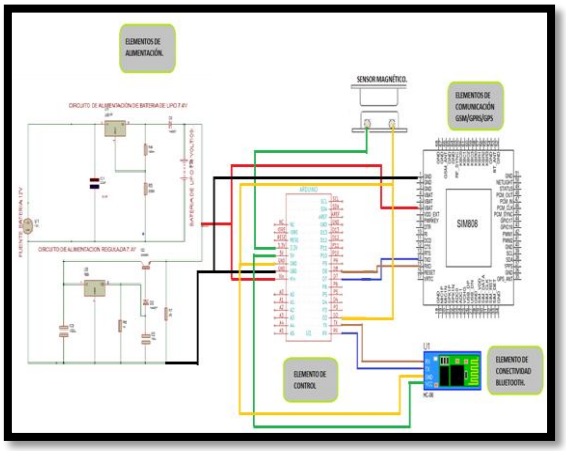

Figure 31. Electronic circuit.

The power circuit consists of a circuit of battery power that realimentará to a 7.4 LIPO battery Volt as a back-up, also consists of a controller circuit of 12 volts (battery of the bike) 7.4 volt that is the voltage that will run the security system reducing the power consumption.

Security system consists of a module arduino Uno, a SIM 808, a bluetooth module and a magnetic sensor module.

The arduino module and the module SIM 808 will be fed 7.4 volt, the bluetooth module will connect pin RX TX of the arduino and the arduino one RX TX; and will be powered by 5 volts from the 5v from one arduino pin. SIM 808 module will connect RX pin 7 of the arduino and TX in 8 one Arduino pin. Magnetic sensor will be connected at pin 2 of the arduino, and powered by a 3.3 volt from one arduino.

X. SECURITY SYSTEM FLOWCHART.

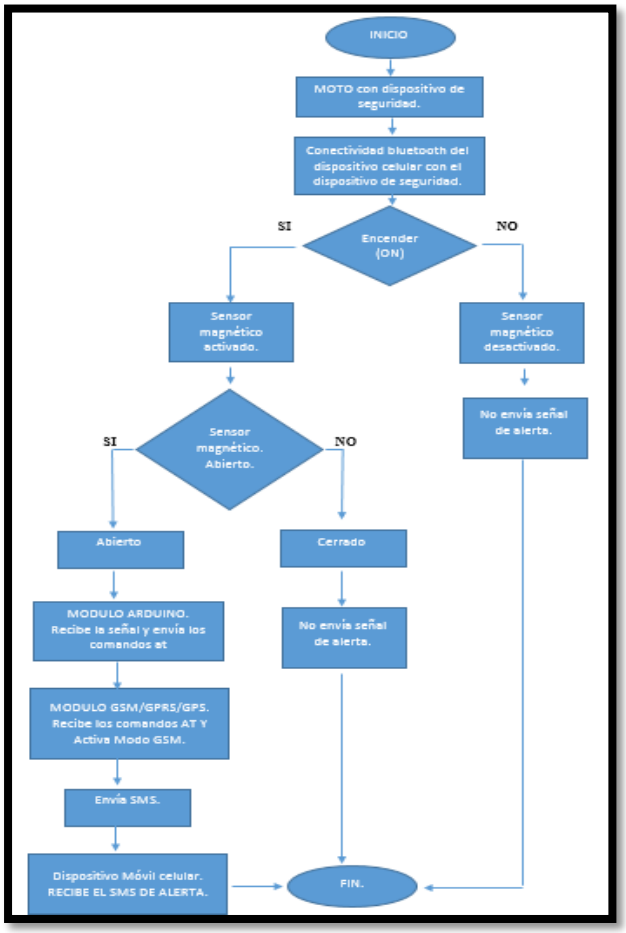

Figure 32. Flowchart of the security system.

By Figure 32 is given to know the operation of the safety device, which begins the motorcycle parking and connection is the cellular device with safety device via bluetooth through the application installed on the cell phone of owner and system alert, tracking and location of bike can be switched on.

When the magnetic sensors are closed, no control signal is not sent to the arduino module but if the handle of the vehicle is moved by any unauthorized person, magnetic sensors will open and send the signal to the arduino module. The arduino module sends AT commands to the GSM module and a SMS will be sent to the cellular mobile device owner, mobile cellular device receives the SMS and you can display the text of the message.

With the application installed on the cell phone owner can turn off the safety device and magnetic sensors will not display no signal when it is opened or closed.

A. Programming and configuration of arduino, bluetooth modules one and GSM/GPRS/GPS module and control for mobile device application.

Each module has its functions and your own settings detailed at continuacion:

- For the design and programming of the implementation of connectivity it is on page www.appinventor2.com.
- Configuration of bluetooth module.
  AT NAMExxxx //Colocamos the name that will be displayed to the module bluetooth.//
  AT PINxxxxx //Colocamos a code for when some device you want to link with the module bluetooth.//
- Configuration of GSM module for sending SMS.
  AT //Retorna an OK if the communicating with the GSM module.
  AT CREG? //Retorna 0.1 if you are registered on any network. //
  AT CGSN //Retorna the device ID, number IMEI. //
  AT COPS //Retorna network which is just linked. //
  AT CMGF = 1 //Activa mode text. //
  AT CMGS = xxxxxxxxxx SMS format //Asigna number for receipt of the SMS recipient, write mode SMS text. //
- Module programming arduino.
  #include <SoftwareSerial.h> //Incluye a library to assign two pin communication serial. //
  SoftwareSerial ss (Rx, Tx); Assigned serial communications pins Rx and Tx. / /
  Int, char. //It assigns the type of variables, int = integer, char = value with numeral sign or letters.
  pinMode (2, INPUT); It assigns a pin of the arduino mode input of señal.//
  ss.begin (9600); Assigns the speed in bits per second for serial data transfer.

XI. DIAGRAM OF OPERATION OF GPS AND GPRS.

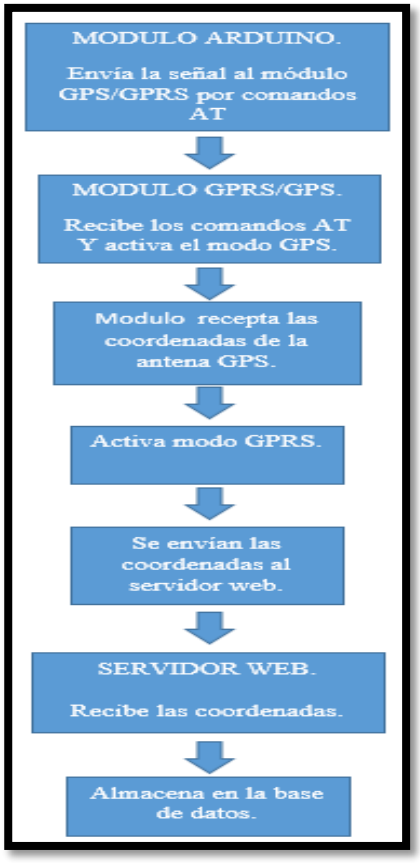

Figure 33. Diagram of operation of GPS and GPRS.

In Figure 33 shows the operation of the GPS and GPRS.

The arduino module sends signals to GPS/GPRS communication module by AT commands, communication module receives the AT commands and activates the GPS mode. GPS module recipe information from the satellites of coordinates in length and latitude while communication module activates the GPRS mode for the sending of such information (latitude and longitude). The GPRS module sends the coordinates of the GPS mode to a web server through the HTTP protocol where the web server receives information from the GPRS module and stored in a database of GPS coordinates.

A. ***P****rogramming and configuration of GPS/GPRS modules and arduino one module.*

Configure GPS and GPRS communication module, and arduino module is programmed so that you realize the control of sending information to the web server.

- **Setting GPS mode.**
  AT+CGNSPWR //Comando EN mode GPS. //
  AT+CGNSTST //Comando EN activation to activate the GPS test mode and receive the coordinates of GPS. //
- **Configuration mode GPRS.**
  AT+SAPBR //Activa the GPRS mode.
  AT+SAPBR = 3, 1, "APN" //Colocation of name of the access GPRS. //
  AT+SAPBR = 3 point, 1, "USER" username GPRS. //
  AT+SAPBR //Colocation = 3. 1, "PWD" key GPRS. //
  AT+HTTPINIT //Inicialización HTTP service.
  AT+HTTPACTION //Action of mode of shipping.
  HTTPPARA = "URL" AT //Assignation's web address http. //
- **Module programming arduino.**
  #include <TinyGPS.h> //Librería of arduino for use of data GPS. //
  Float //Variable to receive data GPS. //
  gps.f get position (,) //Reception of GPS data of latitude and longitude. / /

XII. FLOWCHART OF THE WEB SERVER.

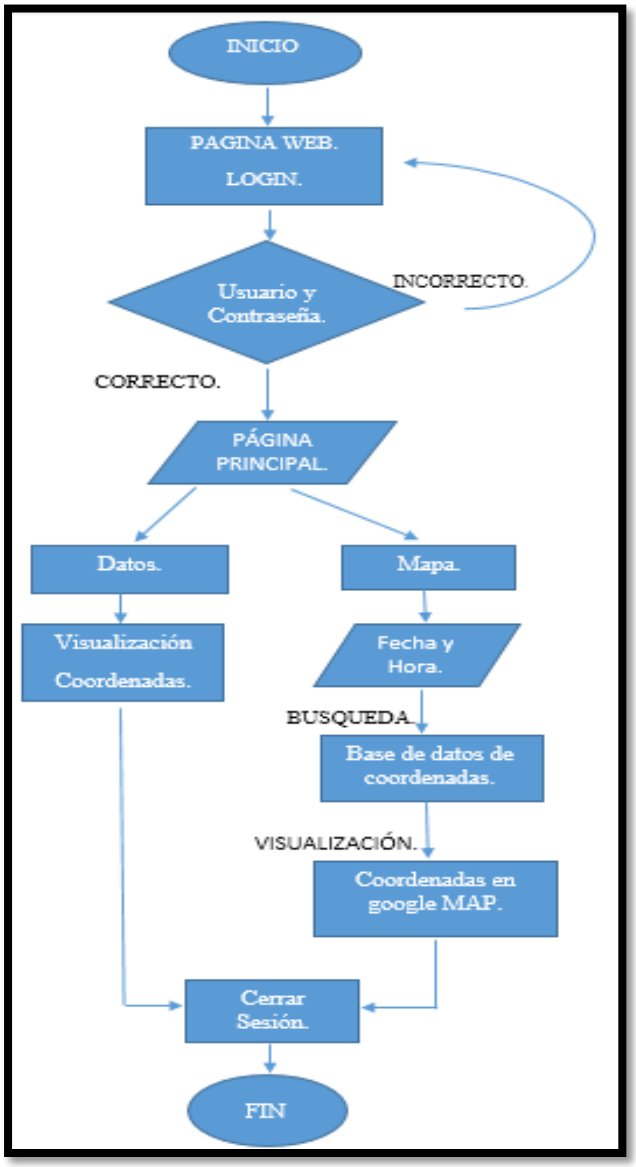

Figure 34. The flowchart of the web server.

In Figure 34 demonstrates the operation of the web server in which entering the website juliomoto2016.comlu.com where the user will have access with your proper restriction, the website has identification through username and password access, once digitized correctly the user and password you will be directed to the main page where there are three options (data (, Map and logout).

The button data is can visualize the coordinates of latitude, longitude, date and time stored in the server, the map button you can select the date and time to display the coordinates on the map points and make a trace of location and tracking of the vehicle, and then the button logout, the

page can be closed and returns to the user authentication page.

A. Configuration of the web server.

In the browser the web address of the server is introduced to create www.000webhost.com obtaining the server home page (see Figure 35).

Figure 95. Free web hosting.

Is a record for the creation of a new account and have access to the web server with the creation of account data (see Figure 36).

Figure 36. User account.

Create the subdomain that is available for our website. juliomoto2016.comlu.com display (see Figure 37).

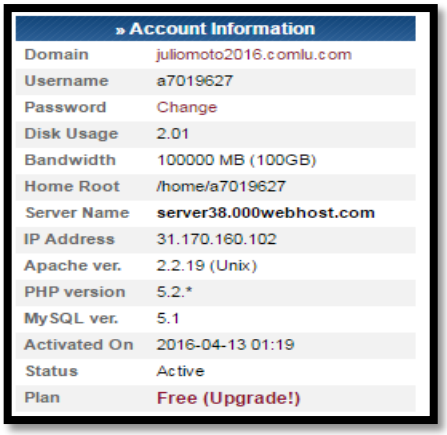

Figure 37. Subdomain.

For the registration of data on the web needs to create a database (see Figure 38) where GSM/GPRS module from GPS coordinates will be stored.

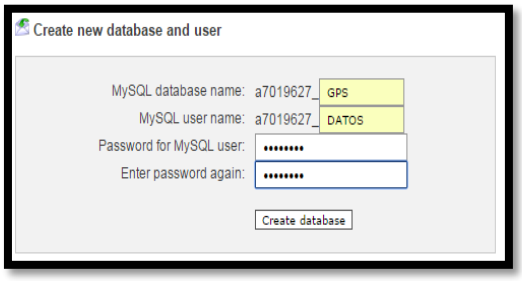

Figure 38. Database.

Once created the database proceeds to create the tables (see Figure 39) where the necessary data from the GPS coordinates are stored.

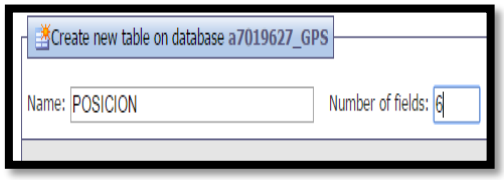

Figure 39. Creating table.

Made the creation of table is where will store data received by GPRS alerting system (see Figure 40).

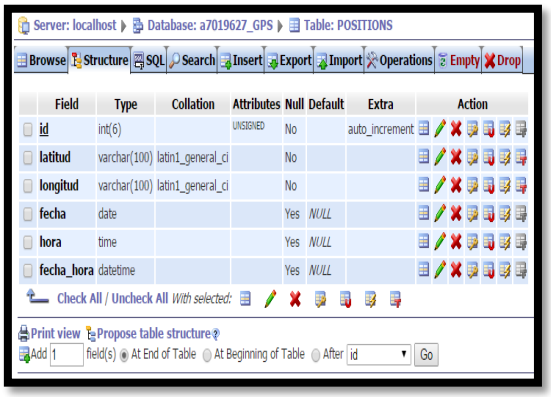

Figure 40.Tabla position.

To display the web page created by using HTML code, is using the following web address: juliomoto2016.comlu.com (see Figure 41).

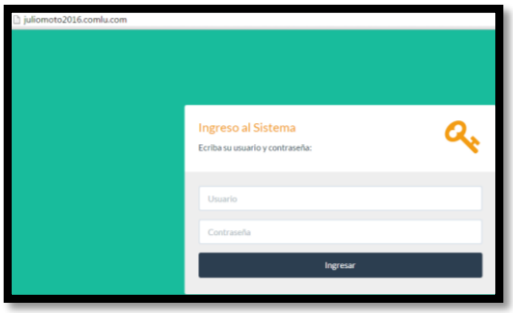

Figure 41. Web page.

Need entry permits which shall be taken to fill fields username and password to access the information (see Figure 42), registered in the database.

Figure 42. Main web page.

Within the web page you have three options in which you can select. Data to display coordinates, map to visualize the dots on the map of google map and log out to return to the authentication page.

In the button data you can see points of coordinates in latitude and length (see Figure 43) as well as the date and time received from the security system.

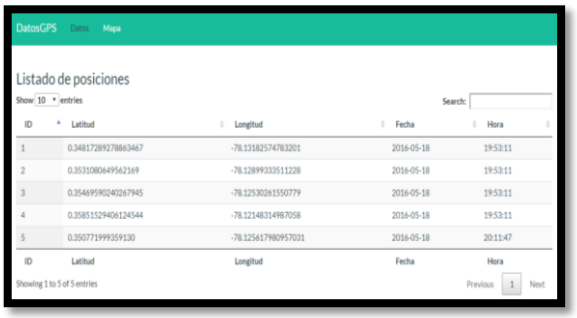

Figure 43. Display data.

For the map button (see Figure 44) should choose the date and time of start and end so that it shows the points of the range entered by the user and verify the path or location of the bike.

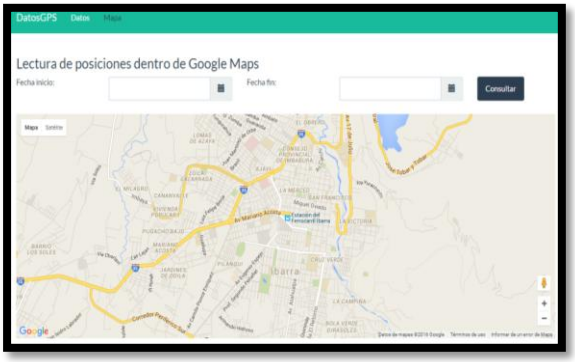

Figure 44. Display map.

XIII. IMPLEMENTATION OF THE SAFETY DEVICE.

Motorcycle features a chassis which is the main part of the bike as it is the structure that supports the elements of the bike.

Figure 45. Motorcycle chassis.

In the inner part of the bike, structure of the chassis (see Figure 45) safety equipment is to be installed (see Figure 46), so it cannot be easily manipulated and proper operation of the safety system.

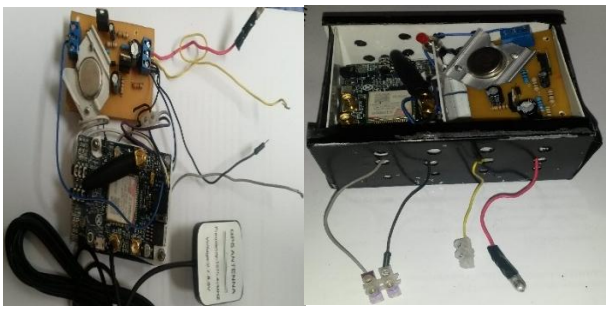

Figure 46. Case of the safety device.

Magnetic sensor is placed in the part front shaft Dela motorcycle (see Figure 47), with purpose of locking the bike part of the magnet makes contact with the magnetic sensor.

Figure 47. Axis of the bike.

XIV. OPERATING MODE OF MANIPULATION ALERT.

The owner of the vehicle park the bike with the handlebars turned to the left (see Figure 48), and thus the magnetic sensors come together hoping to be energized.

Figure 48. Motorcycle.

Have to connect via bluetooth to activate alert through the application system installed on the cell phone of the owner (see Figure 49).

Figure 49. APP.

When they move the handlebars of the bike by any non-authorized events, sensors will open and send the signal of alert by sending an SMS alert from the safety device to the cell of the owner (see Figure 50).

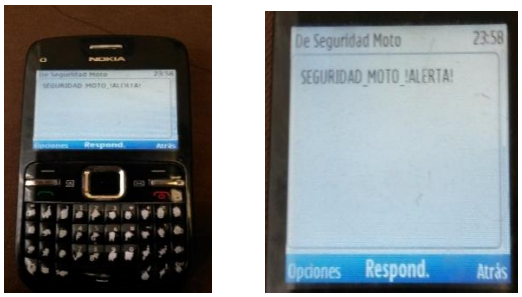

Figure 50. Device owner.

XV. OPERATION OF THE MODE OF SHIPMENT OF COORDINATES TO THE WEB SERVER.

The GPS coordinates (latitude and longitude) will be sending constantly to the database of the web server and you can view that information (latitude and longitude) on the website juliomoto2016.comlu.com (see figure 51).

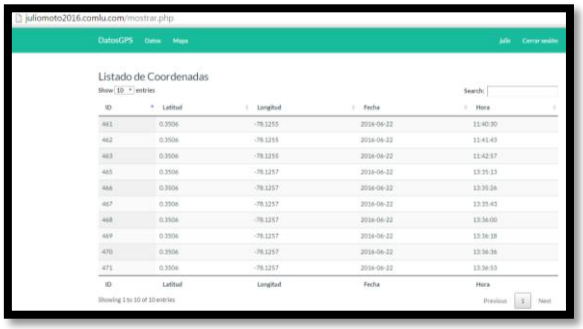

Figure 51. GPS coordinates.

Also can be viewed on the website location of the motorcycle with the date and time inserted by the user to verify the position where he parked the vehicle (see Figure 52). You can also display the route that has been performing during a certain time in date and time.

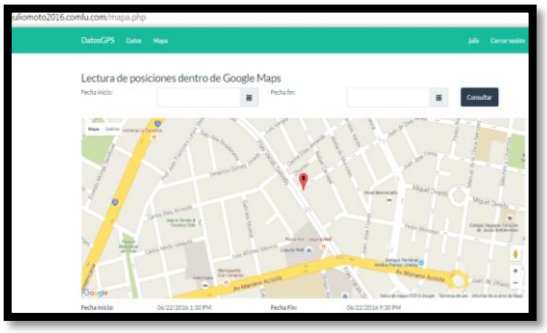

Figure 52. Visualization of coordinates of the bike.

A. Benefit of the Project.

For the benefit of the safety device for motorcycles, is a comparison of the security system proposed in this project through the relationship that exists with other security systems of tracking and location (see table IV).

TABLE IV.

COMPARATIVE BETWEEN LOCALIZATION AND OTHER TRACKING SYSTEMS.

Proposed security system.	GEO LOCATOR G100 tracking system	Star tracking system.
Connectivity GPRS y SMS	Connectivity GPRS y SMS	Connectivity GPRS y voice.
GPS con 66 channel the acquisition / 22 the tracing.	GPS con 20 cchannel de tracing.	GPS con 20 canneles de tracing.
Precision in localization (2.5 metros).	Precision in localization (3 metros).	Precision in localization (3 metros).
Monthly rate $ 11,38	Monthly rate $ 9.99	Monthly rate $ 41.66
Equipment price $ 130.88	Equipment price $149	Equipment price $ 211.48
Maintenance. $ 25	Maintenance. $ 35	Maintenance. $ 40
Manipulation, tracking and localization.	Tracking and localization..	Tracking and localization..
Send data every 15 seconds.	Send data every 1 min.	Send data every 3 min.

The advantages with respect to the different tracking system (see Table IV), we channel capacity of GPS which makes them have more connectivity options to the satellite, has more accuracy for the location of 2.5 meters with which gives us a locality of the most effective vehicle; Price of the equipment more economical with performances of handling, tracking and tracing included and sending data from coordinates every 15 seconds taking more information at every moment, these data can be personally check and every hour within the web page taking the location and taking a trace of the vehicle 24 hours a day.

Other advantages of the project are to have the option to modify the time of dispatch of coordinates of the GPS which would serve to have greater data of tracing and the user will choose the time you want to receive the coordinates of your vehicle, with a maintenance cost of $25.

XVI. CONCLUSIONS

It has been constructed an alerting device of manipulation to warn the movement of the crank of the bike by unauthorized persons and to prevent the theft of the vehicle.

With the construction of the safety device for the tracking and tracing, you can track the vehicle and recover the bike at some time of loss of same.

The magnetic sensors provide the necessary characteristics for the alert to manipulation by its operation in closed circuit producing a warning signal when the motorcycle is handled or the sensor cable has been cut.

The employment of the GPRS technology has guaranteed the communication of the safety device and the web server quickly economic and optimizing the transmission time at a low cost.

The safety device allows the tracking and tracing of the motorcycle during the 24 hours with data in time intervals of 15 seconds getting various points of the path taken in the day or by the hour

The bike that has implemented the safety device will count with a warning signal (text message) when moving the handlebars of the bike.

The coordinates of the bike received from GPS and stored in the web server provided the owner to trace and locate the vehicle at any time from a device with access to the internet.

RECOGNITION

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