NORTH TECHNICAL UNIVERSITY

FACULTY OF APPLIED SCIENCE ENGINEERING

CARRER OF ELECTRONIC AND COMMUNICATION NETWORK ENGINEERING

SCIENTIFIC ARTICLE

PROTOTYPE G.T.S.B-1 (BASIC GLOVE TRANSLATE SIGNS), FOR PEOPLE WITH LANGUAGE AND AUDIO DISABILITIES

PREVIOS PROJECT TO OBTAIN ELECTRONIC AND COMMUNICATION NETWORK ENGINEER´S TITLE

AUTHOR: JAIRO BRYAN NAVARRETE ENRÍQUEZ

HEAD TEACHER: ING. PAUL DAVID ROSERO MONTALVO

IBARRA-ECUADOR

PROTOTYPE G.T.S.B-1 (BASIC GLOVE TRANSLATE SIGNS), FOR PEOPLE WITH LANGUAGE AND AUDIO DISABILITIES

Author-Jairo Navarrete.1

[1] Electronic and Communication Network, North Technical University, Av. 17 de Julio 5-21 Ibarra, Imbabura

jbnavarretee@utn.edu.ec

Abstract. *The prototype GTSB-1 (Basic Glove Translate Signs) for people with language and audio disabilities; allowing the reduction of the technological gap in university students, compelling them to make electronic projects for people who have some special ability and also helping them to improve their quality of life especially by providing the inclusion of new opportunities in their social life, educational and above all in their family background, since most deaf people are cared for by their families; this prototype would improve communication skills within their surroundings.*

Keywords

Prototype, electronic, communication.

1. Introduction

According to the National Plan of the Good one to Live and the National Plan of Science and technology one of the objectives that thinks about the state is to reduce the technological breach to that the students university are linked with aspects of social improvement, and that according to the position of improving the quality of people's life with special capacities in the objective 1 is defined: To favor the equality, the cohesion and the social and territorial integration in the diversity.

According to the Art.87 of the Organic law of special ability it determines to the MIES like national authority in charge of the economic and social inclusion for people with special ability, having the objective of qualifying to the families that have under their care to these people, in the good treatment and attention that you should lend them

In Ecuador they exist 14483.499 of people approximately, which the Ecuadorian population's 5,6% presents some type of special ability, that is to say around 815.900 people, which 48,4% are men and 51,6% are women

With the advance and development of the technology exists a great quantity of branches or variants that every day

charges force as it is investigated on them; such it is the case of the application of the electronics. Since in the North Technical University has the Career of Electronic Engineering and Communication Networks, one has great transcendency in the development of this type of projects, since it is captured in them all the knowledge and the experiences shared so much in the classrooms for educational and students.

2. Materials and Methods

People that present a certain special ability in the case of the deaf people, the communication with the means that surrounds them in if he returns a constant barrier to the moment to exchange information; I toss that it is evidenced even more in the family environment, it is for this reason that the development of electronic prototypes of communication is alternative that they will allow to enlarge the capacities of people's deaf people communication, besides the methods already existent as they are the lip reading and the sign language

The sign language that people with language and audio disabilities use to be able to exchange information inside the environment that surrounds them, will allow them to express their feelings, thoughts and emotions according to the movements and flexibility of the signs that they emit toward the other ones.

Several communication ways exist, among them they stand out the parts of our body that more often are in movement to the moment to establish a communication inside the I intone that it surrounds us like it is the smell, the view, the tact, the pastures of the body and mainly the expressions of the hands

2.1 Signs Sensor

The sensors have become one of the main components in the development of electric and electronic systems, since these they are taken charge of either capturing any action type this in physical or chemical magnitude, that is to say,

the process or device on which the control is exercised and of the information of the behavior of the work; the captured sign is transmitted this way the controller which processed it to be able to take any type of specific action of operation.

In accordance with their application, a sensor can be formed by metallic materials, not metallic, organic or inorganic, and for fluids, gases, plasms or semiconductors. When using characteristic special of those materials, the sensors convert the quantity or property measured in an analogical or digital exit; a sensor should complete several parameters or requirements before being used with the purpose of avoiding possible flaws or errors to the moment to end up managing them.

The sensors should be the most exact or high thing possible, that is to say that according to the variable to be detected should not generate errors; the error average among the actual value the detected value will have to be zero; also, the precision of the mensuration should be as high as was possible, it means that it exists or don't unite small random variation in the mensuration of the variable. The sensor will respond minimum at one time the changes of the detected variable and the maximum securities and minima are also analyzed for the variables of receipt and discursement of a sensor, that is to say that, inside those securities the sensor entered in operation. The useful life is the period in which the device continued working accurately inside the predetermined limits by means of the operation range.

2.2   Communication Modules

The sensors have become one of the main components in the development of electric and electronic systems, since these they are taken charge of either capturing any action type this in physical or chemical magnitude, that is to say, the process or device on which the control is exercised and of the information of the behavior of the work; the captured sign is transmitted this way the controller which processed it to be able to take any type of specific action of operation.

The wireless nets technology has a particular explosion, thanks to the development inside the bands of frequencies ISM (Industrial Scientific and Medical). When speaking of exploitation of free bands, he understands each other the use and operation of nets that operate in those frequencies; also, the free bands for concept should not be graduates, that is to say, a qualifying title should not be demanded for its use, although a registration process can be necessary to carry out a minimum control.

The main advantages of using these wireless technologies are that they allow to generate a wide freedom of movements on the part of the user.

Several technologies of wireless transmission exist making each one of them appropriate to certain uses or applications like they can be: Bluetooth, Wi-Fi, Infrareds, ZigBee, GPS; among others.

2.3   Electronic Badge

At the present time in the world of the development of electronic platforms has made people of all age to be motivated to develop and to investigate all type of projects or prototypes that allow to solve some outlined problem; especially in the field of the education where it begins to be considered of great importance to endow to the new generations of basic knowledge of programming of applications or of electronic development.

The development of interactive projects has allowed that, Arduino can take information of the environment through its pines of entrance of an entire range of switches or sensors and it can affect that that surrounds him controlling lights, motors and other actuadores.

The Arduino microcontroller contains a programming language Arduino based on Wiring, and the development environment Arduino based on Processing; that is to say that the projects made with Arduino can be executed without necessity of connecting to a computer, although they have the possibility to make it and to communicate with different software types.

Processing, is a programming language of open code, focused for people that want to create images, animations and interactions. Initially developed to teach the foundations of the computer programming in a visual context.

Wiring, is a programming language of open code, focused for people that want to create images, animations and interactions. Initially developed to teach the foundations of the computer programming in a visual context.

Arduino includes its own IDE known as the interactive environment of development based on the application written in Java, which allows that the programming of the electronic board is simple because it is based on the code open of Processing and Wiring. It was developed to be the friendliest thing with the user.

Fig 1. Arduino Interactive Development Environment

2.4   Mobile Applications

Today at the present time, the growth of intelligent devices in the world has made that the development of mobile applications as games, entertainment, localizations, news, books, time data, sports, among other; it increases in great measure, with the purpose of covering the necessities of the users.

The mobile telephony has spent in the last years of being a closed sector, in which a small portion of developers only had the operators' license to create applications for its devices and net services, to become a fervent promoter of the platforms of development of open code.

Thanks to that the current market of the mobile applications is led by the companies Apple and Google with its development operating systems as iOS, Android and Windows Phone, and with sale platforms like App Store and Play Store.
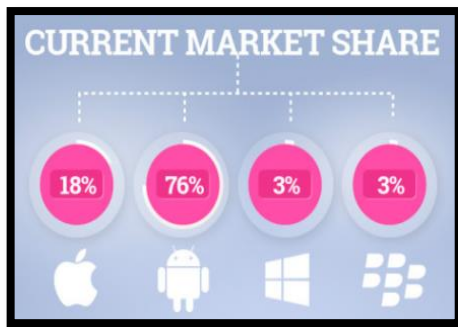

Fig 2. Current Market Mobile Applications

To create services and applications that cover with the necessities of the users, is no longer limited to receive and to make calls, on the contrary it is centered in activities like to receive electronic mail, to read documents, to send pictures, to record videos, chatear, to participate in social nets, among others.

At the present time they are had devices of last technology, which are used by the user in such a way that you/they can interact with the mobile team in a simple way.

The developers of applications at world level are focused exclusively to the programming of applications for Smartphone, and they introduce an implementation for devices with wider screens as the Tablet.

The main function of a Smartphone, is of being good as platform for applications that make profit of the characteristics of the same telephone.

3.   Results

One of the main components of the translating glove of basic signs is the sensors, which adapt in each finger of the right hand, in total are five sensors that will allow to throw a range of specific securities, depending on the position of each finger of the hand, which will be processed by means of the implementation of an electronic board Lilypad Arduino, allowing to develop a programming environment that adapts to the outlined conditions.

The electronic board LilyPad Arduino adapts to the conditions of implementation of the translating glove of basic signs, since to the being cooked by means of the use of a conductive thread, it is an alternative of development of electronic projects for textile intelligent, allowing this way to simplify all type of cables that you/they prevent that the glove is more attractive for the user's use in this case focused people with language and audio disabilities.

The wireless communication using a module Bluetooth HC-05 allows the shipment of data by means of the translating glove of basic signs, toward an intelligent device which will allow to process the data receptados by means of the development of a mobile application, having this way in answer a communication in an auditory and textual way.

The selection of the material type implemented for the translating glove of basic signs much depends from the conditions to those that is exposed, I eat the manipulation and constant movements that one needs to make for the operation tests for example, since it is the main base of the development and implementation of the electronic components as flexible sensors, communication module Bluetooth, electronic badge Lilypad Arduino; among others.

The utilized material for the development of this electronic prototype is a glove of lycra expandible it carves medium that is equal from 21 to 23 centimeters long for a right hand; the excellent comfort, flexibility and adherence that he/she has this lycra material allow to adapt that is to say in a better way the flexible sensors that are located in each finger of the right hand, that one has an excellent manipulation and coordination of the movements of the fingers without a wrong treatment of the sensors exists on the part of the material of the glove. Also, the acquisition of the glove of lycra expandible is carried out it in a sport store at national level, at a very accessible cost

Fig 3. Lycra performance Glove

3.1   First Prototype Design

The first basic sign that has thought about allows to express the necessity to leave to play. In the figure 4 one can observe the position of the translating glove.

Fig 4. First Basic Signal

The obtained results of the first basic sign by means of the translating glove are usually regular, since to the being a sign easy to carry out the lineal positioning of the sensors allows that their securities resistivos don't vary in an abrupt way. The electronic board Arduino ONE implemented in the first design of the prototype works perfectly since it possesses all the necessary pines for the connection of the flexible sensors as it is observed in the figure 5.
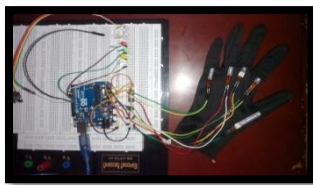

Fig 5. First Protoype Design

The range of securities resistivos that you/they present the flexible sensors according to the position of the translating glove is shown in the following chart 1.

Table 1. Resistive values range for the first basic signal

DEDOS DE LA MANO DERECHA	VALOR RESISTIVO MÁXIMO (KΩ)	VALOR RESISTIVO MÍNIMO (KΩ)
Meñique	21	24
Anular	18	21
Medio	22	25
Índice	20	23
Pulgar	17	20

Reference- Prepared byr Jairo Navarrete

3.2   Second Prototype Design

In second design, those the first thing that was carried out was to locate a pieces of the laminating of cloth lycra they make traps the sponge in the interior part of the palm of the that of the glove, make traps the purpose of the that of the those of hiding it sends a cable the drivers that stood out in the design of the primer prototype. The help of This in the

Such way that the mobility of the most comfortable glove sea that of the since any they observe of the it is sent a cable to the they stand out that of drivers, the damaging this way the aesthetics of the translating glove.

He was carried out the design of the one printed electronic badge in bakelite of the copper, thank you the program Eagle, the which allowed to carry out the ruteo of the hints of the those. The once fact the whole process of the bakelite, implementation of and of the electronic of the components, he/she was carried out a design type adhesive fastener of the material of the cloth the colorful blacks they make traps the filler of the an of the white down which is observed in the figure 6; the allowing to seat the printed circuit of the bakelite of the copper to obtain a better aesthetics of the translating glove of the basic ones of the signs
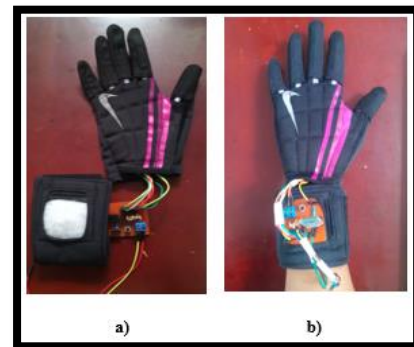

Fig 6. Second Prototype Design

3.3   Final Prototype Design

With the second design of the electronic prototype you could appreciate that the aesthetics of the glove not yet is good due to the use of the electronic board Arduino ONE, the stability of the securities resistivos is not to regulate, and the shipment of data by means of a communication Bluetooth has not still been implemented.

In this final design, the first thing that was carried out was before to locate and to fix with silicona the cables connectors coming from the printed board of copper bakelite in the adhesive fastener it designs, this helps in such a way that the

mobility of the glove is more comfortable, since conductive cables are not observed that they stand out, and likewise so proceeds to the substitution and the location of the electronic board Arduino ONE for the electronic board Arduino Lilypad

You also proceeded to use cable of type termocontraíble amid the union of the terminals of each flexible sensor with those their respective conductive cables, since this cable has as main characteristic of increasing the subjection of the welding of each pin of the flexible sensors.

A problem that one could observe in the second design of the electronic prototype, was that with the constant glove movement the welding of flexible sensors with its cables connectors spread to separate, for what I look for an alternative of better it grabs and soldier's of each flexible sensor duration

The electronic board Lilypad Arduino is designed to be cooked and washed on any cloth type; we have carried out the one cooked before on the fastener adhesive type designed where as materials the conductive thread was used since has special estates to drive electricity and to help to the connection with the printed circuit in copper bakelite, also a needle to sew and shearses. In the figure 7 the implementation of the board Lylipad Arduino is observed to the translating glove of basic signs.

Fig 7. Final Prototype Design

The shipment of signs wireless communication you proceeded to implement a communication module Bluetooth HC-05 in the printed circuit board in copper bakelite.

One of the main characteristics of the module Bluetooth HC-05 that we can say is that the working way comes configured of factory either of two ways like teacher or slave.

The module Bluetooth HC-05 you configures in way slave, this means that this it is clever to listen connection petitions coming from other devices bluetooth. The configuration can carry out it via serial communication with the computer, and by means of a configuration interface that in this case a called executable program HyperTerminal was

used, where they were carried out the basic configurations of the module Bluetooth where implies to have a countersign, a device name and the working way as it is observed in the figure 8.
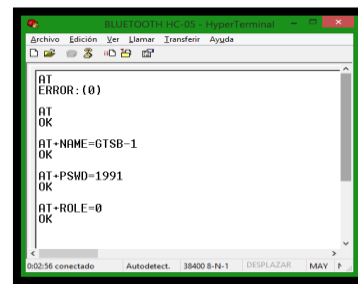

Fig 8. Basic configurations of the Bluetooth HC-05 Module

The development of the mobile application allows a Smartphone to process the basic signs coming from the translating glove, the Smartphone fulfills the main function of serving as platform of this application, where benefits are obtained about the characteristics of the Smartphone in this case the use of the device Bluetooth and the speakers that will allow to have an auditory or textual communication.

For the development of the mobile application it was used a design tool and environment of development of applications for called Smartphone App low Inventor the operating system Android; this software works with the creation of a bill of GMAIL where the benefits like the access will be obtained to custom services as Android to the tool of design of applications App Inventor.

An advantage of Companion App Inventor is that it completes the function of seeing the development of an application as leaves it developing. MIT App Inventor officially is a tool for on-line development for what requires permanent connection to Internet.

Once realized the design of the mobile application that will allow to generate a connection wireless bluetooth toward the translating glove of basic signs, also an auditory and textual communication, is observed in the figure 9, all the components used in the designer like they are bellboys, charts, images and non visible components inside the application like they are the ClientBluetooth, player 1, TextToSpeach and a text box.

Fig 9. Final design of the mobile application GTSB-1

3.4 Eight Basic Signs Language

For the data acquisition you proceeded to prove the basic signs in each position of the right hand, these signs were carried out taking into account that they are not the same positions of the hand with regard to the dictionary of the sign language.

We know that the communication mechanism that people with language and audio disabilities use to be able to exchange information inside its environment that surrounds them is the sign language.

These people will already study an alternative different to the unusual existent, for what this new language of eight basic signs will allow them to express specific necessities that they feel in its daily life and that they can express them with people that are to its care.

Next in the figure 10, the position of each basic sign is observed outlined in the language of eight basic signs with its respective positions of the hand.
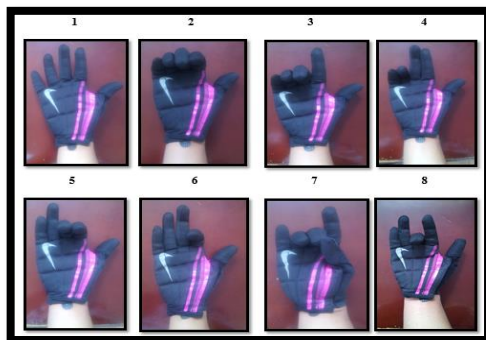

Fig 10. Eight basic sign language

These basic signs were taken with the lycra glove without flexible sensors, since alone the position of each finger of the right hand is shown, it stops then to carry out the necessary tests with the purpose of sensar the signs according to each position of the hand.

In the chart 2 are observed the one meant of each basic sign outlined in the figure 10.

Table2. Basic meaning of each sign

BASIC SIGNAL	MEANING
1	I'm bored, I need to go out and play.
2	I'm tired, I need to go to sleep.
3	I'm hungry, need to eat now.
4	I feel sick, I need care.
5	I feel very lonely, I need love
6	I need to go to the bathroom.
7	I'm very thirsty, need to drink water.
8	I nedd to help to study.

Reference. *Prepared by Jairo Navarrete*

4. Summations

❖ The prototype G.T.S.B-1 (Translating Glove of Basic Signs), which will allow to enlarge the capacities of people with language and audio disabilitiescommunication, in such a way that, people that are under the care of the same ones, can assist them in a better way; since this prototype will facilitate the communication with regard to the basic necessities that deaf people present.

❖ It was carried out a called new communication alternative "The Eight Basic Signs Language"; which transmits complete devises that are basic necessities in this case; and not single letters like it is already the communication mechanism unusual existent called Sign language that identifies a sign with a single letter; presenting a disadvantage with regard to the time and speed of people with language and audio disabilities communication with the means that surrounds them.

❖ It was investigated the characteristics of each electronic component that it was implemented in the translating glove of basic signs, where the flex sensor was adapted from the best way to the same one for the recognition of the basic signs, also the electronic board Lilypad Arduino and their use

advantages with the conductive thread that fulfilled the so much requirements from subjection to the glove like of the use of necessary pines for the respective connections; also the use of a module Bluetooth HC-05 which will allow to settle down and to maintain a wireless communication, allowing the user to not have the mobility of the translating glove inside a specific area more than 10 meters.

❖ It was carried out a called mobile application G.T.S.B -1 that I eat design tool and environment of programming development in blocks, App low Inventor the operating system Android was used; where the use of a Smartphone fulfilled the function of serving as platform of this application; where benefits like the use of its device Bluetooth and the speakers were obtained that will allow to have an auditory and textual communication according to the interpretation and prosecution of the signs coming from the translating glove of basic signs.

❖ A user manual of Basic Glove Translate Signs was developed for people with language and audio disabilities, in which you will be fulfilled a series of requirements that you prevent that the electronic elements of the translating glove suffer damages they are already internal or external so that it doesn't affect its correct operation; also, it includes a series of steps that you helped to settle down and to maintain a wireless communication from the mobile application G.T.S.B -1 installed in a Smartphone, toward the translating glove of basic signs.

5. Recomendations

❖ The present project gives the initial rule for the development of electronic prototypes that you help to facilitate the communication of people with language and audio disabilities inside the environment that you surround them; it is for this reason that it is recommended to have future investigations and implementations of electronic prototypes that support to the present already project realized inside the ability of Engineering in Applied Sciences, in the North Technical University, in Ibarra city.

❖ It is advisable to develop a prototype that allows sensar a bigger number of basic signs, with the purpose of to reduce the time and the speed of knowledge of the necessities that you present to deaf people toward people that are under the care of the same ones that are its families in this case to increase.

❖ Once the electronic components have been find, it is advisable to know their specifications since they helped to be implemented in the prototype according to their functionality, as well as of the voltage range and current that support each one of them, with the purpose of not obtaining the write off from the electronic component to the moment of being used.

❖ The use of the free software, App Inventor is recommended since for the development of the mobile application it allows to reduce the costs in the development of the prototype G.T.S.B -1(Basic Glove Translate Signs), for people with language and audio disabilities.

❖ It is recommended to follow the steps and requirements written in enclosed user's manual in the project before using it, with the purpose of avoiding possible internal or external damages of the prototype that will make that the translating glove of basic signs doesn't work in the correct way.

6. Bibliography

CHERNY, M. & RULICKY, S. (2007). Comunicación no Verbal. Buenos Aires: Ediciones Granica. Primera Edición.

DAVIS, F. (2010). La Comunicación no Verbal. Madrid: Alianza Editorial. Primera Edición.

PEASE, A. (2010). El Lenguaje del Cuerpo: Como Interpretar a los demás a través de sus Gestos. Madrid: Amat Editorial. Primera Edición.

THIMMIS, H. (2011). Practical Arduino Engineering. Primera Edición.

OXER, J. & BLEMINGS, H. & VERHOEVEN, T. (2009). Practical Arduino: Cool Projects for Open Source Hardware. Primera Edición.

ENGST, A. & FLEISHMAN, G. (2009). Introducción a las Redes Inalámbricas. New York: Primera Edición.

ROSSANO, V. (2013). Conceptos Fundamentales y Práctica Profesional PROTEUS. Buenos Aires: Fox Andina. Primera Edición.

SIERRA, A. (2014). Aprendiendo App Inventor. New York: Bohodon Ediciones. Primera Edición.

SEN, R. & ABLESON, F. (2011). Android: Guía para Desarrolladores. Madrid: Anaya Multimedia. Segunda Edición.

ARBOLEDAS, D. (2010). Electrónica Básica. Madrid: StarBoock Editorial. Primera Edición

7. References

Mehrabian, A. (2004). Comunicación no Verbal. Recuperado de: http://www.protocolo.org/social/conversar_hablar/comunicacion_no_verbal_la_importancia_de_los_gestos_i.html

López, L. & Rodríguez, R. & Zamora, M. & Sosa. S. (2013). Lenguaje de Señas para Sordos. Recuperado de: http://www.discapacidadonline.com/lengua-de-senas-para-sordos-y-oyentes.html

Hurtado, J. & Montero, T. (2004). Introducción a la Patología. Recuperado de: http://www.sld.cu/galerias/pdf/sitios/scap/introduccion_a_la_patologia.pdf

Cazar, R. (2013). Análisis de la Situación de las Discapacidades en el Ecuador. Recuperado de:http://icevi.org/latin_america/publications/quito_conference/analisis_de_la_situacion_de_las_.htm

Neri, M. (2001). La Educación de las Personas con Necesidades Múltiples y Sordomudos. Recuperado de: http://icevi.org/latin_america/publications/quito_conference/la_educacion_de_la_persona_sordo.htm

Fundación Vivir la Sordera. (2012).Situación de las Personas Sordas en Ecuador. Recuperado de: http://smart-track.info/vivir-sordera/SorderaenelEcuadorHoy.aspx

Gil, M. & Iturbe, N. & Riquelme, G. (2007). Asistencia temprana de niños sordos y orientación familiar. Recuperado de: http://www.monografias.com/trabajos55/asistencia-infantes-sordos/asistencia-infantes-sordos2.shtml

Merino, M. (2013). Necesidades Especiales de Comunicación. Recuperado de: https://prezi.com/6hk-s2cz8mgx/necesidades-especiales-de-comunicacion/

Díaz, A. & Rodríguez, A. & Riquelme, G. (2007). Necesidades Educativas Especiales Derivadas de la Discapacidad Física. Recuperado de: https://campus.usal.es/~inico/actividades/actasuruguay2001/12.pdf

Jiménez, J. (2013). Programa de Interpretación Ambiental para Personas con Discapacidad Recuperado de: http://www.bionica.info/biblioteca/Interpretacion%20Ambiental.pdf

Vélez, C. (2006). Definición y Caracterización de la Discapacidad Cognitiva. Recuperado de: http://www.colombiaaprende.edu.co/html/micrositios/1752/articles320691_archivo_5.pdf

Suárez, A. (2013). Necesidades Emocionales para una Vida Satisfactoria. Recuperado de: http://www.metodosedona.com/2013/06/9-necesidades-emocionales-para-unavida.html

Fantova, F. (2013). Trabajando con las Familias de las Personas con Discapacidad. Recuperado de: http://www.iin.oea.org/Cursos_a_distancia/Lectura13_disc..UT3.pdf

Vassiliou, A. (2012). Necesidades en la Educación de las Personas con Discapacidad. Recuperado de: http://europa.eu/rapid/press-release_IP-12-761_es.htm

Mercado, E. (2010). Necesidades sociales de las personas con discapacidad en edad escolar y sus familias. Recuperado de: http://revistas.ucm.es/index.php/CUTS/article/view/CUTS1010110009A/7472

Valverde, L. (2013). Sensores y Acondicionadores de Señal. Recuperado de: http://html.rincondelvago.com/sensores-y acondicionadores-de-senal.html

Gonzales, J. (2013). Clasificación de los sensores. Recuperado de:http://www.virtual.unal.edu.co/cursos/sedes/manizales/4040003/lecciones/cap3lecc4.htm

Calle, S. (2013). Tipos de sensores. Recuperado de: http://es.slideshare.net/saulcalle1/tipos-de-sensores-27429965

Jairo Navarrete was born on 27 of June of 1991, in the province of Imbabura-Atuntaqui, I realize its primary studies in the "Fe y Alegría" school, their secondary studies conducted in the "San Francisco" high school, graduating specialty of "Mathematical Physics"; currently graduate of the Electronic and Communication Network Engineering at the North Technical University (Ibarra).