

Autism Support System using RFID Technology

A. Sharmila Agnal, S. Janani, Chellekampalli Maneesha, K. Ramya



Abstract: This study represents a device to identify the location of an Autism Spectrum Disorder (ASD) child using an Radio Frequency Identification (RFID). This is a wearable device, that is to be worn by the autism child, which allows the parent to track the child anytime, anywhere. The RFID technology is implied for the location tracking, The RFID Tag is affixed on the device, the reader which is supposed to sense the RFID tag is placed at the spots such as classroom etc. The reader when it senses the tag notifies the parent through a message. When an RFID tag passes through the electromagnetic zone, it detects the activation signal produced by the reader. The encoded data present in the integrated circuit of the tag is being encoded by the reader and the data is delivered to the host computer for processing. The location can be sent to parent in the form of a normal text message via GSM. Autism children deserve to acquire knowledge and explore the environment. To overcome the obstruction this device will be of immense help.

Keywords: Autism Spectrum Disorder (ASD); RFID; electromagnetic zone; radio waves; tag; reader.

I. INTRODUCTION

Autism is a developmental disorder characterized by difficulties regarding social interaction and communication, and by restricted and repetitive behavior. In a recent research in the year of 2018, 1 out of every 160 children have autism spectrum disorder (ASD). ASDs by and large experience the early youth and will in general support until youthfulness and adulthood in the greater part of the cases. Because of the expansion in the predominance of medically introverted kids has prompted an expansion in related pursuits. A few people with ASD can live unassisted, while others have serious handicaps and require long lasting consideration and backing. These afflictions create a necessity to have a constant check over them by tracking them on a day to day basis to their educational centers, work place etc. Presently there are various such devices to track autism children [1]. This specific paper introduces the following of mental imbalance kid utilizing the idea of RFID. Radio-recurrence distinguishing proof (RFID), it fundamentally utilizes electromagnetic fields to naturally recognize and track labels joined to protest. RFID stays away from the prerequisite of viewable pathway access to every gadget and restriction to utilize just a single thing at once. RFID streamlines and robotizes resource filtering as well as dispenses with the plausibility of human blunder.

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In addition to this there is no need for any manual operation of the device by the autism child in-order to track them. The major components of RFID are transponders also called as the tag and the transceiver which can be identified as readers. The major communications between these systems are via radio signals that carry data either in an unidirectional manner or bidirectional manner. At the point when a transponder arrives at a read zone, its information is exemplified by the per user and would then be able to be transmitted through different standard interfaces to a host which incorporates PC, printer, or programmable logic controller for storage and management. The location will be transferred to the parent through the concept of GSM. GSM architecture was created in the form digital system using time division multiple access (TDMA) technique for the purpose of interaction. The concept behind RFID is simple yet profound. Also the GSM module helps in the easy transfer of the necessary data. Our intention is to create a surrounding for the autism child, where they could go explore the world and achieve their goals without any hindrance due to their conditions.

II. EXISTING SYSTEM

Yan Shi et al [1] proposed system for enhancing the interactions among children with autism spectrum disorders (ASD) and overcome the lack of interaction between the autism children. The main goal of the work is to provide services on data-driven detection, therapy, intervention and monitoring the autism spectrum disorder children. The purpose of detecting the interaction between the autism children provided the sensor framework comprises of sensor badges worn by child and teacher participants in the pockets of the customized T-shirt

Nancy Rasche et al [2] identifies and distinguishes the territories of mental imbalance in the areas of autism therapy that can be upgraded and improve the learning background of the autism children. The technology involved in this proposed project is Touch screen mobile computer (TSMC) device which plays a crucial role in enhancing the autistic child's learning experience. The idea is to use TSMC as an instructional tool to explore the viable implementation and improvise the learning experience of children with ASD at economical price

The proposed idea in [3] is to save women or children in hazard by alerting in the mode of notification which is sent through a wearable device. when a women or child wearing this 'watch me' is exposed to harassment, by checking the heart beat rate which will be high because existing apart from everything else the emission of epinephrine hormone from hpa pivot and gets actuated, and instantly the alarm sound is activated and automatically call is made to the police.

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This system involves the technology GSM or GPS module for the location tracking purposes and various sensors such as pulse rate sensor, temperature sensor and motion sensor for monitoring the heart beat and detecting the pulse condition of the person. This proposed system [4] involves the study on the biological research purposes using the technology Radio-frequency identification (RFID) sensing system and small dipole antenna for tracking the location for the purpose of monitoring the butterfly motion and activity for the biological research purposes.

IftexharUddin Ahmed et al [5] the main methodology of the venture is to screen the well being state of the ADS kids and the alert and regular notification facility is provided for the constant monitoring purposes of the autistic children. The power generation technology of the project involves solar panel, boost converter and DC battery and the transmission of data is achieved using technology GPS, GSM and SD card.

Eunji Chong et al [6] the feature of this system is to automatically capture the position of the head of the child in a face to face naturalistic social interaction for the purpose of measuring the children's social behaviour. The technology involved in this system is a flexible camera setup and automated tracking framework.

[7] The idea of this proposed system involves the technology of four antennas GSM, GPS, LTE and WLAN is implemented in a square shaped smart watch. It is a wearable device with all the applications of GSM, GPS, LTE and WLAN.

The concept in [8] gives a summary about the existing condition of the Radio Frequency Identification (RFID) Technologies. Various concepts such as RFID principles which includes two sorts of RFID specifically Near-Field RFID and Far-Field RFID, the way RFID works, the pros and cons of RFID which is majorly done by comparing itself with the Barcode technique and its various real time applications.

Pang-Wei Hsu et al [9] the strategy of this system is feasibility study on the improvement of the indoor area following exactness with dynamic RFID. In this system they proposed a new indoor location system depending upon the received signal strength force and also sensing area was introduced.

Suvojit Manna et al [10] this work is about tracking smart bags using Radio Frequency Identification (RFID) technology. It track the bag from point A to B with low cost. The user can also get full details about tracking without logging. User can use tracking ID to get the details. The tracking ID is one of the prime concept of this work.

The domain behind the work in [11] is cloud computing which is one of the emerging sector of the present decade. In this work the process of location tracking is done using the concept of Radio Frequency Identification and the location is accumulated using cloud storage concept. The proposed work consists of technologies such as RFID, WSN, CLA, cloud computing, and LTA.

Analyn N. Yumang et al [12] proposed a system for monitoring the flood water levels in order to prevent hazards. The core technologies involved in this system are Arduinouno, GSM shield and sensors. The system detects the flood water level which exceeds and it instantly notifies

the people in the surrounding area through SMS notification.

III. SYSTEM DESCRIPTION

A. Proposed Work

The proposed framework is to build up a gadget that makes a difference helps the parents of the autism child to track them using the Radio Frequency Identification (RFID) technology. This system is of great aid to the parents, which lets them to unbind the unnecessary control over their children and let them free to explore this world like any other child. RFID is a simple yet effective device that is apt for the application of this project. It consists of a transmitter and a receiver and an antenna. The tag is generally identified as the transponder while the reader is identified as the transceiver.

The radio signal radiated by the reception apparatus will in general enact the tag and permits to peruse and compose information to it. The radio waves discharged by the reader generally fall between the scopes of somewhere in the range of one inch to 100 feet or more, relying upon its capacity yield and the radio recurrence utilized. At the point when a RFID tag experiences the electromagnetic zone, it recognizes the initiation signal emitted by the transceiver. The encoded data present in the integrated circuit of the tag is being encoded by the reader what's more, the information is conveyed to the host PC for preparing [12]. Further the GSM comes into action to transfer the data about the location to the parent.

B. System Architecture

The System Architecture system shown in fig-1 depicts the implementation of this work in a very simple manner. The diagram clearly depicts the workflow and the sequence of the process. The principle behind RFID is based on the electromagnetic induction, the transmitter and the receiver which plays a vital role in sensing the data and notifying the parent or guardian. The diagram renders the explanation about how the autism child dons the device which consists of the tag, the RFID readers are places at various spots.

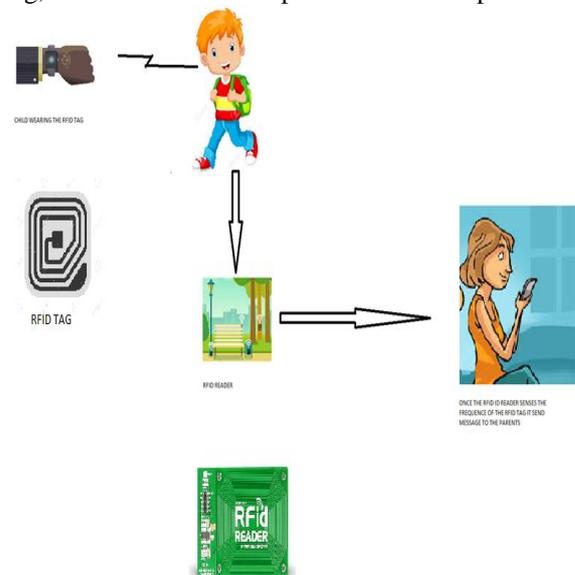


Fig-1: System Architecture



As already quoted whenever the reader senses the tag is notifies the parents. For this another module along with RFID is used, that is GSM is a very well known network that helps us to notify the parent through a text message to their respective mobile phones.

C. Module Description

The modules of this proposed work can be classified into three modules which are as follows:

1. Data sensing
2. Data transmission
3. Notification

The Data sensing module depicts the process of how the RFID reader senses the RFID tag that is worn by the autism child. The antenna that is part of the RFID transmits radio waves which will in general enact the tag and to peruse and compose information to it. The radio signals discharged by the reader which lay on from one inch to 100 feet or more, accordingly to its resulting power and the radio frequency used. At the point when a RFID label moves by means of the electromagnetic zone [4], it see the recipient's actuation signal. The preceding steps imply location-data sensing followed by data transmission.

The Data transmission module involves the concept of how the data about the location is transmitted from the RFID transponder the RFID transceiver through interface and class. The encoded data present in the integrated circuit of the tag is being encoded by the reader and the information is conveyed to the host PC for handling. The ultimate aim of a RFID technology is to enable information to be transmitted by a versatile gadget called tag, which is accepted by an RFID reader and updated and managed according to the requirements of a particular application. Motioning between the per user and the tag is done in a few distinctive conflicting ways, depend on the recurrence band utilized by the tag. Labels using on LF and HF groups are, as far as radio wavelength, near the per user receiving wire since they represent an extremely little extent of a wavelength away.

The last module is Notification, through which the location that is being captured by the RFID reader has to be sent to the parent or guardian, this can be done by a programmable interface using embedded C. This process solely depends on our requirement, we can alter the notification process through various methods, either by messages on ur mobile or through an email or through a mobile application. Here we use the GSM module to transfer the data through a text message to the parent [3].

D. Methodology

The methodology behind this system is RFID technology, which has various components that has been used for the implementation of this work.

1. Experimental Set-Up And Working

To implement the proposed work, the relationship between the RFID reader RC5220 and ARDUINO mega 2560 are given as follows. Arduino 3.3V pin is associated with the 3.3V pin of RFID, it is followed by the connection between the pin 9 of Arduino and rest pin of RFID, now GND pin of the Arduino board is interfaced with the GND pin of the

RFID, further proceeded by the affixing pin 12 of the Arduino board to the Master in slave out (MISO) pin of the RFID, then pin 11 of the Arduino board is associated with Master out slave in (MOIS) pin of the RFID reader board, pin 13 that belongs to the Arduino board is connected to Clock signal from mater to slave SCK pin of the RFID reader, pin 10 of ARDUINO is interfaced to Serial data SDA pin of RFID reader. These interfacing are done using the jumper cables

2. RFID

RFID is the acronym for “radio-frequency identification” and alludes to an innovation whereby computerized information encoded in RFID labels or savvy names as shown in fig-2 are encapsulated by a transceiver by means of the radio waves.



Fig-2: RFID tag

The reader used here is RC522 as shown in fig-3 RC522 - RFID Reader fundamentally represents a remarkable regulation and demodulation calculation to give simple RF communication at 13.56 MHz. With the end goal of correspondence with microcontrollers the module utilizes SPI.

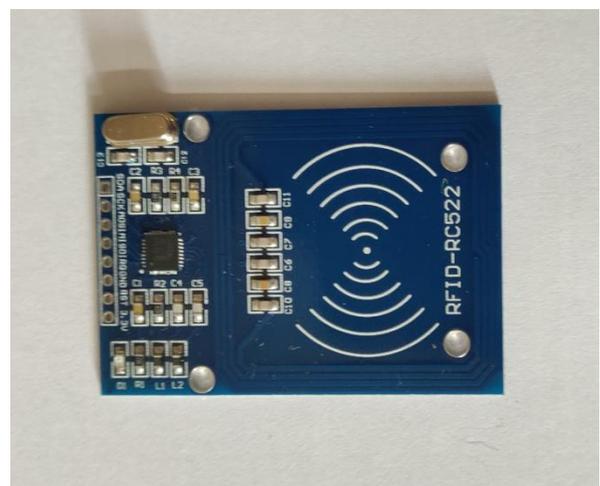


Fig-3: RFID reader RC-522

3. Arduino Board

It is a microcontroller board dependent on Atmega 2560 microcontroller as depicted in fig-4. Arduino Boards have renewed the mechanization business with their simple to utilize stage where everybody with essential or no specialized foundation can investigate it. A basic arduino board MEGA 2560 consists of 54 digital I/O pins and 16 analog pins incorporated on the board that make this device incomparable from the remaining devices. 15 digital input-output ports out of 54 are used for PWM (pulse width modulation).



Fig-4: Arduino Mega 2560

4. GSM Module

Global System for Mobile Communications abbreviation of GSM. The European Tele-communications Standards Institute (ETSI) developed this concept of GSM. A GSM module is fundamentally a chip or circuit that can be utilized to approve correspondence between a cell phone and any figuring machine alongside a GSM or GPRS framework.

5. Software

The software used here is ARDUINO IDE. It is an open-source stage. Also it can be used for both software and hardware implementation. The program can be associated legitimately to the microcontroller board by utilizing the idea of sequential correspondence or over the air technique. It can be installed in OS such as Mac OS X, Windows, Linux. It gives a basic and adaptable programming condition for novices.

IV. RESULTS

The implementation of the proposed work was done using the RFID, Arduino board and the GSM module as shown in fig-5 the results were as expected.

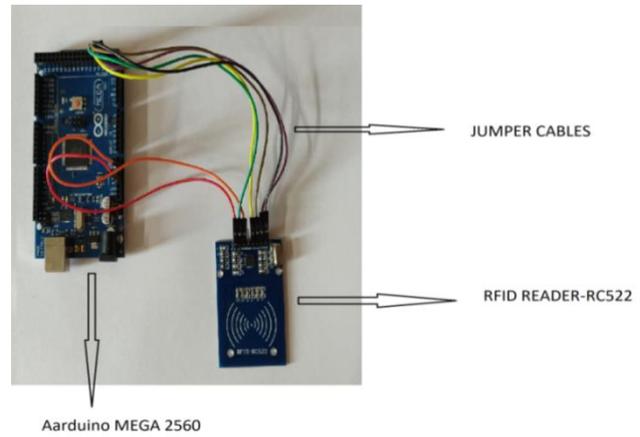


Fig-5: Hardware Implementation

The notification blinked as soon as the RFID tag was sensed by the RFID reader, the tag was able to perceive the activation signal sent by the RFID reader which was in-turn sent as a text message to the parent using the GSM module. The results can be further enhanced by using advanced technologies to incorporate better applications.

V. CONCLUSIONS

In this work, tracking the location of an ASD person using the Radio Frequency Identification Technology and GSM was executed successfully. The limitation behind the parent binding their children due to their insecurities were overcome. The ultimate goal for the ASD child to step out and acquire the knowledge like any other child was achieved. The implementation of this project was done using the Arduino board MEGA 2560, RFID reader RC522, RFID tag, GSM and the software used was Arduino IDE. The results of the implementation were as expected. The tag attached to the device which senses the activation signal from the RFID reader, responds to it which in turn notifies the parent about the child's whereabouts. Though there are many such devices, this device is more effective in terms of cost and efficiency. Further we would like to enhance this work by adding features such as sensing the environment and also the presence of a warning button which when clicked by the child in times of need will send an SOS notification to the parent. Also the paper can include an increase in the range.

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