

Children Activity Alert System Using Accelerometer and GSM Technology

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Abstract— In this paper the discussion is about monitoring a child. Most of the children's takes their first step sometime between 9 and 12 months and are walking well by the time, when they are 14 or 16 months old and they will be in danger, during this age as they start walking. Hence we place an Accelerometer and RFID on the body of child to secure child from accidents such as falling or any injuries at home. The Accelerometer and RFID placed on hands and waist of baby which gives every movements of child. Temperature sensor is used to check the home temperature for safety of child.

Keywords- Accelerometer, GSM module, Zigbee transceiver, RFID card.

I. INTRODUCTION

The child activity monitoring is done using sensors such as Accelerometer and RFID reader. This can be implemented or adopted in real time. As children's normally take a step in the age between 9 to 12 months and starts walking correctly, when they are at 14 or 15 months, at this age they are more risk of falling from window, staircase and beds (when sleeping). Falls are frequent cause of injuries. Children's at younger age, most fall related injuries at home because of lack of parental care. Thus a new safety management method is required to protect children from home accidents, thus we are implementing a monitoring system using Accelerometer and RFID.

Activity recognition can be performed by collecting acceleration data from multiple locations on the body; this could be done using Accelerometer. Accelerometers are most broadly used sensor to recognize human activities such as walking, lifting hands, body rotating still more and it also inexpensive, require low power and are embedded in most cell phones. A single Accelerometer is not enough, multiple Accelerometers are used to improve the robustness of the system.

Radio Frequency Identification (RFID) is an automatic identification technology. In the past, RFID is used to trace the movement and existence of goods. RFID can provide a direct and continuous recognition, including position and direction in which child may go.

Temperature sensor is used to monitor home temperature and GSM module to send alert message to parents.

The overall sensed data from Temperature sensor, Accelerometer and RFID reader is given to arduino atmega328 Processor, then controller transfers this data to the receiver part which is kept in living room using Zigbee transceiver.

At the receiver end another arduino atmega328 processor is kept where the received data by Zigbee is compared and if child is awake and starts walking the alert message are sent to the parents using GSM module.

A. Objective

The objectives of this project are

- I. To design the circuit that can improve the safety of children's from injuries.
- II. To develop a Smart safety monitoring system for children's and to alert the parents.
- III. To study and understand the concept of Accelerometer and RFID circuit in implementing the project.

B. Problem statement

To thrive, a child must experience the consistent and ongoing care by a loving, nurturing caregiver, whether that person is a parent or substitute caregiver. Now-a-days, it became very difficult that parents were too busy in their own work and can't give enough attention to their children's and due to lack of parental care, the children's may meet home accidents such as falling from windows, staircase and from beds (while sleeping) and still more. Most of the injuries occur at home and medical attention is needed after meeting with an accident.

Thus to overcome these problems we are implementing a monitoring system to monitor children's when they are sleeping, while walking and doing some activities. Use of accelerometers and RFID would be helpful in designing this system and to recognize the activities of children's.

GSM makes the usage for intimation regarding the activities of children's and identification of direction, to the parents. So have chosen GSM technology to give the information by sending SMS, using GSM module which has SIM card slot to place the SIM and send SMS.

II. BLOCK DIAGRAM

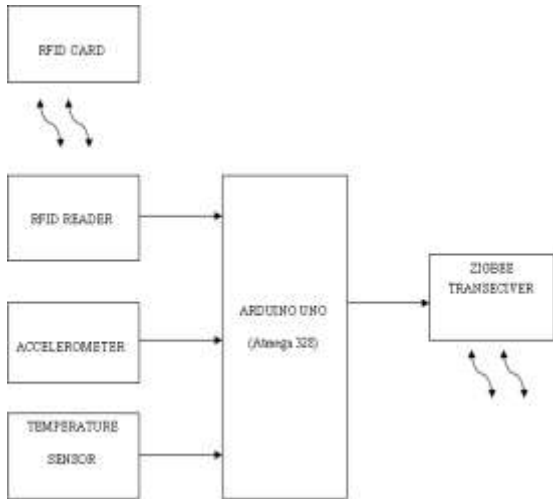


Figure1: Block diagram of Transmitter

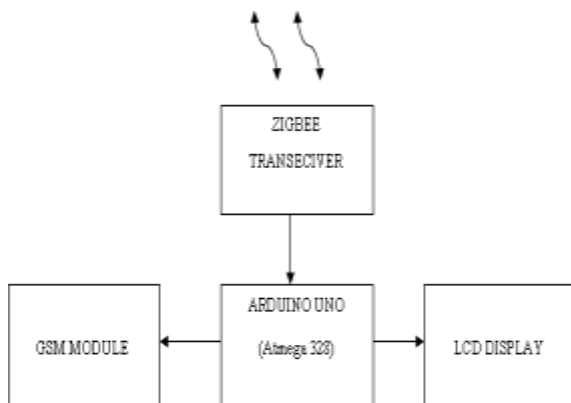


Figure2: Block diagram of Receiver

III. METHODOLOGY

A.Arduino Uno:

The Arduino Uno is a microcontroller board based on the ATmega328P with High Performance, Low Power Atmel® AVR® 8-Bit Microcontroller Family. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller.

The Arduino Uno architecture is based On Advanced RISC Architecture and the Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. [4].

B. MEMS

MEMS Accelerometer used here is ADXL335 from Analog Devices. ADXL335 is tri axial accelerometer sensor with built-in amplifiers and demodulator. ADXL335 has a range of $\pm 3g$ in each axis. The ADXL335 is the latest and greatest from Analog Devices, known for their exceptional quality MEMS devices. This breakout comes with 3 analog outputs for X, Y and Z axis measurements and renders high performance with low power consumption.

C.RFID

Radio-frequency identification is an automatic identification method that uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information; tags collect energy from a nearby RFID reader's interrogating radio waves.

D. Temperature Sensor

LM35 is used as temperature sensor. The LM35 series are precision integrated-circuit with an output voltage linearly- proportional to the Centigrade temperature. The low-output impedance, linear output and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. LM35 device is rated to operate over a $-55^{\circ}C$ to $150^{\circ}C$ temperature range. [5]

E. GSM modem:

A GSM modem is a wireless modem that works with a GSM wireless network. The GSM modem is having internal TCP/IP stack to enable you to connect with internet .It is suitable for SMS, voice as well as DATA transfer application in M2M interface, attending incoming calls etc., through simple AT commands. A GSM modem doesn't have a keypad and display to interact with. It just accepts certain commands through a serial interface and acknowledges for those. These commands are called as AT commands. There are lists of AT commands to instruct the modem to perform its functions. Every command starts with "AT". That's why they are called as AT commands. AT stands for attention. In our project, the program waits for the mobile number to be entered through the keyboard. When a ten digit mobile number is provided, the program instructs the modem to send the text message using a sequence of AT commands [6].

F. ZIGBEE TRANSEIVER

ZigBee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios. ZigBee protocols are intended for embedded applications requiring low power consumption and tolerating low data rates. The resulting network will use very small amounts of power.

Here ZigBee is used to transmit the data computed at the transmitter side to the receiver side.

G.LCD

16x2 LCD display is used. A liquid-crystal display (LCD) is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits, 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix, its operating voltage is 5v.

RESULTS

Results took by making a model of child. Transmitter part is placed on back of child body and the receiver part is kept at the living room.



Figure1:Transmitter part on Child.

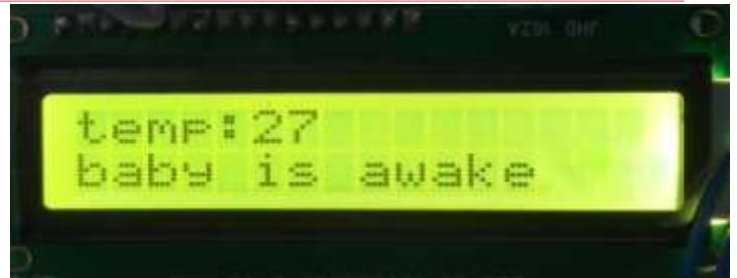


Figure6: Displaying that child is awake.



Figure2:MEMES Accelerometer placed on baby hand.



Figure7: First RFID tag swiped.



Figure8: Second RFID tag swiped.



Figure3: Receiver part kept in living room.



Figure4: Displaying Room Temperature.



Figure9: Message sent to parents.



Figure5: GSM module initialization.

IV. CONCLUSION

Child activity Monitoring using accelerometer and RFID reader presented the activity monitoring method for children using only accelerometer and RFID reader. Accelerometer detects child activities through its axis and displayed on LCD and also sent to their parents via GSM.

V. FUTURE SCOPE

It could be implemented using smaller processor likes ARM, Arduino Nano mini and still more. Using more RFID tags it will be able to detect the direction in which child may go. Also there are many satellite phones available, use of satellite phones will provide continuous network to overcome problems of network breakdown.

REFERENCES

- [1] Laxmi Pai, Shivakumar M, "Child Activity Recognition Using Accelerometer and RFID Reader", International Journal of Research in Engineering and Science, Volume 2 Issue 6 | June. 2014 | PP.14-21.
- [2] N. Li, Y. Hou, and Z. Huang. (2011). A real-time algorithm based on triaxial accelerometer for the detection of human activity state. in Proc. 6th Int. Conf. Body Area Netw., ser. BodyNets '11. ICST, Brussels, Belgium, Belgium: ICST (Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering), [Online], pp.103–106, Available: <http://dl.acm.org/citation.cfm?id=2318776.2318801>.
- [3] Kushbu, M.C. Chandrashekhar, Dr.M.Z. Kurian, "Design And Implementation Of Child Activity Recognition Using Accelerometer And RFID Cards", International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 3 Issue 4, April 2014
- [4] <http://digital.csic.es/bitstream/10261/127788/7/D-c-%20Arduino%20uno.pdf>
- [5] <http://www.ti.com/lit/ds/symlink/lm35.pdf> "
- [6] "<http://forum.researchdesignlab.com/datasheet/GSM%20modem%20Arduino%20Compitable.pdf>