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An Intelligent Mobile Agents System for Sudden Infant Death Syndrome Monitoring

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***Abstract*: Sudden Infant Death Syndrome (SIDS) usually happened for new born. It typically occurs associated with a period of sleep. The cause (or causes) of SIDS is still unknown. Deprived of oxygen, parental alcohol consumption and overheating are environmental risk factors of SIDS. In this paper, an intelligent method for preventing sudden infant death, based on IoT system is proposed. The proposed system consists of intelligent software incorporated with hardware components such as sensors to sense and detect important physiological parameters i.e. infant breathe level, Infant temperature, heart rate and the recorded data is sent to IOT device. In addition, the information is sent to parents through Global System for Mobile communication (GSM) in real time. The recorded data gives alert message to the respective persons immediately as soon as the infants suffer with above mentioned problems. Thus the prototype designed gives a reliable and efficient real time infant monitoring system that can play a vital role in reducing the SIDS occurred and save an infant's life.**

***Keywords*: SIDS, Infant monitoring, Multi-Agents, IoT System.**

1. Introduction

Sudden Infant Death Syndrome (SIDS) is the expression used to symbolize the sudden, ambiguous death of an infant due to unknown causes. In the past, SIDS was sometimes called "crib death", even though cribs themselves do not cause SIDS. Researchers estimate that SIDS is the cause of about 2,500 infant deaths each year. In addition, in the United States, each year, at least 4,500 babies die unexpectedly without an apparent cause. The main cause of SIDS is still unknown; researchers have find out trends in SIDS deaths that may help them explain this ambiguous mortal problem. In fact, there are several hypotheses and risk factors that have been suggested as causes of SIDS. For instance, it has been hypothesized that exposure of babies to tobacco smoke and sleeping prone are at a higher risk of SIDS than babies who are not exposed to the tobacco smoke and sleeping in the supine position. With current revolution in wireless sensor networks and advent of low-power embedded systems, is the ability to build a service system is increased. Such a system will help the human to collect environmental signals that will be used to solve specific problem such as SIDS problem. In addition, this revolution helps to implement wireless sensor networks, allowing easily interfaced, programming and configured sensors to be placed anywhere indoor or outdoor. The sensor observations intelligently analyzed and transported over large distance via networks.

Multi-agent system or smart agent group is a system which divides rules between agents for fast execution and treatment of more tasks in one time (parallelism). An agent, however, is an extremely high-level software abstraction which provides a convenient and powerful way to describe a complex software entity. Rather than being defined in terms of methods and attributes, an agent is defined in terms of its behavior. This is important because programming an agent-based system is primarily a matter of specifying agent behavior instead of identifying classes, methods and attributes. It is much easier and more natural to specify behavior than to write code.

2. Objective

The main aim of our project is to design a system to monitor the health status of infants and to reduce the SIDS syndrome. It consists of intelligent software incorporated with hardware components such as sensors to sense and detect important physical signals i.e. infant breath, infant temperature and heart rate and accordingly transfer these recording data to IOT device. In addition, parents will receive Multimedia Messaging Service (MMS) via Global System for Mobile communication (GSM) in real time. Such message will carry the recorded data as well as a warning, when problems occurred. A prototype is designed and developed which gives a reliable and efficient real time infant monitoring system that can play a vital role in reducing the SIDS occurred and save an infant's life, and transported over large distance via networks.

3. Methodology

The intelligent infant monitoring system would consist of both hard and soft parts. The overall system which is composed of two subsystems is illustrated as follows. An algorithm is proposed to determine any critical case based on the sensory inputs as following, receive all sensors reading by sensor agent, and analyze such readings. Based on the previous steps, do the following, if the readings is in normal range will be decided by physician, the normal action will be recorded, if the readings is in abnormal range but not critical, the parent will be informed via message., if the readings is in abnormal range and critical which will be decided by physician, a critical message will be passed to ambulance services holding the infant address as well as his/her medical record. The responsibility of a sensor agent is to collect and analyze the sensors readings, and then pass the needed information via message to ambulance, sleep-wake up, warnings and database agents.

4. Block diagram

This current revolution helps to implement wireless sensor networks, allowing easily interfaced, programming and configured sensors to be placed anywhere indoor or outdoor. The sensor observations intelligently analyzed

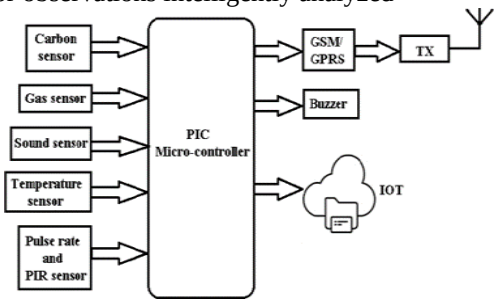

Fig. 1. Transmitter

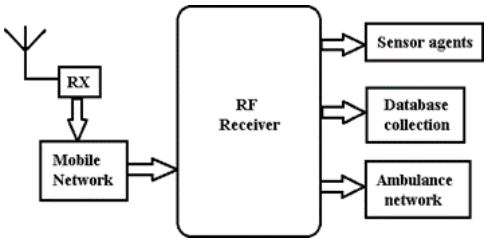

Fig. 2. Receiver

A. Temperature sensor

The temperature sensor is used to determine the temperature of the infant respectively. By using this system, we can reduce the death rate of infants due to SIDS. Calibrated Directly in Celsius (Centigrade), linear+ 10-mV/°C Scale Factor, 0.5°C Ensured Accuracy (at 25°C), rated for Full −55°C to 150°C Range, suitable for Remote Applications.

(a) Temperature sensor

B. Carbon sensor

This sensor is used for measuring carbon-dioxide gas. The most common principles for CO2 sensors are infrared gas sensors and chemical gas sensors. CO2 are measured in parts-per-million (ppm), it is reported in units as micromol mol^-1 (10^-6 mol CO2 per mol of dry air, measurements are directly traceable to WMO CO2 mol fraction scale.

(b) Carbon sensor

C. PIR sensor

This sensor measures infrared (IR) light radiating from objects in its field of view. Sensing range less than 120 degrees, within 7 meters, temperature – 15 ~ +70, lock time 0.2 sec, voltage 5V, power Consumption 65Ma.

(c) PIR sensor

D. Gas sensor

Gas sensors can be used detect combustible, flammable, toxic gases and oxygen depletion. This type of devices are widely used to monitor manufacture process and imaging technologies such as photovoltaic. Analog and Digital output, good sensitivity to Combustible gas in wide range, high sensitivity to LPG, Propane and Hydrogen, operation voltage: 5Vdc, simple drive circuit, long life and low cost.

(d) Gas sensor

E. Sound sensor

This module provides an easy way to detect sound and is generally used for detecting sound intensity. This module can be used for security, switch and monitoring applications. Operating voltage: (3.3v-5v) DC, operating current: 15mA, output: analog (0-5v) DC, easy to use.

(e) Sound Sensor

F. Pulse rate sensor

It consists of a bright red LED and a light detector. When the finger is placed close to the sensor a certain amount of light passes through the finger and depending upon the intensity of the light detected in the detector the current is produced accordingly. When no finger is placed brighter light intensity is detected by the detector. So based on the current variations the pulses are recorded and data is obtained. Heart beat indication by LED, compact Size, working Voltage +5V DC, instant output digital signal for directly connecting to microcontroller.

(f) Pulse rate sensor

G. GSM

GSM (Global System for Mobile communication) is a digital mobile network that digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. High Quality Product, RS232 interface @ RMC Connector for direct communication with computer or MCU kit, configurable baud rate, SIM Card holder, built in Network Status LED, Inbuilt Powerful TCP/IP protocol stack for internet data transfer over GPRS, audio interface Connector, normal operation temperature: -20 °C to +55 °C, input Voltage: 4.5V-12V DC.

H. Buzzer

It is an audio signaling device, which may be mechanical, electro- mechanical or piezoelectric. Typical uses of buzzers include alarm devices, timers and confirmation of user inputs. Rated voltage 6V DC, operating voltage 4-8V DC, rated current < 30mA, sound type continuous alert, resonant frequency: ~2300HZ, small and neat sealed package, bread board and perf board friendly.

I. IoT (Internet of Things)

It is essentially a platform where embedded devices are connected to the internet, so that they can collect and exchange data with each other, so that they can interact such as sending an alert or automatically adjust the sensors. Increase business opportunities, enhanced asset utilization, efficient processes, improved safety and security, increase productivity, cost saving.

J. PIC micro-controller

It is referred to peripheral interface controller and is currently expanded as programmable intelligent computer. It can carry out vast range of task. Flash memory. 14.3 Kbytes (8192 words), data SRAM 368 byes, data EEPROM: 256 bytes, self-reprogrammable under software control, in- circuit serial programming via two pins (5v), watchdog timer with on-chip RC oscillator, programmable code protection, power-saving sleep mode.

K. RF module

RF module is a small size electronic device that is used to transmit or receive radio signals between two devices. The main application of RF module in an embedded system is to communicate with another device wirelessly. This communication may be accomplished through radio frequency communication. Receiver frequency 433MHz, receiver typical sensitivity 105 Dbm, receiver current supply 3.5mA, transmitter frequency range 433.92 MHz, transmitter supply voltage 3V~6V, transmitter output power 4~12 Dbm, low power consumption.

L. Database collection

A database is an electronic system that allows data to be easily accessed, manipulated and updated. It is used by an organisation as a method of storing, managing and retrieving information. Modern databases are managed using database management system (DBMS).

M. Mobile network

A mobile phone network or cellular phone network is made up of large number of signal areas called cells. These cells join or overlap each other to form large coverage area. Communication over the mobile network can be made up of voice, data, images and text messages.

5. Advantages

Detect immediate respiration problem. Monitor heartbeat rate and temperature of the infant. If sudden changes in vital parameters, it will automatically alert the ambulance.

6. Applications

It is more efficient ad safer for the infants in homes and in hospitals. It is more reliable for women employers to carry this system to their work places for their infants.

7. Verification results

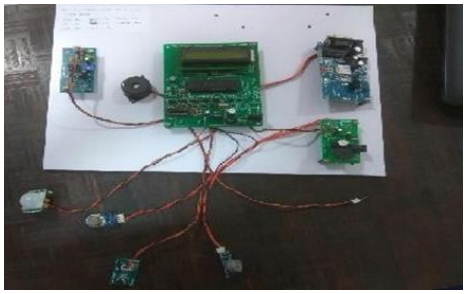

Fig. 3. Output

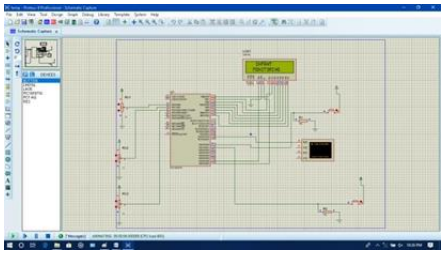

Fig. 4. Output for proposed system

8. Future scope

The system can be implemented for monitoring ECG, EMG and EEG signals. It can be implemented using battery instead of power supply. PIC controller can be implemented by using limited amount of sensors.

9. Conclusion

It has been successfully proven that an intelligent infant monitoring system using multi-agents approach is proposed and designed. A new dynamic method for infant sleeping/wakeup mode is presented by using sensory inputs. A new technique was investigated that would help to dynamically contact the ambulance services in case of any critical conditions.

References

[1] Athira Vijayan, Manju Suresh, "Wearable Sensor for Animal Health monitoring using Zigbee". (International Advanced Research Journal in Science Engineering & Technology, Lourdes matha college of Science& Technology), pp. 369-373, August 2016.

[2] R. Reshmi, R. A. Saranya, S. Vishaka, S. V. Prabha and S. Ashokan, "Sudden Infant Death Syndrome Detection and prevention using Grid Eye Sensor", International Research Journal of Engineering and Technology, pp. 623-625, April 2019.

[3] Ruth Ravichandran, Elliot Saba, Ke-Yu Chen, Sidhant Gupta and Shwetak, "Estimating respiration rate using wireless signals in natural settings in home", IEEE International conference on pervasive computing, pp. 131-139, 2015.

[4] Sagar Dhumal, Akshay Niranjan Kumbhar, Akshay Tak, S. G. Shaikh, "Wearable Health Monitoring System for Babies", International Journal of computer Engineering &Technology, pp. 15-23, April 2016.

[5] Z. Zakaria, A. F. Cheadib, M. A. Othman, "Development of respiratory monitor using smart phone via Bluetooth for bedridden elderly or patients". (Sindh university research journal) pp: 83- 86, October 2016.

[6] Kilic, A. Bentum, M. J. Scanlon, "Device free person detection and ranging in UWB networks", IEEE journal of signal processing, pp. 43-54, Feb. 2014.

[7] S. Ralston, G. L. Charvat, J. E. Peabody "Real time through wall imaging using an ultrawide band MIMO phased array radar system", IEEE International symposium on phased array systems and technology, pp. 551-558, October 2010.

[8] T. Shany, S. J. Redmond, N, H. Lovell, "Sensors based wearable systems for monitoring of human movement and falls", IEEE International conference on E-health applications, pp. 658-670, March 2012.

[9] J. Edwards, "Wireless sensors relay medical insight to patients and care givers", IEEE journal of signal processing on medical alarm devices, pp. 8-12, Sept. 2014.

[10] K. Malhi, S. C. Muukhopadhyay, H. Ewald, "A Zigbee based wearable physiological parameters monitoring system", IEEE International conference on wireless communication, pp. 423-430, March 2012.