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THE BABY MONITORING ROOM PROTOTYPE MODEL USING IOT

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ABSTRACT

This paper proposes the idea of automatic caretaker room for a baby. The main motive of this idea is to save time and energy of very busy parents. Working people are very busy these days. They do not have enough time to properly take care of their babies. So, the whole room is set up as it can sense the activities of the baby and work according to requirement. Parents can save their time and energy as they don't have to go and check their baby again and again until they don't get any information about baby. Electric energy is also being saved because the devices will work only when they are needed. There will not be any wastage of electric energy. The idea of this scenario is accomplished by using sensors and a microcontroller. The sensors will sense the things happening and microcontroller will operate the devices under the conditions the parents set for these devices.

Key Words*: Smart baby room, *Arduino Uno ATMEL Microcontroller, IOT, Serial port monitor

1. INTRODUCTION

This paper presents the Smart nursery room prototype model. There is huge problem the working parents are facing is proper take care of their babies or toddlers. They cannot pay proper time for their babies. Toddlers and babies need 24×7 observation of their parents, which is very difficult for working parents. This prototype model solves the problem of time and energy usage of such parents. The prototype model of the room contains a movement sensor, gas sensor, voice recognizer and other electronic devices connected to Arduino. The room appliances are working with coordination of sensors and Arduino. Parents can set the electronic devices work according to the conditions they have given and they can operate these devices by their mobile phones even when they are away from the baby room. There are many project works done for baby monitoring but they only works to monitor baby's temperature, heartbeat and some other baby's physical conditions. But there is no work done on the whole caretaker baby room. This room is multitasking.

1.1 IOT (Internet of things):

IOT is the word of era. From Artificial Intelligence to networks IOT is playing a vital role. Everything is in the ease of hands. The Internet of Things (IOT) is defined in many different ways, and it encompasses many aspects of life from connected homes and cities to connected cars and roads, roads to devices that track an individual's

behavior and use the data collected for push services. So, Internet of things is a system of interrelated computing devices, digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data from one place to another place over a network without requiring human to human or human to computer interaction. Internet of Things (IOT) is an ecosystem of connected physical objects that are accessible through the internet. The thing in IOT could be a person with a heart monitor or an automobile with built-in sensors, i.e. objects that have been assigned an IP address and have the ability to collect and transfer data over a network without manual assistance or intervention. The embedded technology in the objects helps them to interact with internal states or the external environment, which in turn affects the decisions taken. In today's world things should be very fast and automatic. IOT is a very good platform which can make probably everything automatic. IOT can be used in various fields as shown in (Fig1.)

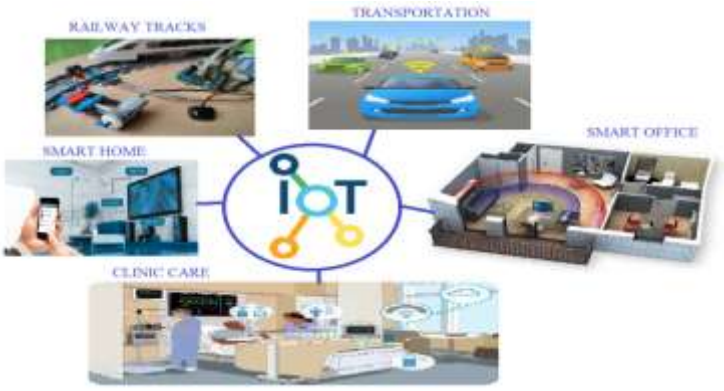

Fig.1 Internet of Things

1.2 Why use IOT:

Internet of Things can connect devices embedded in various systems to the internet. When devices/objects can represent themselves digitally, they can be controlled from anywhere. The connectivity then helps us capture more data from more places, ensuring more ways of increasing efficiency and improving safety and IOT security.

1.3 Hardware:

(i) GSM:

The GSM was developed at Bell Laboratories in 1970. GSM is a modem that can be used in mobile communication. It stands for global system for mobile communication. It is used at very large scale in mobile communication system in the entire world. GSM is a form of digital cellular technology, which is an open source technique. It can be used for transmitting voice and data services on mobile. It operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. GSM system was developed using time division multiple access (TDMA) technique for communication purpose. A GSM digitizes and reduces the size of data transferring through a channel with two different streams of client data. Every data stream has its own particular time slot. The digital system is able to carry data at the rate of 64 kbps to 120 Mbps.

(ii) Arduino:

An Arduino is a microcontroller based kit. It is basically used in communications and in controlling or operating many devices. It was founded by Massimo Banzi and David Cuartielles in 2005. The Arduino used in this scenario is Arduino Mega. It is based on the Atmel ATmega328.

Fig. 2 Arduino

(iii) PIR Sensor:

PIR sensors sense any motion in its range. It is mostly always used to detect whether a human has moved in or out of the area of sensors. They have very small size, very low cost, low energy usage, easy to use and don't wear out qualities. That is why they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyro electric", or "IR motion" sensors.

Fig. 3 PIR Sensor

(iv) Gas sensor:

In this implementation Gas Sensor REES52 MQ2 is used. It is an analog gas sensor, which can detect smoke, methane and other dangerous and flammable gases.

(v) Microphone Module:

Microphone detects the sound and gives a digital input to Arduino.

2. Review of Literature:

[HYPERLINK \l "Shu16" 1] Wang, Hou and Gao described a novel IOT access architecture. The proposed architecture could provide unified access to various sensors and actuators as well as high-speed devices, which meets real-time application requirements in IOT fields. Making full use of FPGA and SoC

technologies, the system provides powerful processing capability, excellent compatibility and expansibility while requiring less hardware resources and reduced power consumption. By taking vehicle monitoring system as a typical example, we verified that the system achieved good performance in a practical application scenario. 2]**}** In this paper Stankovic proposed the vision of IOT, in summary, one vision of the future is that IOT becomes a utility with increased sophistication in sensing, actuation, communications, control, and in creating knowledge from vast amounts of data. This will result in qualitatively different lifestyles from today. [HYPERLINK \l "Hos16" 3]In this paper, it is showed that IOT scenarios can be grouped into four clusters in terms of their potential privacy risks. After comparing these encapsulated groups according to the five contextual parameters, we also extracted some contextual factors that cause users' privacy concerns in IOT. To verify whether our findings are also applicable to broader IOT contexts, we plan to design and develop a location-based survey system. One of our research hypotheses is that a location-based survey system would be more suitable for collecting genuine responses from users than a traditional survey system, since it situates users in IOT scenarios that are comparatively more realistic than clicking through a survey in a web browser. 4]**}** Chakkor, Ahmadi, Baghouri, & Hajraoui have presented in this paper a comparative performance analysis of six wireless protocols: Bluetooth, UWB, ZigBee, Wi-Fi, Wi-Max and GSM/GPRS. In case of wireless module used for communication in an intelligent sensing application will compromise something among the energy cost, QoS and real time execution. However, robust sensing quantitative evaluation indicators permitted us to determine the suitable protocol for an application based on intelligent sensor. [HYPERLINK \l "Has17" 5] This system is designed using Raspberry Pi B+ module which is a credit card-sized microcomputer and has huge advantages over Microcontroller or Arduino. Moreover, Raspberry Pi is a low-cost chip which can make the system cheaper than other existing systems. This system can provide both audio and video output at the same time. It can be applicable for the home environment as well as in the hospital or baby nursing care. Effective use of this system can remove the anxiety and monotony of the parents. The safety issue of the baby is also confirmed in this system. Although this system is implemented, further improvement and modification of the system can be done. 6]**}** In this proposed system, the limitation of earlier system has been overcome by providing the continuous monitoring of infant's health. This data can be used not only to track infant's health at home but also useful to continuously monitor babies at hospitals especially where manual monitoring is not always possible. In future, the size of the monitoring device can be reduced. Also, the accuracy of the sensors can be refined in order to get precise measurements.

3. Smart Baby room prototype model:

Nowadays, people are very busy in their daily routine. So, they don't have much time to take care of their babies for 24 hours. Parents hire babysitters for taking care of their kids. Today, everything is technology based so the baby care should also be automatic by using technology. IOT is a good platform to make an automatic baby care room. First we have to notice all the activities of babies and then embed the sensors according to the activities. There are many sensors which can sense many basic things, such as temperature sensor to sense the heat,

movement sensor to sense any motion, pressure sensors for pressure, voice sensors to detect voices etc. In the future, a smart nursery room will be necessity for all the parents.

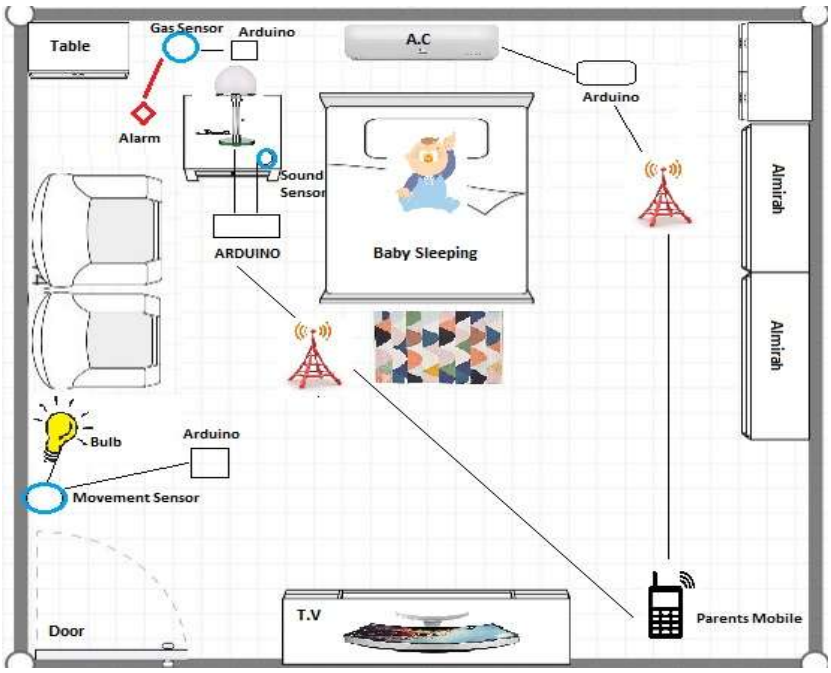

Fig. 4 Baby Room Scenario

A nursery room should have a temperature sensor which can measure the temperature of the room and can adjust the temperature as required. Temperature sensor can also sense the body temperature of baby if it is not normal then it can also inform the parents via any communication media. A light sensor is also necessary for kid's room it will sense if it is dark in the room it will turn on the LED. Parents can also have the control of light source from a remote place on their phones or other related devices. Voice sensor can sense the voice or noises. If parents record the voice of baby when he is crying then it will sense and inform the parents whether baby is crying. Movement sensor can be used with various sensors. Like if baby woke up and he will start moving his legs or arms then it will sense the movement and trigger the light so that baby will not be afraid of dark.

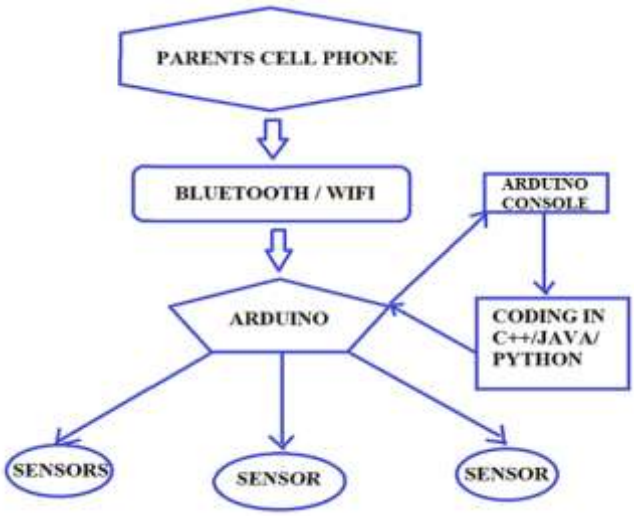

Fig. 5 Flow Chart

3.1 Working model of Smart Baby room prototype:

The smart baby room prototype model has a PIR sensor, Gas sensor, sound detector. These sensors are connected to Arduino. When there is any movement occurs in the room the PIR sensor activates the Arduino and GSM module. Arduino switch on the light, which can be clearly seen in the fig. 6. The same way when gas sensor sense any dangerous gas it will activate the Arduino which send the message to parents mobile phone through GSM. Voice detector catches the sound of baby cry. The message of "Baby is crying" will be sent to parent's mobile phone as shown in fig. 7. LED1, LED2, LED3, LED4 indicates the other appliances connected to and controlled by Arduino.

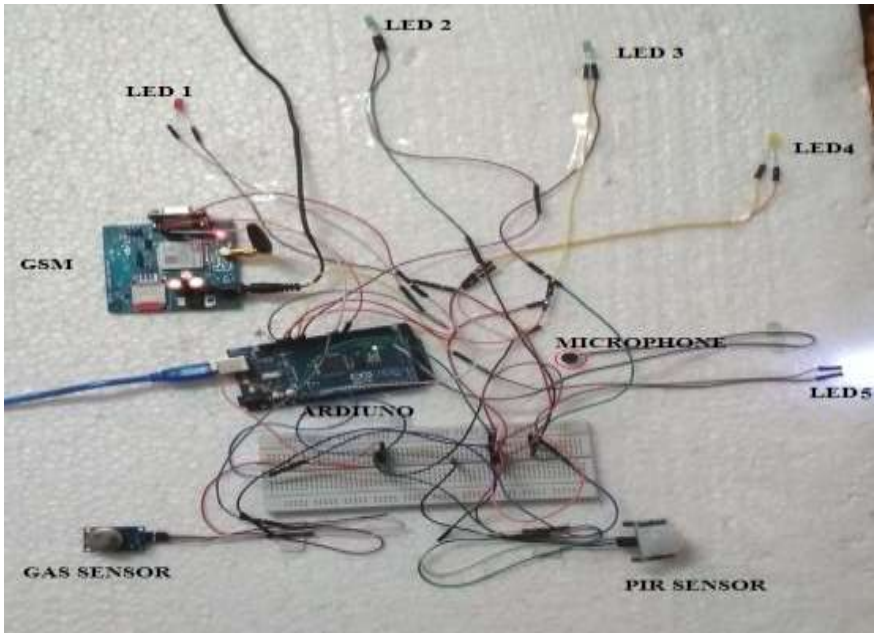

Fig. 6

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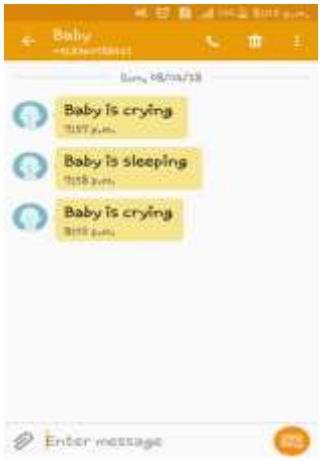

Fig. 7

3.2 Results:

The results are taken by using Serial Port monitor. It is very powerful monitoring system used by professionals for RS232/RS422/RS485 port monitoring. When using this software all the logs and serial port activities can be shown on COM monitor. This is the best way to track the problems occurred during application or driver development, testing and optimization of serial devices, etc. when information is send to parents phone through GSM as shown in the proposed work following results are taken using Serial port monitor.

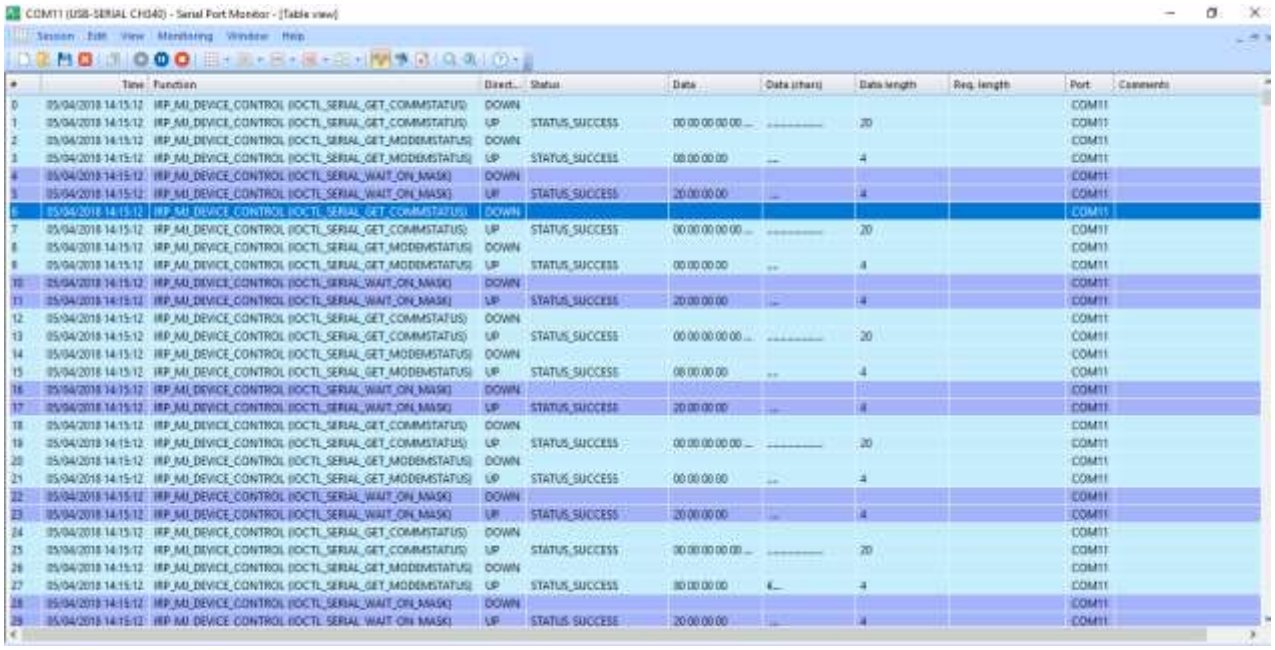

Fig. 8

It can be seen that all the data send through the GSM is successfully received. There is no data loss in this scenario. There could be loss of data if the message is sent from very remote place.

4. Conclusion:

In the nut shell, this system is made in the consideration of giving comfort to working parents. This system can be very much useful for them. It also enhances the use of IOT. People can use the technology to make them more comfortable and quick. Home appliances become connected to internet, which make them smart devices as they can work by their own if they are designed in such manner by using sensors. A Smart baby room can be like blessing for the parents. They don't need to pay for maids or caretakers for their babies. They can trust on the system because machines are more reliable than humans.

5. Future scope:

The proposed system monitors the baby whether the baby is sleeping or not and also checks the room's condition is favorable for baby or not. It can be enhanced by adding baby's health monitoring. Parents can also check their babies from another room at home. For short range communication they can use Wi-Fi and Bluetooth technologies.

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