Cradle Monitoring System

Miss. Rupali A.Pokale[1], Miss. Meghana M.Thombare[2], Miss. Pragati U.More[3], Mr. Akshay Bhosale[4]

[1, 2, 3] Dept of Electronics and Telecommunication Department

[4]Professor, Dept of Electronics and Telecommunication Department

[1,2,3,4]Sanjay Ghodawat Institutes, A/P: Atigre 416118, Tal: Hatkanangale, Dist: Kolhapur, State: Maharashtra, India

Abstract- *This paper presents a design of an Automatic Baby Cradle System which gives a reliable and efficient baby monitoring system that can play a significant role in providing better infant care. This system monitor parameters such as baby cry, environment temperature, and using GSM system this information is accessed by parents to initiate the proper control actions. Proposed system helps the oldsters and nurses in taking care of their kid while not physical attention. We have design of a low cost automatic baby monitoring cradle that swings automatically when baby cries, for this it has a cry analyzing system which detects the baby cry voice and accordingly the cradle swings till the baby stops crying. There is a need to develop a new low cost indigenous electronic cradle because the existing cradles are imported and costly. The system architecture consists of sensors for monitoring vital parameters, LCD screen, and GSM interface all controlled by a single microcontroller core.*

Keywords- Baby monitoring, vital parameters, microcontroller, GSM module.

I. INTRODUCTION

In the past few decades, female participation in the labor force in the industrialized nations has greatly increased in present society. Subsequently, infant care has become a challenge to many families in their daily life. Mother is always worries about the well being of her baby [1]. As we seen in India both the parents need to work and look after their babies/infants, so more workload and stress is there on such families especially on female counterparts. If a system is developed which continuously gives updates about their infants during illness or during normal routine then it will be of great help to such members as they can work in stress less environment giving more fruitful output. Also urgent situation condition can be quickly be noticed and handled within less time. Usually, when a young baby cries, the cause is one of the following things i.e. they are hungry, tired, not feeling well or need their diaper changed. So we developed a prototype which can monitor the activities of the babies and/or infants along with finding one of the above causes and give this information to their parents [2]. Sometimes it's not reasonable for them to afford a nanny. This end in admitting their child to crèche throughout their Job temporal order. It is found that almost all

of the day's baby stops crying or sleeps after they are in cradle. In today's life style, it's terribly troublesome for fogeys and nanny to take a seat close their kid and truthfulness them whenever they cry or sleep. Thus, we have designed a system which might facilitate the parents within the kid care while not physical attention. Automatic cradle could be a device that provides associate aid to swing the baby cradle automatically. This system aims at two main things in assisting parents. Automatic cradle movement informs parents when necessary. The system is designed to help parents and nurses in infants care. The design aims at following points:

1. Cradle starts swinging automatically when baby cry.
2. Monitor environment temperature to check baby's well-being.
3. Message sending to the parents through GSM which is indicating that baby needs attention.
4. Toy is used in system for entertainment of the baby.

II. REVIEW OF LITERATURE

Many home-care systems are available but majority of this system are specially designed for the aged people and patients. These systems can monitor their health status, automatically send out emergency signals, and have other functions. However, the caring methods for infants are not the same. Children and adults require different type of care because they are totally dependent for their normal functions on someone else. Infants cannot give any feedback about their discomfort or health complaints. Infants cannot express themselves like old people, e. g when an infant has a fever, he/she can only express his/her discomfort by crying. Hence, a home-care system specially designed for infants is today's need which would substantially lighten parents' especially mother's burden. In support of this requirement many research papers and patents for healthcare application are studied with the intention of possible solutions to take care of the infant. Author had developeda system which is based on commercial GSM network. Patents are also searched to find novelty in baby care monitoring system. In design, (Patent No. 2002/0057202A1) [3], system is developed which monitors breathing, fever and volume of baby sleeping in the crib. There is a module having three sensors attached to the diaper. This signal are amplified, transmitted by transmitter and at

remote station there is receiver, multiplexer which applies this signal to audible alarm to alert mother to take appropriate action. U.S. Patent No.6, 043, 747(Altenhofen), wherein a parent unit can record messages which may then be transmitted to the baby unit to soothe or calm the baby [4]. The baby unit includes a microphone and can transmit sounds to the parent unit. However, in order for the parent to detect a problem with the child, the parent must constantly monitor the sounds being transmitted from the baby unit. The next U.S. Patent No. 6,450,168 B1 [5], includes an infant's sleep blanket/garment which is offered as either a sleep sack or a sleep shirt, depending on the age of the infant. The sack with no arm holes for newborns and with arm holes and sleeves for older infants. Here thermometers incorporated to monitor the infant's temperature as he sleeps. U.S. Patent No. 4,895,162 [6], in which a soft belt containing a pair of electrodes is positioned around the torso of an infant such that the electrodes are in position to monitor vital signs, such as respiration and pulse. Monitoring lead Wires connect the electrodes to a monitor unit proximate the infant.

III. OBJECTIVES OF STUDY

1. To design the development of an intelligent baby care, this has ability to monitor baby movement, and body temperature.
2. To make cradle innovation that is more flexible and less expensive to market.
3. User friendly- simple and complete with instruction.
4. When baby cry parent can automatically swings the cradle till baby stops crying.
5. Alerts parent by sending sms.

IV. SYSTEM ARCHITECTURE

The architecture of the system consists of both hardware and software. Block diagram is as shown in Fig.1, hardware components were assembled according to the block diagram. The code is written in embedded C and is burnt into the microcontroller.
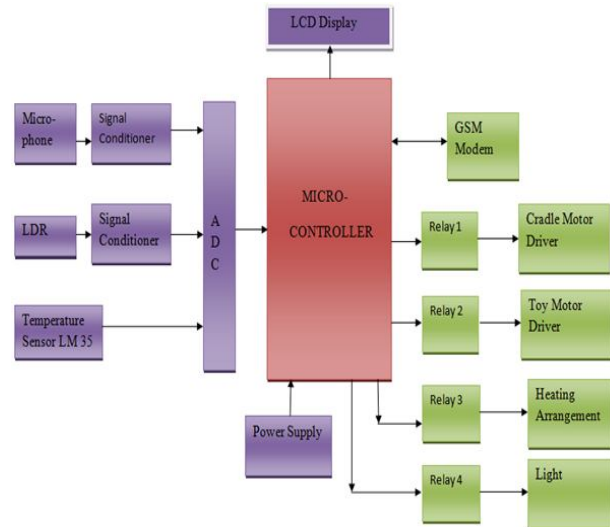

Fig. 1. Block Diagram of Proposed System

The following subsections provide more details of the components used in our prototype:

A. MICROCONTROLLER

The microcontroller is used to control the signals to be sent, and then the output of the microcontroller is sent to the drivers which drives the DC motor and makes the cradle to swing according to the sound intensity of baby's cry.

B. TEMPERATURE SENSOR

Human body needs special type of sensors for reliable readings which led to the choice of using the LM35 temperature sensors in our prototype [1, 6]. It operates at 3 to 5 V and can measure temperature in the range of -40 C to +125 C which is sufficient for the targeted body temperature range .It is having linear response and easy conditioning. The sensor's output is an analog DC voltage signal which is read by the microcontroller using an analog pin linked to an ADC. The ADC used has a resolution of l0-bits, 1024 levels, with a sample rate of 9600 Hz and input voltage range depending on the ground and Vee. The output voltage of the LM35 is analog and in the linear range of -1 V to 6 V with accuracy of ±0.5 °C can be converted from volts to degrees of Celsius and Fahrenheit.

C. MICROPHONE

When baby cries in the cradle, microphone detects it and converts the sound signal into electrical signal. The electrical signal is then fed into amplifier. Condenser microphone is used to detect

the baby cry. This has two plates and one of these plates is made of very light material that acts as a Diaphragm. The diaphragm vibrates when struck by sound waves, changing the distance between the two plates and therefore changing the capacitance and producing electrical signal.

D. SIGNAL CONDITIONING

Signal amplification is done here. Op-amp is used as amplifier for signal conditioning circuit. The electrical signal from MIC is provided as input to the circuit. The output from MIC is amplified by op-amp so that it can be used by microcontroller.

E. LDR

Light dependent resister has a particular property in that they remember thelighting conditions in which they have been stored. This memory effect can be minimized by storing the LDRs in light prior to use light storage reduces equilibrium time to reach steady resistance values. Here we are using LDR for detecting day or night status.

F. LCD DISPLAY

In our prototype 16 X 2 LCD module is used. It has 2 rows and 16 columns therefore total 32 characters are displayed. It has two operation modes; one uses all 8 pins and the other uses only 4 of them. The 4-bit mode was used to manage the LCD screen. All sensor output is displayed continuously as it is being measured.

G. GSM MODULE

The purpose of the GSM here is to alert the parents or the nurse if the baby does not   stop crying after the set instant of time. Here the microcontroller would be programmed in such a way that if the baby does not stop crying and the cradle keeps swinging after the set instant of time then the signal would be passed to the GSM to make a call or send a message to the parents number and alerting the parents that the baby is not being taken care of. An RS232 interface is connected between the controller and GSM for level conversion.

H. DC MOTOR

A DC motoris any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or

electronic; to periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line. DC motors were the first type widely used, since they could be powered from existing direct current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC Motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

V. FUTURE WORK

1. This system can be enhanced with more features like with baby rotating toy with music and camera. Parents can monitor their baby live via 3G.
2. In future we can make Android App for directly monitor of baby cradle from registered mobile.
3. In future moisture sensor are used for more caring of the baby.

VI. CONCLUSION

Looking after babies is hard problem worldwide. Babies are society future. This system emphasizes the importance of child care. The above designed system is economical and user friendly and very useful for working parents and nurses. They can manage their work efficiently. With the development of technology day to day work has been eased for parents along with baby care. Otherwise, mother's lap would be best cradle for baby. In the present study, an intelligent baby cradle system was developed. The cradle was capable of detecting the movement of the baby and initiate cradle swing. Additionally, the developed device is capable of sending SMS. The device can be used to minimize the workload of the parents and nurses in home and hospitals respectively.

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