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INFANT SECURITY ALERT

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ABSTRACT

Researchers conducting the largest long-term study of child care in the United States said today that they had found that children who spend most of their time in child care are three times as likely to exhibit behavioral problems in kindergarten as those who are cared for primarily by their mothers. The main objective of this paper is to raise alerts on parent mobile regarding the child status when he is in a problem.in this the infant is made to wear a dress which is capable of identifying the following issues: When child is continuously crying or when the child is under pressure by care taker (harassing, throwing, beating).

I INTRODUCTION

The term "Internet of Things" (IoT) is used to describe a galaxy of wildly different devices, from twenty dollar children's toys to airliners that cost hundreds of millions of dollars. While this paper focuses on the consumer end of the IoT spectrum, we believe that the findings can inform how security researchers look at undiscovered vulnerabilities affecting expensive, industrial devices as well. we can think of a "Thing" with "Internet" as simply any device, regardless of size, use, or form factor, that contains a CPU and memory, runs software, and has a network interface which allows it to communicate to other devices, usually as a client, sometimes as a server. In addition, these Things tend not to resemble traditional computers. They lack a typical keyboard and mouse interface, and they often have a user interface not centered around a monitor or other text-filled screen. Finally, these devices are marketed and treated as if they are single purpose devices, rather than the general purpose computers they actually are. This last distinction is often the most dangerous one to make when it comes to deploying IoT devices. In his keynote address to the Chaos Computer Club, Lockdown: the coming war on general-purpose computing2 , Cory Doctorow makes the case that with today's technology and current computer science thinking, we cannot yet create a computer that is anything other than a general purpose computer. End users may have devices that are nominally prohibited from performing certain actions according to the manufacturer, and those manufacturers sometimes go to great lengths to foil modification efforts. In the end, though, it is not possible to build and sell a computing device that cannot be coerced into rebelling against a manufacturer's intentions.

II BABY MONITORS

The research presented focuses on the security of retail video baby monitors for a number of reasons. Baby monitors fulfill an intensely personal use case for IoT. They are usually placed near infants and toddlers, are intended to bring peace of mind to new parents, and are marketed as safety devices. By being Internet accessible, they also help connect distant family members with their newest nieces, nephews, and grandchildren, as well as allow parents to check in on their kids when away from home. They are also largely commodity devices, built from general purpose components, using chipsets, firmware, and software found in many other IoT devices. Video baby monitors make ideal candidates for security exploration; not only are they positioned as safety and security devices (and therefore, should be held to a reasonably high standard for security), but the techniques used in discovering these findings are easily transferable to plenty of other areas of interest. Other products of direct interest to commercial and industrial consumers and security researchers (commercial security systems, home automation systems, on-premise climate control systems) share many of the insecure design and deployment issues found in video baby monitors.

III RELATED WORK

Known Vulnerabilities Brand-name manufacturers of IoT devices tend to implement much of the technology used by their products as embedded systems subcomponents, sourced from third party suppliers. The upstream vendors of these subcomponents tend to run extremely large operations, producing millions of units in a given year, and any change in this supply chain is both time consuming and expensive. Due to the nature of this time-lagged supply chain, individual software components may be months to years old before being assembled into the final product, bringing old and commonly known software vulnerabilities along with them.

IV IMPROVE SECURITY

It should also notify the child moment when he is in sleep, it should raise alert when a sudden fall occurs. There should be a sensor which could be capable of recording voice notes, it could be streamed to parent mobile continuously. Parent should able to listen whenever he want n see alerts for taking concerned actions.

It is the authors' hope that everyone who reads this paper has a better sense of security issues facing the current generation of the Internet of Things. While we take great pride in performing research on individual IoT devices that have real-world benefits to consumers and businesses, we also realize that those efforts alone don't scale to the massive size and growth of IoT. In February 2014, Mark Stanislav co-founded the IoT security initiative, BuildItSecure.ly.9 Through vendor outreach efforts, BuildItSecure.ly not only provides curated information security guidance to IoT vendors of all sizes, but also pairs those vendors with highly regarded information security researchers. Through this pro bono, coupled approach, BuildItSecure.ly is able to translate research and knowledge transfer into real security improvements that will impact the entire product line of participating vendors.

Additionally, Mark also participates in the Online Trust Alliance's IoT Working Group10, which is developing the "IoT Trust Framework" to provide clear guidance to vendors on expectations of both privacy and information security features for their products. Vendors that utilize this framework will have a set of minimum boundaries for how their products and related services should handle the data and trust being provided to them by their customers. By establishing this framework, vendors can be confident in how to approach tough design and implementation choices that produce high quality, secure, and affordable products.

V SYSTEM ARCITECHTURE

The architecture of the system consist 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 .

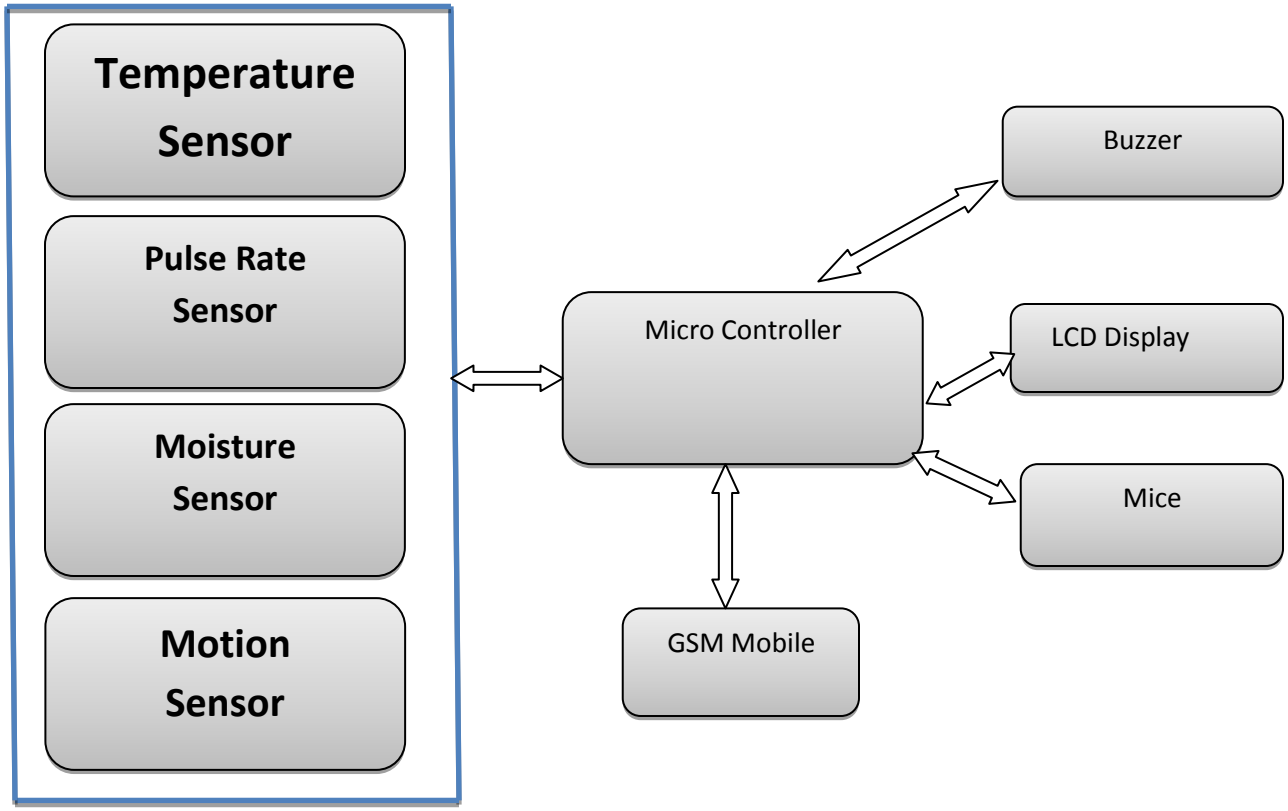

Fig. 1. Block Diagram of Proposed System

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

5.1 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 . The placement of sensors is also important for accurate measurements. In our prototype it is placed in the socks of an infant wrapped in cotton so that no irritation made. The temp sensor and actual readings are listed in table below:

TABLE I

Serial No	Actual Temp (^{0}C)	Practical Temp(^{0}C)
1	32	36.1
2	31	35.6
3	32.5	36.7
4	33	37.2

5.2 Pulse Rate Sensor

The components used are 5mm photodiode and 5mm light emitting diode. The system consist of IR transmitter and receiver, high pass filter ,amplifier and comparator .By using this circuit component biological signal in mill volt is converted to larger magnitude about one to two volt and then send it to the microcontroller.

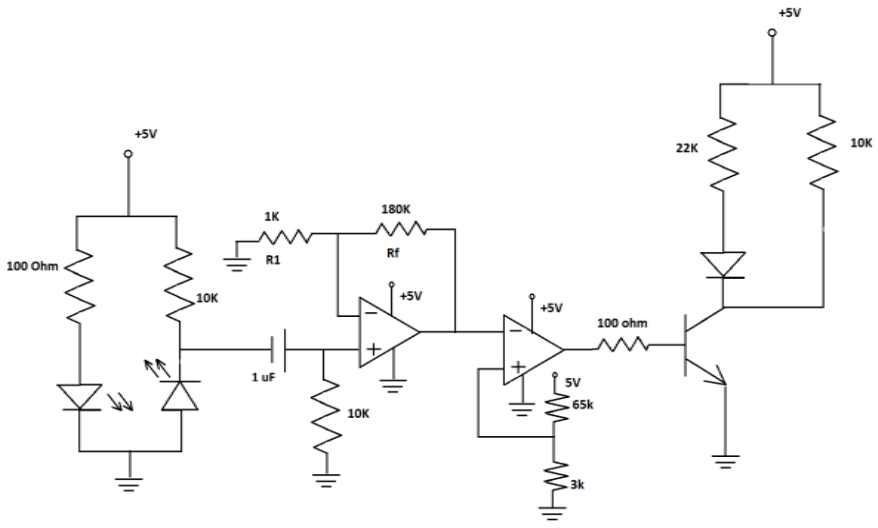

Fig. 2. Pulse Rate Sensor Circuit

Pulse rate will be measured from the finger using optical sensors and displayed on the LCD. The transmitter-sensor pair is clipped on one of the fingers of the

subject. Pulse rate signal is applied to the Non-inverting input terminal as shown in Fig. 2.Voltage gain of Non Inverting amplifier is given by Equation 1+ Rf/R1. Gain=1+ 180/1=181. This amplified signal is given to comparator circuit where voltage divider circuit is used. Voltage at non-inverting input is compared with reference voltage and whatever voltage is generated is applied to the base of transistor. There is a 100 Ohm resistor at the base of transistor used to limit the current flowing to the base of transistor. As soon as the voltage across this resistor increases beyond 0.7V the transistor turns ON and at the output we get 0v and the LED D2 glows. The pulse-rate sensor and actual readings are listed in table below:

TABLE II

Serial No	Actual pulse rate	Practical pulse rate
1	72	78
2	66	72
3	70	76
4	54	60

5.3 Moisture Detection Sensor

To determine the moisture condition i.e. urine detection ,two pairs of copper electrodes are placed under the cloth on which baby is sleeping. The signal obtained is given to microcontroller.

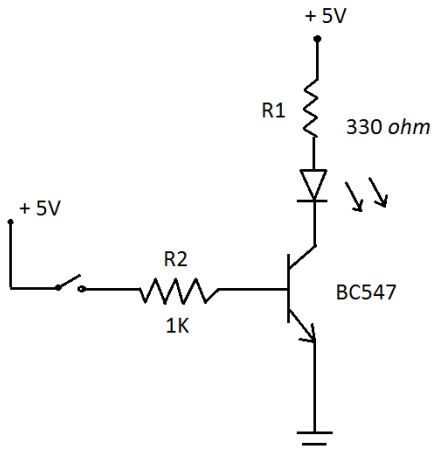

Fig. 3. Moisture Detection Circuit

5.4 Motion Sensor

An accelerometer is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant force of gravity pulling at our feet, or they could be dynamic - caused by moving or vibrating the accelerometer. By measuring the amount of static acceleration due to gravity, one can find out the angle the device is tilted at with respect to the earth. By sensing the amount of dynamic acceleration, one can analyze the way the device is moving. Accelerometers use the piezoelectric effect - they contain microscopic crystal structures that get stressed by accelerative forces, which cause a voltage to be generated. The three axis accelerometer are basically used to identify the movements across the three axis i.e. x-axis, y-axis, z-axis. The accelerometer used in this system is ADXL335, [20] which is small low profile package, can measure minimum full scale range of +/- 3g as shown in Fig.4.In this way movement of an infant is monitored by placing accelerometer properly. It is positioned in the socks of an infant so accurate motion will be detected.

Fig. 4. ADXL335 Accelerometer

5.5 LCD SCREEN

In our prototype 16 X 2 LCD module is used. It has 2 rows and 16 column 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.

5.6 GSM MODULE

GSM (Global System for Mobile communication) is a digital mobile telephony system. With the help of GSM module interfaced, we can send short text messages to the required authorities as per the application. GSM module is provided by SIM uses the mobile service provider and send SMS to the respective authorities as per programmed. This technology enable the system a wireless system with no specified range limits. In this way, whenever the safe range of the vital parameter of an infant is violated, the programmed microcontroller produces an alarm and GSM

Modem interfaced with the microcontroller sends an alert SMS to the parent's mobile number deploying wireless technology.

5.7 CONTROLLER

The PIC 18f4520 is an 8-bit microcontroller, which has an on-chip eight channel 10-bit Analog-to-Digital Converter(ADC).The amplified and conditioned sensor signals are fed to the microcontroller.

VI . SOFTWARE DETAILS

PIC18F4520 is used as a micro-controller in a proposed system. The sensors namely pulse rate sensor, accelerometer, temperature sensor, moisture sensor and sound detector are interfaced with analog channel of ADC of micro-controller. The values taken from this sensor are displayed after every 2msec of delay. Power on reset function of PIC micro-controller resets all the values. The micro-controller read output of ADC after every 2 seconds. Temperature of an infant is read by microcontroller, the software is developed in such a way that upper limit of temperature is set, if crosses that limit ,buzzer will be on and alert message send to mother. Similar conditions are considered for other sensors. V. RESULTS The system was tested carefully on an infant, the results found to be same as the one's measured by standard instrument. While testing this system on an infant parent's concern was considered. During the execution of the system snapshots of the display were taken. The system being a complete hardware design and the data available on cell phone and LCD display have been captured. Test results of the system are given below, shows successful implementation of the system. Fig.5 and Fig.6 shows hardware module and the actual implemented system.Fig.7,8,9 shows a sample readings of infant onto the LCD attached to the module on an infant's side. The reading were matched to the readings taken by standard instrument and found to be same.Fig.10 and Fig.11 shows message received on parent's cell phone when some abnormal condition exists. Message shows temperature is high and moisture condition exists.

VII CONCLUSION

Proposed Infant Monitoring System is an inexpensive and simple to use, which can improve the quality of infant-parent communication. This system expressively provides the parents with the feeling of assurance. The constant capturing of multiple biological parameters of the baby and analysis of the overall health helps mother to understand the internal status of the baby. As GSM technology is used which makes the users to communicate for longer distances. This is a convenient system to monitor the baby's health condition from any distance.

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