IOT BASED WIRELESS NURSE CALL SYSTEM IN MEDICAL INSTITUTIONS

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Abstract - *Patients must summon assistance for normal or emergency needs in traditional nurse call systems used in residential care facilities. Wireless nurse call systems (WNCS) have additional capabilities for people who are unable to act or consciously interact with the system, such as detecting dangerous conditions, preventing and treating them quickly, and improving nurse workflows. The aim of this study was to look at the benefits and drawbacks of using WNCSs in residential care facilities. Is to design and implement the entire Wireless Nurse System within the hospital, showing the patient's room and bed number, then the data could be saved in local server and display via monitor. In this system uses an Arduino Microcontroller and Multi-Wireless Devices, to provide prompt and decent medical care without human error Or Medical Delay. In an Emergency, it provides code block alerts.*

*Key Words***:** Wireless nurse call system, nRF24L01, Arduino UNO, Code blue alert.

1.INTRODUCTION

Nurse call systems are frequently found in hospitals and care homes and play an important role in alerting nurses and careers to the fact that patients or residents need help. Whether it is staff or patients asking for help in an emergency situation, nurse call systems can literally offer a lifeline. And of course, such systems offer ongoing support in non-urgent situations as well, enabling individuals to request assistance if they have a particular requirement or need some extra support. Over time, nurse call systems have evolved considerably. Their functionality has come on leaps and bounds from their origins as straightforward bell call systems, thanks to the evolution in the available technology. The range of benefits they can now potentially deliver to both patients and staff are considerable. It is vital that patients and residents have the reassurance of knowing they can alert staff to a problem at any time of day or night. For the majority of the time this will be related to basic care needs, or perhaps specific support that's required in relation to an ongoing health issue. Nurse call solutions can also be incorporated as part of an access control and CCTV (closed circuit television) system (including door monitoring), enabling staff to be aware of patients' and residents' whereabouts on an ongoing basis to increase their safety. There will inevitably be cases where specific patients or residents will have challenges in using the more conventional nurse call systems. In many cases, it's still more practical and desirable to have a nurse call system hardwired into a building. But as the technology has evolved, it's created other options which might be more suitable in some circumstances.

A wireless nurse call system is a new advancement technology, this enables patients to use them in such an easy and comfortable way, receiving its medical assistance quickly. Since it does not need the usage of any wires like old versions of nurse call systems, it becomes very simple for hospital staff to deploy and use it within minutes. Developments in nurse call system technologies allows them to be integrated with smart digital devices. That enables nurses and cares to communicate instantly with each other and patients and residents, as well as potentially providing more rapid access to clinical data. These technologies can also facilitate better centralized management and maintenance of the nurse call system itself. If there is a communications point failure, the system can notify the estate and facilities management team straight away, allowing them to respond quickly and helping to reduce the risk of an undetected failure in the system which could compromise patient care.

2. RELATED WORKS

A medical-surgical unit in a hospital in the Southwest of the United States looked at the effects of using wireless communication technologies to help nurses recognise patient bed status changes and improve team communication. Response time has improved since the addition of wireless communication The amount of nurse-initiated communications and response time to patient calls were compared to pre-wireless calls and the response time sampling span[1].

The need for an effective nursing system arose when patients began to be moved to more private rooms than to share the same space; this measure reduced the nurses' perception of what they had about their patients, and thus created the need for alternative ways of identifying their patient's needs (Solumsmo and Aslaksen 2009) [2].

Remote control or local control is always useful for those people who are challenged in the world. Such a system always helps them to use life more easily then without these programs [3].

The key to the call-up system for nurses to make calls from patients to the nearest nurses' control room [4].

Standard nurse care systems are not enough for customer satisfaction to provide safe and comfortable technology for patients, residents, and their families. [5]

The wire system requires up to 24 wires per room, thus creating spaghetti wires, resulting in an increase in weight during installation, in addition to formal and informal maintenance. In addition, these traditional systems are unable to store data regarding patient and nurse behaviour, leading to staff sharing without data backup. [6]

Evaluating a nurse's call system can be frustrating, time-consuming, and costly. However, this will no longer be a problem with wireless nurses' call systems [7].
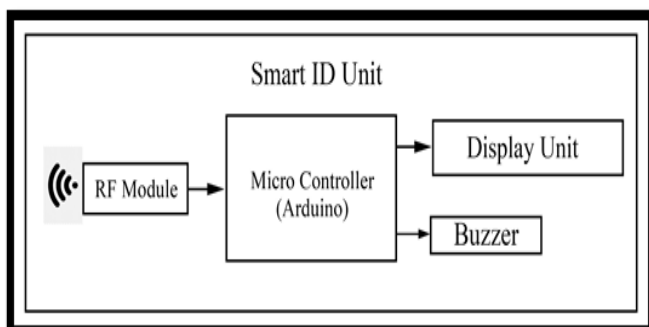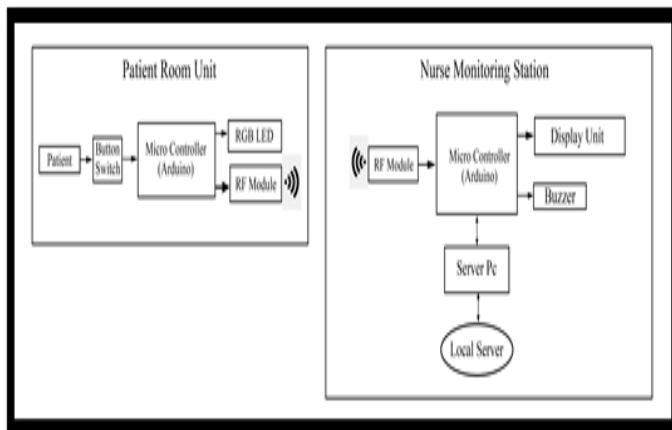
3. METHODOLOGY

Fig-1 : Block Diagram of proposed system

The main objectives are mentioned below

- ➢ To reduce the time delay of assistance to the patient.
- ➢ Try to reduce the nurse-to-bed ratio.
- ➢ To make a complete wireless nurse call system.

A Patient need any medical assistance they push a button switch, then the signal could be processed by the Arduino and RF module is normally set into TX (transmitter) mode, it modulates and transmits the signal to the nurse monitoring system, which demodulates the signal and process via Arduino and displays patient Room and Bed number in the display unit and gives a buzzing sound from buzzer. The nurse monitoring system is actively set into RX (receiver) mode, once a signal received from a patient room it ACK (acknowledges) the patient unit, which emits a green light through RGB LED. Based on the LED indication the patient gets the signal received Successfully then the data could be stored in the server PC. In case of emergency nurse monitoring system sent the CODE BLUE ALERT to the SMART ID UNIT which is carried by the duty doctors the unit displays the patient Room and Bed number in the display and gives a buzz sound through buzzer. The nurse system also indicates the CODE BLUE ALERT in the room as shown in above Figure 1. Communication Between Patient Room unit and Nurse Monitoring System as same as the Normal Patient Call Operation.

4. PROPOSED SYSTEM

Our proposed program aims to address all of these weaknesses in an effective way to support high quality and reliability of health care. The basic idea is to design and implement a complete wireless call system using RF technology in the hospital, continuously monitoring and displaying the condition of any room / patient / medical aid or assistance needed, to provide prompt and respectful medical care without any medical help delays.

This proposed system could be divided into three major modules are Patient Room Unit, Nurse Monitoring System, Smart Id Unit.

Arduino UNO is the most basic and inexpensive Arduino board and is the most popular of all Arduino boards with a market share of over 50%. The Arduino UNO is regarded as the best imitation board for beginners in electronic and code. There are two variants of the Arduino UNO: one that contains a connection with a hole microcontroller connection and the other with a higher ground type. The through-hole model will be useful as it can remove the chip in the event of a problem and replace the new one as shown in Figure 3. The Arduino UNO comes with a variety of features and capabilities. As mentioned earlier, the microcontroller used in the UNO is the

ATmega328P, an 8-bit microcontroller based on AVR architecture. UNO has 14 digital input pins - output (I / O) that can be used as input or output by connecting to various external devices. Of these 14 pins, six pins are capable of producing PWM signals. Digital anchors operate at 5V and have an output of 20mA current.

Fig-2 nRF24L01

The nRF24L01 + transceiver module is designed to operate on the 2.4 GHz ISM band worldwide and uses GFSK flexibility for data transfer. The data transfer rate can be either 250kbps, 1Mbps and 2Mbps. The 2.4 GHz band is one of the world's leading Industrial, Scientific, and Medical (ISM) bands for low-power unlicensed devices. Examples are wireless phones, Bluetooth devices, proximity field (NFC) devices, and wireless computer networks (Wi-Fi) Which are all using ISM waves. The power of the module works from 1.9 to 3.6V, but the good news is that the logic pins tolerate 5-volts, so we can easily connect it to Arduino or any 5V logic microcontroller without using any logic level converter as shown above fig 2.

MySQL is the most widely used database management system programme for managing relational databases today. It is an open-source database that is funded by the Oracle Corporation. In comparison to Microsoft SQL Server and Oracle Database, it is a fast, scalable, and simple to use database management system. It's often combined with PHP scripts to create efficient and dynamic server-side or web-based enterprise applications. MySQL is based on the Client-Server Architecture. This model is intended for end-users, or clients, to use network services to access information from a central computer, or server. Clients submit requests through a graphical user interface (GUI), and the server responds with the requested output as soon as the instructions match as shown in fig 2
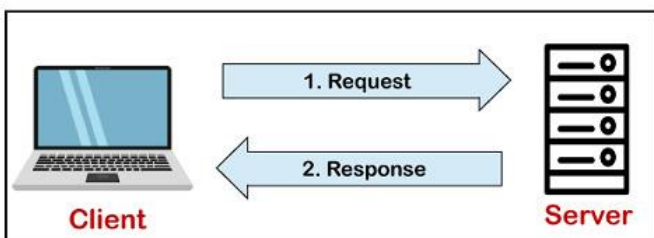

Fig -3 MySQL Database

5. RESULTS

The patient needs any medical attention by pressing the Button switch and transferring information to the RF Module.
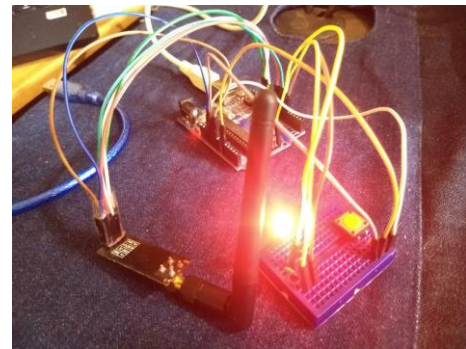

Fig-6: Patient room

The Nursing Room receives the signal from the patient's room and indicates the patient's room number and bed number and the data could be stored in the database.
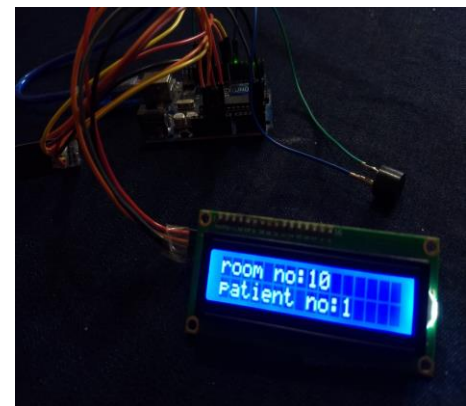

Fig-6a: Nurse monitoring station

Fig-6b: MySQL Database

6. CONCLUSION

Our target system uses wireless technology because there is no need to connect cables to any of the hitting points, and the impact is minimal. Wireless systems also have lower installation and operating costs than traditional cable systems, as well as faster and easier to install. Wireless configuration provides complete flexibility and mobility, which makes our system flexible and flexible indefinitely, thus allowing for continuous ability to address priorities and changes. In addition, our system is safe, reliable and cost-effective. It can be tailored to suit the needs and requirements of the individual and adapted to work in any hospital budget. It also has a variety of features that can help increase the efficiency of staff and improve the overall quality of care provided by health care clients and patients.

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