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Review Article

The Drawbacks of a Wireless Medical Alert System

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Abstract
In order to speed up the doctor's or nurse's time reaction in providing patients with rapid care, the nurse caller gadget is utilized as a specific communication tool between the patients and the healthcare provider inside the hospital. The two parties' communication is more efficient and organized when the wireless nurse caller device is used. The microcontroller ATMega8 is linked to the Bluetooth module MH-10, acting as both the transmitter and the recipient. A microcontroller known as ATMega8 processes the data, generating characters on the LCD, turning it on, and sounding the buzzer to summon the nurse or doctor.

Keywords: Cons, Hospital, Nurse Caller, Arduino microcontroller, Bluetooth Module, Doctor.

I. INTRODUCTION
The hospital is an essential part of a social and health organization with the function of providing plenary (comprehensive), healing (curative), and disease prevention (preventive) services to the community, whose services are handled by nurses, doctors, and other health experts. The nurses are considered the spearhead in the organization of hospital services because it is the nurse who continually provides care to the patients. The nurse continues to monitor the patient's health and provide care to them. Numerous previous studies have conducted research on nurse callers. The techno-economic evaluation of an ontology-based nurse call system through discrete event simulations was investigated by Vannieuwenborg [1]. The design and implementation of the Wired Nurse Call System was researched by Sharma [2]. A study on the automatic evaluation method of designating and invoking nurse education was researched by Maekawa [3]. Khera [4] researched the development of smart house call systems and android-based nurses for different abilities. A realtime feedback-centric nurse call system with archival monitoring using a Raspberry Pi was studied by Mahmud [5]. The hospital is equipped with a calling device in each patient's bedroom to speed up patient services. Presently, the nurse calling device used is very conventional, namely, it still uses a pair of cables. Electronic technology innovation is one way for patients and nurses to interact more quickly. A component that can calculate, remember, and make choices using a microcontroller is needed to make this device. The microcontroller is a chip or an integrated circuit (IC) that contains a processor and a flash memory capable of reading and writing up to 1000 times. The cost of development is inexpensive because it can be minimized and refilled with other programs as needed. Wireless network technology has been widely researched by previous researchers. The WI-FI Microcontroller-based Capacitive Water Wireless Sensor System Model was studied by Suryono [6]. [7] Thakare Obtaining Information About Neighboring Street Lights Using the WIFI Mesh Network was researched by S.N [8]. Riviezzo [9] investigated Wi-Fi Activated Speech Recognition Control Nodes. Xiao [10] investigated the design of Wi-Fi internet of things (IoT)-based household appliance control systems for Smart Homes. An efficient remote control system using SMS and Wi-Fi technology for outdoor security lighting applications was studied by Akorede [11]. Dai [12] investigated a smart car design based on Wi-Fi video capture and OpenCV motion control. A 220-volt power switch controlled through Wi-Fi was studied by Gao [13]. Jarande's research [14]. The Internetbased monitoring and protection of the smart PV grid system was studied by Pramono [15]. Aalsalem's Campus Sense Smart Vehicle Parking Monitoring and Management System using ANPR Cameras and Android Phones was researched by Aalsalem [16]. In this study, Sriyanka [17] investigated Intelligent Environmental Monitoring through the

Internet of Things (IoT) using Raspberry Pi 3. Occupancy estimation based on environmental sensors in buildings through IHMMMLR was studied by Chen [18]. Yu [19] has researched a real-time carbon dioxide emission system based on participatory sensing technology based on Yu [19]. Tian-He [20] investigated Comprehensive Monitoring and Analysis Instrument Design for Mine Environment. Smart Community Monitoring Platform for Smart Homes that Actually Work was researched by Nettikadan [21]. The equipment control and environmental environment of the smart home were investigated by Shiqi [22]. An Automated Service Request System for Security in Smart Homes Using the Internet of Things (IoT) was investigated by Madupu [23]. Edge-Based Smart Bura's Parking Solution Using Camera Networks and Deep Learning were researched by Bura [24]. The Monitoring and Ventilation Control System for Multi-story Historic Buildings was studied by Singh [25]. Nurse calling devices can facilitate communication between patients and nurses in the hospital area when patients need aid in an emergency. This nurse calling device is different from the nurse caller that has been researched by previous researchers. This nurse caller uses wireless technology. so that the installation does not require a lot of cables.

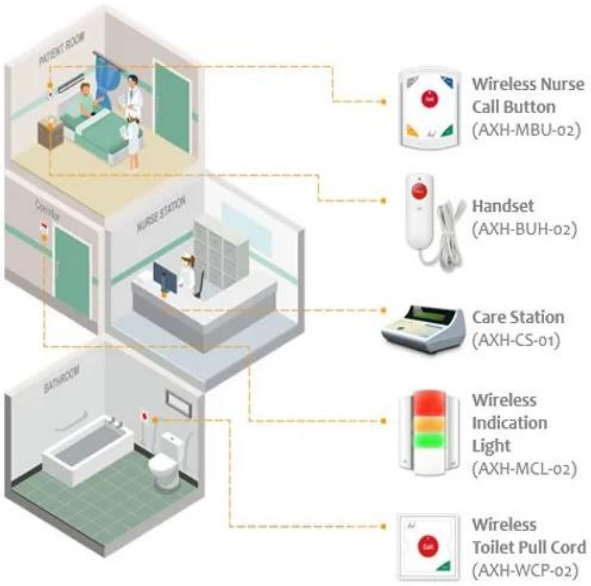

Fig.1: A Model of Wireless Nurse Calling System

II. METHODS/MATERIALS USED

2.1. Methods

First, when you press the call button, the Arduino microcontroller receives input from the button call sensor information, which is then processed by the Arduino microcontroller to be transmitted using the (HM-10) Bluetooth module to send a signal, and the signal is received by the receiver. The Bluetooth module (HM-10) is then processed by the Arduino microcontroller client to be displayed on the Liquid Crystal Display (LCD) in the form of a patient call, Light Emitting Diode (LED) and buzzer light up. Secondly, when the stop button is pressed, the Arduino microcontroller receives input from the button stop sensor information, then it is processed by the Arduino microcontroller to be emitted using the Bluetooth module (HM-10) to send a signal, and the signal is received by the (HM-10) Bluetooth module receiver, then processed by the Arduino microcontroller client to be displayed on the LCD in the form of stop call, LED off, and buzzer off [26, 27]. The ATMEGA8 microcontroller is used to process input information from the sensor button and then transmit it to the Bluetooth transmitter. Additionally, the LCD displayed the characters and numbers. The LED is used as an indicator and the buzzer as an alarming unit. When the stop button was pressed, the HM-10 Bluetooth transmitter [28] sent a signal, and it was received by the HM-10 Bluetooth receiver [29]. The characters or numbers on the LCD were deleted, and the LED indicator and buzzer alarm were turned off. From the implemented system, it can be seen that the program starts with register initialization, displays the display and waits for the call and stop button presses. When the call button is pressed, information is sent and received for an active call. When the stop button is pressed, information is sent and received for the deleted call. When the call is active, the LED lights up, and when the call is not active, the LED turns off. There are four buttons to call the nurse and four buttons to stop calling the nurse on the system. The nurse calling device operates on a 220-volt AC power supply and has a current safety. There are four indicator LEDs for each patient bed. When the patient in the bed first presses the nurse call button, the LED indicator for the first patient bed lights up. In addition to the LED indicator, there is a display in the form of an LCD to display patient status. The nurse calling device operates on a 220-volt AC power supply and has a current safety. The design of the power supply circuit used the Proteus application on the computer to create the module. This power supply circuit in this module served as a

voltage supply to all circuits that used direct current (DC) voltage. The working principle of the power supply was to change the alternating current (AC) voltage to a DC voltage by using a transformer as a voltage reducer and a diode as a voltage rectifier. In this module, the power supply changed the alternating current (AC) to direct current (DC) by using a regulator integrated circuit (IC) 7805. The 5-volt voltage produced was used to supply the minimum system. The minimum system circuit design uses applications on laptops. The application used in making this module is proteus software. The minimum system circuit in this module functions as the overall module work controller. The workings of the minimum circuit system utilize the storage capacity of an ATMega8 integrated circuit (IC). In this example, the ATMega8 IC is given a program that will control the module work system as a whole. The application program used in this module is CVAvr. From the design, it can be seen that the LCD display is connected to Port C on the microcontroller. For the receiving module connected with pins TX and RX the led indicator is connected to Port D. The nurse call button and the call stop button are connected to pin C on the microcontroller. Meanwhile, the transmitter module is connected to pin D of the microcontroller. System testing in the analysis of the test design, there are 2 parameters to be tested, namely: (1) Indoor testing: Place the testing device on the horizontal and vertical distances in the room to determine the distance that the wireless module in the room can travel. (2) Outdoors testing device on the horizontal and vertical distance outside the room to know the distance that can be traveled by the wireless module outside the room. Engineering wireless devices to call nurses using one receiver and one transmitter with an HM-10 Bluetooth module. On the transmitter there are four remotes that are connected with a call button and a stop button, so that one remote can be placed in each room/bed.

2.2. Materials used

The Transmitter:

When the switch is pressed, the voltage from the grid of the state electricity company (PLN) will enter the power supply to change the voltage to direct current. The minimum system circuit gets a 5-volt direct current voltage supply that enters the Bluetooth (HM-10) module, which will be processed for removal at the specified port. In this device, ports D0 and D1 are set as the outputs of the maximum system circuit that will be connected to the Bluetooth (HM-10) module. The outputs from ports D0 and D1 are used to activate the Bluetooth (HM-10) module, which functions as a wireless information sender. While on port B4, B5, C0, C1, C2, C3, C4, and C5 are set to activate buttons that function as call and stop buttons.

The Receiver:

When the switch is pressed, the voltage from the grid will enter the power supply to change the voltage to direct current. The minimum system circuit gets a 5-volt direct current voltage supply that enters the Bluetooth (HM-10) module, which will be processed for removal at the specified port. In this device, ports D0 and D1 are set as the outputs of the maximum system circuit that will be connected to the Bluetooth (HM-10) module. The outputs from ports D0 and D1 are used to activate the Bluetooth (HM-10) module, which functions as a receiver of information sent by the sending module. On ports C0, C1, C2, C3, C4, and C5 are set to activate the liquid crystal display (LCD), which functions as a room/bed number viewer that makes calls and stops calls. On port C6, is set as the output of the reset button, which functions to repeat or restart the program from scratch. On port D3, the output of the buzzer is set as an alarm when the call button is pressed. While on ports D4, D5, D6, and D7 are set to activate light emitting diodes (LEDs) that function as room/bed number viewers that make calls as well as LCDs, the difference is the appearance, because the LEDs only expose light, while the LCD displays character letters and numbers.

III. The cons of a wireless nurse call system

1. The hardware costs can be higher.
2. Device batteries need to be changed on a regular basis, often every one to two years [33].

IV. The benefits of adopting a wireless nurse call system

1. Instant communication and quicker response time

The wireless nurse call systems give patients access to timely care, especially in terrible situations where response time decides the odds in the battle of life and death. The wireless nurse call system alerts the medical staff and sends them the exact location of the patient that requires or needs medical attention. If the patient is wearing a wireless hand transmitter, then she or he can be found anywhere inside the care facility or hospital. an advanced mobile application for smartphones, which enables them to be informed and react even when they are not in the vicinity of the nurse's station. The iNurse mobile application is an advanced replacement for pagers or DECT phones. How so? Because it also enables nurses to see which personnel are currently working and allows them to make direct assistance calls without using a SIM card.

2. Relieving the personnel

Many hospitals still rely on paper documentation, which delays the process of patient admission, medical research, and diagnosis. Nevertheless, healthcare management can be optimized. With an intelligent wireless nurse call system, you can digitalize your healthcare administration and save all information inside a cloud database connected to the hospital network. That is not all! An IP nurse call system like Nurse Care allows medical personnel to store and access patient information instantly. The Nurse Tab, an interactive room touchscreen display, and the interactive corridor display Info Tab connect the nurse call system, the entire healthcare management system, and nursing documentation into one device. Nurses can store patient information and updates from inside a patient's room or the hallway. The latter eradicates the need to fill out documents, and it likewise prevents the loss of data or repetition of information. In most cases, this happens when the nurses transcribe handwritten data into electronic form.

3. Better workflow and fewer disturbances

Enhanced workflow cuts down on any potential losses, both in time, money, and knowledge. With an intelligent nurse call system, every piece of data is stored instantly, accessible with a simple touch, and transmitted among medical staff. Better communication leads to better decisions and better organization. It likewise helps lower the number of medical errors, which affects not only the hospital's budget but also its reputation. With nurse care, there are fewer disturbances in the healthcare process since it provides prompt and timely patient care. It helps nurses stay organized and keeps them focused on dealing with patient care, not distractions.

4. Fewer mistakes and cost-effectiveness

Monitoring technology benefits both the medical staff and the hospital management. Healthcare workers treat several patients throughout the day. In this process, data gets handed down many times, resulting in loss of data or even a medical error. With monitoring technology, such as Nurse Tab, healthcare processes are under constant supervision, guaranteeing patient safety. The Nurse Tab enables medical personnel to log (a) The personnel assigned to work in a specific patient room, (b) The time they will arrive and the time allotted (c). Nursing notes, (d) Services provided, (e) The patient's name in care. When you consider the long-term benefits and the initial cost, you realize that employing a wireless nurse call system pays off. Especially when you can connect it to your existing nurse call system and use the installation that is already in the building. You can personalize and select only those features that will benefit you the most.

5. Satisfied staff, satisfied patients

Satisfactory, attentive, and efficient patient care results in pleased and comfortable patients, who are likely to recover quicker. Wireless nurse call systems quicken the treatment processes, optimize workflow, and decrease the level of stress in hospitals and other caring facilities. These intelligent solutions are easy to use, which helps keep hospital tasks moving smoothly and efficiently [31].

CONCLUSION

The author concludes that employing a Bluetooth module to make a nurse call device will simplify installation and result in a neater end product after going through the process of creating, trying, testing, and gathering data. We needed a part that could use a microcontroller to calculate, recall, and make decisions in order to create these gadgets. It will be simpler for nurses to acquire information about the patient's room that is calling if the commands detected on the LCD and LED are displayed. We demonstrate that wind can alter the Bluetooth module's frequency, resulting in varying distance readings, based on measurements taken both horizontally and vertically outside the room. There is a discussion on the effects of installing the wireless nurse calling system [32]. The nurse call system's drawbacks are discussed.

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