ISSN: 2454-9940

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

E-Mail :
editor.ijasem@gmail.com
editor@ijasem.org

www.ijasem.org

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT

ISSN 2454-9940

www.ijasem.org

Vol 19, Issue 2, 2025

Internet of Things-Based Hospital Bed Vacancy Detection

[1]CH. SURYABABU,[2]RAYI LOKESH,[3]NAGULAPALLI DASARAD,

[4]TEKUMUDI NAGA SANJAY KUMAR,

[1] Professor, Department of ECE,Rajamahendri Institute of Engineering & Technology

[2,3,4]Student, Department of ECE,Rajamahendri Institute of Engineering & Technology

ABSTRACT:

In times of medical crisis or global epidemic, hospital bed management becomes even more important. Slow patient admissions, wasteful use of hospital resources, and overcrowding are all consequences of an ineffective system for detecting when beds become available. We provide an Internet of Things (IoT)-based automated bed vacancy detection system that uses infrared (IR) sensors, IoT technology, and a buzzer alarm mechanism to solve this problem and increase healthcare efficiency by streamlining hospital bed allocation.
With the use of an infrared sensor, medical facilities can accurately monitor the occupancy status of each bed in real time, regardless of whether a patient is on it or not. Hospital managers can remotely monitor bed availability and update records in real-time thanks to data provided via IoT technology to a centralized cloud-based system. Incorporating a buzzer alarm into the system ensures effective turnover by immediately alerting personnel when a patient leaves a bed, giving them enough time to prepare for the next patient.
Patients will be able to locate available beds more rapidly, and the system will increase the efficiency of hospital administration while decreasing the need for human monitoring. Patients, medical professionals, and first responders may get up-to-the-minute information on hospital occupancy using a web dashboard that is built on the internet of things. Automated bed vacancy identification and management in hospitals is now possible with the help of the suggested system, which is scalable, accurate, and inexpensive.

Introduction

The IoT, or Internet of Things, is now an integral part of contemporary human civilization. Its impact on the environment and human life is far-reaching. [4] The healthcare industry's digital transformation has propelled it to the forefront of its field. A great deal of impact is produced by the merging of the digital domain with IoT technology. The term "Internet of Things" (IoT) describes a network of networked physical items that allow for the automatic and worldwide interchange of data and communication beyond physical boundaries. Electronic actuators, software, sensors, tools, and machines all work together in what is known as the Internet of Things (IoT) to enable data flow between different locations over the internet. [2] Finding empty hospital beds and dispersing patient information are two of the biggest obstacles. Neither the public nor the government has found a solution to this issue in any of the available market systems. Consequently, we will provide a solution that addresses this issue for both public-level regular people and hospital administrators. In this study, we suggest using the internet of things to create a system that can automatically recognize whether a bed is empty. It will be useful in resolving the issue mentioned before. During the COVID-19 epidemic, there wasn't a way to make sure that patients could get into beds that had the right equipment. On regular days and during crises, this approach is helpful.

Literature review

In their paper titled "Designing and testing a laser-based vibratory sensor,"Gnath et al. suggested the parameters that should be examined and evaluated using this kind of sensor. A better understanding of the range of these sensors was also provided by this study. Our laser work's boundary conditions were informed by these factors. These limits might be widened and the bed monitoring system could be enhanced in future studies.

In their paper titled "Internet of Things-Based Laser-Inscribed Sensors for Detection of Sulfate in Water Bodies," Shan He, Shilun Feng, and others have put up the idea of using lasers. We included this work into the sensor interface for the hospital's Wi-Fi and internet infrastructure. For the best-case scenario, we have computed laser-based sensors. The need of ports

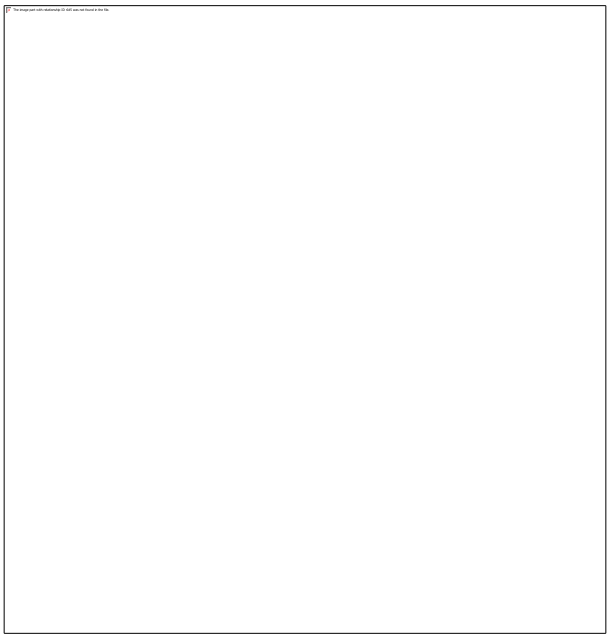
ISSN 2454-9940

www.ijasem.org

Vol 19, Issue 2, 2025

for connecting to the internet will be bolstered by this study.

Methodology



Block diagram

Working

To provide real-time monitoring of bed occupancy and automated notifications, the proposed Internet of Things (IoT) system incorporates infrared (IR) sensors, Internet of Things (IoT) connection, and a buzzer. The infrared sensor can tell whether a bed is in use or not by looking for motion. As soon as a patient gets out of bed, the system sounds an alarm to let the medical staff know it's time to clean the bed and be ready for the next patient.
A online dashboard or mobile app allows hospital managers, physicians, and emergency responders to get real-time updates on patient beds thanks to the Internet of Things module's transmission of data to a cloud-based hospital administration system. Because of this, hospital personnel can more rapidly assign beds to arriving patients and lessen the need for human verification.Important aspects of the suggested system comprise:

Bed occupancy and vacancy detection with infrared sensors. Internet of Things (IoT)-enabled cloud connection for remote monitoring in real-time A buzzer alarm system that notifies personnel the moment a bed is emptied.
Displays the availability of hospital beds via automated online dashboard updates.
A contemporary healthcare facility can use this solution since it is both scalable and affordable. By providing precise, real-time bed monitoring, this technology greatly improves healthcare administration, cuts down on patient wait times, and increases hospital efficiency.

Arduino uno

A microcontroller board based on the Atmega328, the Arduino Uno is described in the datasheet. A 16 MHz crystal oscillator, 6 analogue inputs, 14 digital input/output pins (including 6 PWM outputs), 1 USB port, 1 power connector, 1 ICSP header, and 1 reset button are all part of it. All you need is a USB cable, an AC-to-DC converter, or a battery to get it going; it comes with everything you need to support the microcontroller.
Because it forgoes the FTDI USB-to-serial driver chip, the Uno stands apart from all previous boards. In its place, you'll find the Atmega8U2 configured to convert USB to serial. "Uno" signifies "One" in Italian and is chosen to commemorate the impending release of Arduino 1.0. Going forward, the Uno and version 1.0 will serve as the reference versions of Arduino. See the index of Arduino boards for a comparison with earlier generations; the Uno is the newest in a series of USB Arduino boards and the platform's standard model.
The USB port or an external power source are both viable options for powering the Arduino Uno. It chooses the power source mechanically. You may use a battery or an AC-to-DC converter (wall-wart) to power it from the outside (not via USB). It is possible to attach the adapter by inserting a 2.1mm center-positive connector into the power port on the board. The POWER connector's Gnd and Vin pin headers are suitable for inserting battery leads. The board is compatible with power sources ranging from 6 to 20 volts. But if the voltage is lower than 7V, the 5V pin could not give 5V and the board might become unstable. The voltage regulator might become too hot and ruin the board if you use more than 12V. A voltage range of 7 to 12 volts is suggested.

INTERNATIONAL JOURNAL OF APPLIED SCIENCE ENGINEERING AND MANAGEMENT
ISSN 2454-9940
www.ijasem.org
Vol 19, Issue 2, 2025

LIQUID CRYSTAL DISPLAY

In front of a light source or reflector, a thin, flat display device called a liquid crystal display (LCD) arrays a large number of color or monochrome pixels. Pile of liquid crystal molecules held aloft by two transparent electrodes and two polarizing filters, whose polarity axes orthogonal to one another, make up each pixel. If there weren't liquid crystals interposed, one would block the other from light. Light that enters one filter is able to pass through the other because the liquid crystal bends its polarity.

A program's ability to communicate with the outside world depends on its input and output devices, which in turn rely on human communication. An LCD display is a typical accessory for controllers. The 16x1, 16x2, and 20x2 LCDs are among the most popular types of displays that are attached to the controllers. This equates to sixteen characters on a single line. The first set has 16 characters on each line while the second set has 20 characters on each line.

BUZZER

In a magnetic transducer, the circuitry includes an iron core, a yoke plate, a wound coil, a permanent magnet, and a vibrating diaphragm that can be moved. The magnet's field gently draws the diaphragm up nearer the core's surface. A positive alternating current (AC) signal causes the diaphragm to move up and down, which in turn vibrates the air. This is achieved by the current passing through the excitation coil, which forms a fluctuating magnetic field. A resonator, which is composed of a cavity and one or more sound holes, may amplify vibrations in order to generate a loud sound.

ESP8266 Wi-Fi Module

This project revolves on this. The module plays a crucial role in the project as it is centered on WIFI control of appliances. A low-cost Wi-Fi chip with full TCP/IP capability, the ESP8266 Arduino compatible module has an amazing built-in MCU (Micro Controller Unit) that allows you to control I/O digital pins using a simple programming language that is almost pseudo-code like. The Chinese company Es press if Systems is situated in Shanghai and makes this gadget. In August 2014, this chip made its debut in the ESP-01 version module manufactured by the third-party company AIThinker. The MCU can establish basic TCP/IP connections and connect to WiFi networks with the help of this little module. In his Many hackers and tech enthusiasts were interested in exploring and using it for a wide range of projects because to its tiny size and very inexpensive pricing (1.7$ to 3.5$). Since it has been so successful, Espressif has released other variants with varying proportions and technological specs. Among the following is the ESP32. Numerous projects and applications, such as home automation, may be found online.

RELAYS

Many household and commercial equipment, as well as industrial control systems, make use of electrically controlled switches called relays. By using a relay, two independent voltage sources may be isolated from one another; in other words, a little quantity of voltage or current on one side can manage a big amount of current or voltage on the other side, and vice versa.

SOFTWARES

The Arduino platform is an open-source, user-friendly hardware and software environment for prototyping. It is comprised of a programmable circuit board (also called a microcontroller) and an Integrated Development Environment (IDE) called Arduino that is pre-made for writing and uploading code to the physical board.The main characteristics are:

• Many sensors can send signals in digital or analog formats to Arduino boards, which may then be used to activate motors, control LEDs, establish connections to the cloud, and much more.
• The Arduino IDE (also called "uploading software") allows you to command your board's operations by communicating with the microcontroller on the board. • A separate device, known as a programmer, is not required to load fresh code into an Arduino board, in contrast to most prior programmable circuit boards. The usage of a USB connection is all that is required. • The Arduino IDE employs a streamlined version of C++, which facilitates programming learning. Last but not least, Arduino offers a standardized form factor that simplifies the microcontroller's tasks.

Now that we know what the Arduino UNO board is and how it works, we can go on to setting up the Arduino IDE. As soon as we figure this out, we can upload our software to the Arduino board.

CONCLUSION

A clever, dependable, and real-time solution for hospital bed management is the autonomous bed vacancy detection system that is based on the Internet of Things. The system utilizes infrared sensors, internet of things (IoT) technology, and a buzzer alarm system to do away with manual bed monitoring, which speeds up patient admission, reduces staff burden, and makes better use of hospital resources.

This technology ensures that hospitals can react swiftly to changes in bed availability using real-time IoT-based monitoring and automatic warnings, unlike traditional ways of hospital bed management. With the buzzer system's fast alerts, employees may respond quickly, further improving efficiency. Better healthcare service delivery might be achieved in the future via integration with emergency medical response systems, automated hospital resource management, and predictive bed allocation based on artificial intelligence. Hospitals will be able to better manage patient admissions with this simple, scalable, and inexpensive system, which will improve both patient care and hospital operations.

REFERENCES

[1]. Smart Emergency Management with IoT for Integration of Emergency Centres and Patients, (G.N. Keshava Murthy), International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878 (Online), Volume-8 Issue-4, November 2019

[2]. Automatic Bed Tracking System in hospitals using IoT, (Arjun M SRM Alumnus), International Journal of Engineering Research & Technology (IJERT) http://www.ijert.org IJERTV10IS120216 (This work is licensed under a Creative Commons Attribution 4.0 International License.) 10 Issue 12, December-2021

[3]. International Journal of Research in Engineering and Science (IJRES) ISSN (Online): 2320-9364, ISSN (Print): 2320-9356 www.ijres.org Volume 9 Issue 8 ǁ 2021 ǁ PP. 68-72 www.ijres.org 68 | Page IoT Based Bus Seats Vacancy Unit for Roadways SMART BUS: SEAT OCCUPANCY DETECTION SYSTEM

[4]. International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075 (Online), Volume-10 Issue-8, June 2021 IoT Based Automatic Seat Vacancy Detection in Travel Buses using Cloud Database M. Venkatesh, R. Rashia Suba Shree

[5]. Majumder, M., Sinha, P. J., &Vedanarayanan, V. (Year of Publication). Autonomous Remote Controlled Smart Bed for Hospitals.

[6]. Mrinai M. Dhanvijay, Shailaja C. Patil, "Internet of Things: A survey of enabling technologies in healthcare and its applications", Computer Networks 153, pp.113– 131,2019.

[7]. Subarnarekha Ghosal, Shalini Chaturvedi, Akshay Taywade-Android Application for Ticket Booking and Ticket Checking in Suburban Railays, Volume 8, Supplementary 2 January 2015 (IJST), DOI: 10.17485/ijst/2015/v8iS2/60291.

[8]. Kirti Dhiman, Er. C. K. Raina, “IoT Based Ticket Checking System”, International Journal of Advanced Research in Computer and Communication Engineering (IJARCCE), ISO 3297:2007 Certified, Volume 6, Issue 3, March 2017. p. 916-919.

[9]. P.P. Ray, "A survey on Internet of Things architectures", Journal of King Saud University – Computer and Information Science 30, pp.291–319, 2018

[10]. Rj.M. Gomathi, G. Hari Satya Krishnan, E.Brumancia, Y. Mistica Dhas, "A Survey on IoT Technologies, Evolution and Architecture", 2nd International Conference on Computer, Communication, and Signal Processing ICCCSP,2018

[11]. Gnath proposed in their work titled “Designing and testing a laser based vibratory sensor” in IOP science in March 2018, Vol 28, No. 4.

[12]. Shan He, Shilun Feng, and et-al have proposed in their work titled “IoT-Based Laser-Inscribed Sensors for Detection of Sulphate in Water Bodies” on Dec 22,2020 in IEEE Open Access, Vol – 8. [3]

[13]. Dekui LV, Xiaxin Yang, and et-al has proposed in their work titled “Research on the technology of LIDAR data processing” About LIDAR. This work has used this paper to understand the use of LIDAR technology in medical space