Application for Bed Vacancy Detection and Provide Real Time Data of ICU Patient to Their Relatives

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Abstract*: An efficient bed availability tracking system is necessary. In India, the availability of beds in hospitals is a big problem. Many times, people face issues related to the availability of many things. Whether it pertains to sleeping arrangements, seating options, or any other type of physical location, this has been perceived as a challenge by our team. This project aims to develop a system using IoT and the Web. That would be able to detect the availability of beds. It will not only be beneficial for the person who is looking for a bed but also for the hospital administration to manage and distribute it in a well mannered way. The condition of bed availability in India is very poor. People look for treatment for many days. This situation in rural areas has even worsened, where many people die due to a lack of proper treatment and ignorance by the hospital. If they can book a bed from their place in advance, then it will be best for people and hospitals. And this is also beneficial for hospitals, as they can extend the beds for emergencies. We completed this project with the help of a sensor (an IR sensor) to detect the presence of a person, Arduino as the heart of the system, and different kinds of IoT devices.*

Keywords: IoT devices

I. INTRODUCTION

In today's fast-paced world, the efficient management of bed vacancies is crucial across various sectors, including hospitality, healthcare, and residential care. Bed vacancy refers to the unoccupied spaces available for guests or patients and is a critical metric for operational efficiency and revenue optimization. For hotels and lodging facilities, maintaining an optimal occupancy rate is vital for profitability, as empty rooms represent lost revenue opportunities. In health care settings, particularly hospitals and nursing homes, bed vacancy management is essential to ensure patient care, resource allocation, and emergency preparedness. Improved Patient Care A patient tracking app allows healthcare providers to closely monitor patient progress, ensuring timely interventions and better treatment outcomes. It helps in keeping track of medications, follow-up appointments, and patient health metrics, which can enhance personalized care. Real-Time Monitoring Patients with chronic conditions or post-surgery recovery can be monitored in real-time. The app can collect and display important data like heart rate, blood pressure, glucose levels, and more, helping healthcare professionals identify any abnormalities and act quickly. Enhanced Communication It improves communication between patients and healthcare providers. Patients can send updates or queries, while health care providers can share feedback or reminders about treatments and appointments, ensuring both sides are always aligned.

OBJECTIVES

- To enable hospitals to update bed availability in real time.
- To provide a secure login system for patient relatives to monitor health data. To integrate with medical devices for real-time health data collection.
- To enhance the transparency and efficiency of hospital resource management.

II. LITERATURE REFERENCES

- IoT-Based Automatic Bed Vacancy Detection: A system using IoT, IR sensors, and Arduino to track bed availability in hospitals, helping patients find beds and allowing hospitals to manage bed allocation more efficiently.

- Hybrid BCI for Patients with Disorders of Consciousness: A brain-computer interface (BCI) combining EEG and eye-tracking to assist in communication for patients with disorders of consciousness, using neural networks to detect responses like P300 potentials and eye movements.

- Body Posture Determination for Heart Failure Patients: A wearable device that monitors heart failure patients by tracking body posture and activity using sensors, helping physicians assess patient health remotely and continuously.

- Healthy Lungs: COVID-19 Lung Monitoring: A mobile app that continuously monitors lung function in COVID-19 patients using wireless devices, allowing doctors to remotely track oxygen levels and other vital lung parameters.

- IoT-Based COVID-19 Patient Monitoring: An IoT system that monitors COVID-19 patients' health using wearable devices, tracking vital signs like temperature and respiration, with data stored in the cloud for efficient monitoring.

- Non-Contact Control System for Disabled Patients: A system using EEG signals to allow limb- disabled patients to control hospital equipment (e.g., nurse call, lights) by focusing on visual icons, improving independence in hospital settings

- Secure Monitoring of Patients with Wandering Behavior: A system that uses WLAN, SDN, and wearable devices to securely monitor dementia patients with wandering tendencies, ensuring safety and compliance with hospital policies.

- Seizure-Cluster-Inception CNN (SciCNN): A patient-independent epilepsy monitoring system that uses a CNN-based neural processor to track seizures without patient-specific training, improving epilepsymanagement with real-time detection.

- SIM-PFED: Emergency Department Patient Flow Simulation: A simulation model to optimize patient flow in emergency departments, reducing patient wait times and length of stay through improved decision-making processes.

- COVID-19 Social Interaction Tracking and Prediction: A BLE and GPS-based system that tracks social interactions and predicts COVID-19 infection risks, using algorithms to promote isolation and slow virus spread.

III. SYSTEM ARCHITECTURE

This system architecture diagram illustrates a healthcare platform designed to manage bed availability and monitor patient health data, with secure access for different types of users. The system is divided into several key components. The **Security** module ensures secure communication and data storage through a secure API and database, protecting sensitive information such as bed availability and patient health data. The **Bed Availability Management** component allows regular users, such as patients or family members, to check available hospital beds, while hospital authorities are responsible for updating bed information to keep the system current. Both functions rely on secure access to the underlying database. The **Patient Health Data Monitoring** module focuses on the ICU, enabling authorized users, such as healthcare providers or relatives, to access real-time health data, including vital statistics like heart rate and ECG readings. This data is consolidated for easy viewing, helping users monitor patient conditions. The diagram also shows different user roles: **Regular Users** have limited access to bed availability, **Hospital Authorities** manage bed data and patient records, and **Patient Relatives** can view select health data. Overall, the system ensures secure, role-based access to hospital resources and patient information, supporting both operational efficiency and patient care.
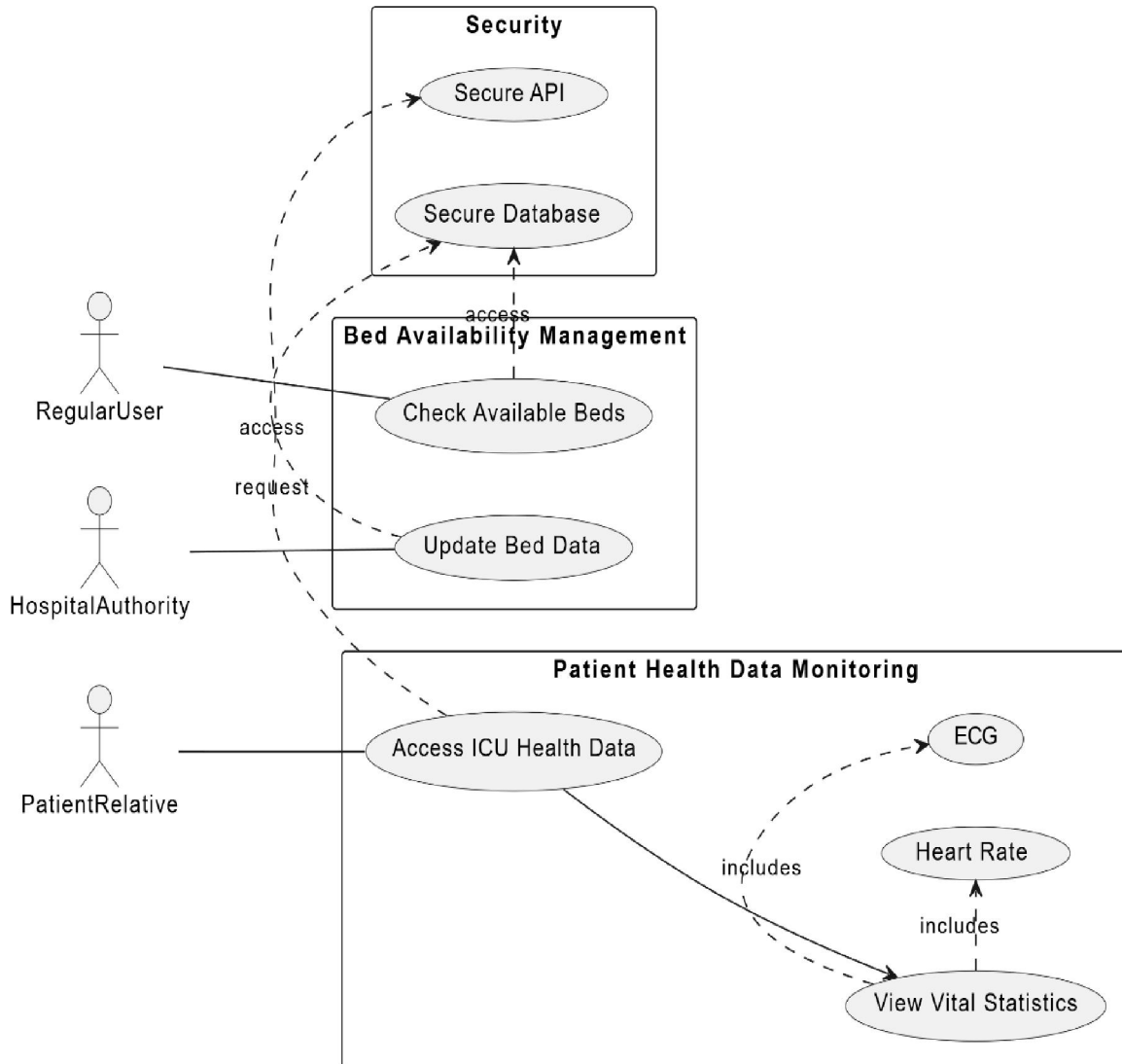
Figure 1. System Architecture

IV. APPLICATIONS

- How many beds are required at different stages of the pandemic?
- How to optimize the use of available resources (beds, staff, and equipment)?
- What is the impact of different admission policies (e.g., threshold for ICU admission) on resource utilization?
- Mild cases (require ward beds) Severe cases (require ICU beds) Recovered or deceased

V. ADVANTAGES

- The system offers significant advantages in healthcare management. By providing real- time bed availability, it allows hospitals to manage their resources more efficiently, ensuring patients can find beds faster.
- Remote health monitoring capabilities enable patient relatives to access critical ICU data, such as heart rate and ECG, keeping them informed about their loved ones' condition without needing to visit the hospital. This not only reduces the burden on healthcare facilities but also improves patient care by giving providers accurate, real-time information.

- The mobile-based platform offers users the convenience of accessing vital healthcare information from anywhere, enhancing the overall patient experience.
- Additionally, the availability of timely and accurate data aids both hospital authorities and patient families in making quicker, well-informed decisions regarding care and resource allocation.

VI. CONCLUSION

This application proposes a real-time bed vacancy detection system for hospitals, utilizing IoT sensors and cloud-based analytics. By providing accurate and timely information on bed availability, this system aims to improve operational efficiency, reduce patient wait times, and enhance overall patient satisfaction.

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