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Life Slot - Emergency Ward Booking

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Abstract: ***LifeSlot is an emergency ward booking system that assists patients and their attendants in locating hospitals with available emergency beds and booking requests. In case of emergencies patients and their attendants are usually unable to locate hospitals that have beds which leads to delay in treatment. The proposed system provides a platform where users can register, log in ,search for nearby hospitals, view emergency ward and bed availability, choose a suitable hospital and ward and submit booking requests. administrator in the hospitals can update bed. often struggle to locate hospitals that have beds, which can delay medical care. The proposed system offers a platform where users can register log in search nearby hospitals view emergency ward and bed availability choose an appropriate hospital and ward and submit a booking request. Hospital administrators can update bed availability manage bookings and keep patient and hospital records. The system comprises of user interface for patients and hospital personnel, a backend for processing requests and bookings and a database that will store information relating to hospital, ward, bed and booking information. The goal of the system is to reduce the time spent searching for emergency wards and to organize the process of emergency bed booking. The system could be devoloped using HTML, CSS and JavaScript for the frontend, a backend framework such as Node.js and Express.js and MySQL for database management system.***

Keywords: Emergency Ward, Hospital Bed Availability, Emergency Booking, Healthcare Management, Hospital Management System, Web Application.

I. INTRODUCTION

In emergency medical situations there is the need for access to healthcare facilities. One of the main issues patients and their attendants face in emergencies is how to get access to hospitals that have beds. At times people may have to call hospitals one by one or move from one hospital to another trying to establish if an emergency ward or bed is available. This is quite tedious and consumes a lot of time. LifeSlot is an emergency ward booking system which will provide a platform to search hospitals and book emergency ward. The system allows users to register and log-in, search for hospitals, view hospital ward availability, select and book using required patient and booking information. it is responsibility of the hospital administrators to keep track of ward availability and booking records. The system is designed to improve the efficiency of searching and requesting of the emergency ward but not to substitute emergency medical service and decision making.

A. Overview

LifeSlot is a platform for connecting users with hospitals having available emergency ward beds. The user makes his/her account, Logs-in. Then he/she can search hospitals and their ward availability. When selecting hospital with available ward the user submits required patient and booking data. Hospital staff can update ward availability, manage booking requests and record all necessary booking information. When the booking request is completed, user receives booking information via the system.

B. Existing Methods

In Current situation patients or their attendants decide on hospital bed availability by contacting hospital personally, visiting hospitals, checking hospital websites or asking other people. In case this information is not provided via a single centralized platform.

Limitations :

1) No Availability Platform: Users may have to reach out to the different hospitals independently.
2) Time-consuming availability checking: Calls/visits to the hospitals may take up time.
3) Lack of Real-time visibility: Availability of the bed may not be accessible to users in real-time.
4) Manual booking: Emergency ward requests may require communication between the users and the hospitals.
5) Comparison of the hospitals: Users may lack an interface, for viewing the options of the hospitals.

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6) Booking tracking: Users may find it difficult to keep a track of their requests.
7) Availability management: Hospital staffs may have to update and communicate the availability by conventional means.
8) Scattered Record: Patient booking record may be kept separately in different processes.

The sample paper also mentions the lack of centralized management, manual processing, delays in the systems, poor request tracking, and poor communication as the key limitations of the traditional system.

C. Main Contribution

The main contribution of Life Slot is the provision of a centralised web-based platform for emergency ward availability and booking. It incorporates the hospital search, emergency ward availability, booking requests and booking management on one platform.

The key contributions are:

One interface for searching hospitals.
Show the ER ward availability and number of beds.
Let users to submit an emergency ward booking request.
Let hospital administrators manage the availability.
Maintaining the booking and patient's records in the database.
Let users to track the status of their booking requests.
Reduce the of manual effort to check hospital availability.

D. Paper Organisation

The rest of the paper is organised as follows. Section II discusses the related works in the areas of hospital bed management, emergency patient flow, healthcare booking and hospital scheduling systems. Section III describes the proposed LifeSlot methodology including the system architecture and the booking algorithms. Section IV shows the results and discussion of the proposed system, including the system performance and the evaluation criteria. Section V consists of the references used in this work.

II. RELATED WORKS

Hospital Bed Management Systems – Ren et al. introduced a hospital bed centre management information system which is based on a Hospital Information System (HIS). The goal was to manage the hospital bed resources and to incorporate bed related information into the hospital information environment. The paper demonstrates the value of centralised management of hospital bed resources, but the system is mainly focused on the internal management of hospital beds as opposed to enabling patients to look up hospitals and request an emergency ward booking.[1]

Emergency Patient Admission Prediction - El-Bouri et al. presented a deep learning framework for predicting an emergency patient admission location after triage. The system involved various ward types and its main objective was to facilitate bed space preparations and hospital resources allocations. According to the findings, the ability to predict the required admission location has great potential in terms of managing the flow of emergency patients and in planning hospital resources. It is basically a prediction system that doesn't offer the user the capability to find out what beds are available and book into a ward.[2]

Emergency Department Patient Flow – In this search by Tan et al., patient flow in hospital emergency departments was analyzed using the dynamic priority queue. The emergency department was modeled as a time-varying queue, while dynamic prioritization was utilized for improvement of the patient flow. The findings indicated that this approach leads to reducing the length of patient stays and improving emergency department patient flow. This study mainly focused on the queue management in the ED and not online booking for emergency wards.[3]

Emergency Department Patient Flow Forecasting (Zhang et al.) is concerned with studying the application of a Markov-chain approach for forecasting emergency department patient flow. Forecasting techniques are valuable to a hospital in the sense of anticipating and planning for changes in the level of demand from patients using emergency departments. The process of forecasting patient flow does not provide the user with any information about bed availability or online emergency ward booking.[4]

Online Medical Appointment Management – Odeh et al. designed the 'Mwa3edk' intelligent software system for managing medical appointments. The system puts together the traditional process of making appointments into an online process where the user can browse through various doctors available and pick one who fits their schedule. This system also offers recommendations based on symptoms. Neveretheless, this system focuses more on doctor appointments than emergency ward booking.[5]

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Online Appointment Booking System: Akshay et al. created an online appointment booking system which demonstrates the use of digital technologies in the booking process. This system cuts the dependence on the traditional method of booking appointments and helps the user to perform the booking procedure online. However, It should not be noted that appointment booking does not entail booking of an emergency ward bed whereby the availability and capacity of beds in real-time matters.[6]

Smart Queue Management in Hospitals – In their study, Soman et al. introduced a mobile-enhanced smart queue management system in hospitals. The paper focuses on patient queue management through smart means. Although queue management strategies have been useful in dealing with the problem of wait times, they do not address the problem of identifying the availability of beds in emergency wards.[7] Automated Healthcare Appointment Booking – Suryavanshi et al. suggest an automated approach towards healthcare appointment booking. It describes how the process of healthcare appointment booking can be automated in order to minimize manual procedures. Although the approach is purely related to appointment booking, It does not concern patient allocation to patients to emergency wards on availability of beds.[8]

Hospital Scheduling System – Musa et al. investigated hospital scheduling systems and the problems, of resource allocation, scheduling, technology integration, scalability, and practical implementation of such systems. As they state, in some scheduling systems emergency situations are not taken into consideration properly. Once again this raises the need of the necessity of implementing systems taking emergency needs into consideration in the process of resource management.[9]

Smart Healthcare Access System – Maddhi et al. introduce a new generation healthcare access system that will increase the access to patient care through technology. Undoubtedly these systems have great potential to facilitate access to care and the management of patient care. However, the specific problem addressed by LifeSlot still needs a special mechanism for searching the hospitals availability of emergency wards and ward booking.[10]

III. PROPOSED METHODOLOGY

LifeSlot is a centralized web-based application where users can search for hospitals, check the availability of emergency ward and make a booking request. Hospital administrators can use management interface of the application to manage information about hospital, wars, bed and bookings.

The entire process works in the following way:

1) User Registration and Authentication.
2) Hospital search.
3) Availability of emergency ward.
4) Selection of hospital and ward.
5) Request for booking submittion.
6) Verification of availability.
7) Confirmation/Rejection of booking.
8) Update booking status.
9) Maintenance of database records.

The basic logic behind the booking process is:

B = f(U, H, W, A)
B = Booking Status
U = User/Patient Information
H = Selected Hospital
W = Selected Emergency Ward
A = Available beds

A booking process requires at least one bed to be available in the selected ward.

A. *Architecture Diagram:*



Fig.1 Architecture Diagram

Fig 1. LifeSlot consists of three major layers: the User Layer, the Application Layer and the Database Layer.

1) User Layer: Users will be able to register, log in, search for hospitals, check ward availability and place a booking request. The administrators of the hospital information, bed availability and approve or disapprove the booking.

2) Application Layer: This layer is made up of Node.js and Express.js and works on the requests made by the user. This layer takes care of login, search for a hospital, checking ward availability, bookings and status of the booking.

3) Database layer: MySQL contains user information, ward information, bed availability and booking information.

The user layer communicates with the application layer and the latter either fetches or updates the information in the database. This is how the system of booking of wards and hospital bed availabilityis managed.

B. Algorithm

Algorithm – Emergency Ward Booking

Step	Action
1	Register / Login
2	Search Hospitals
3	View Ward Availability
4	Select Hospital & Ward
5	Enter Patient Details
6	Submit Booking Request
7	Verify Availability
8	Create Booking (if available)
9	Update Status
10	End

Table 1: Algoritm

The Emergency Ward Booking Algorithm is initiated when the patient registers and logs in to the LifeSlot system. After that, he will be able to search for the hospitals around him and the availability of emergency ward and bed space. After choosing the particular hospital and ward which he wants, he will enter his details and submit the booking request. The system will confirm the booking and save the information in the database. In case the bed is not available, the system will notify the patient about the same. After that, the system will update the booking status and display it to the patient.

IV. RESULT AND DISCUSSIONS

The LifeSlot system is a web-based emergency ward booking system that is meant to ease the hospital search and emergency bed booking process. The system allows the user to register, login, view the list of hospitals, check the availability of emergency ward in those hospitals, make a booking request and monitor the status of the booking request. The hospital administrators are able to see the booking requests and update the availability of the wards through the system. The performance of the system was tested by running tests on all the major modules of the system (registration, login authentication, hospital search, ward availability, booking processing, status tracking and admin ward availability update). The success rate of each module was measured in terms of the test cases that were successful. These results are shown in Table II which gives the functional performance of the proposed LifeSlot system. The LifeSlot application makes use of Node.js and Express. It uses requests to communicate with the MySQL database. It can be used to search for hospitals, check the availability of beds in the emergency wards, process booking requests, and update the booking status. The main aim of the application is to make booking in emergency wards easy and reduce the efforts in finding a bed.

A. Result

Result

Module	Test Cases	Success Rate
Registration	10	100%
Login	10	100%
Hospital Search	10	90%
Ward Availability	10	90%
Booking	10	90%
Status Tracking	10	90%
Admin Update	10	100%

Table 2: Result

The performance of the system has been measured by the number of test cases and the success rate of each module. The Registration, Login and Admin Update modules were all the most successful with a success rate of 100%. The Hospital Search, Ward Availability, Booking and Status Tracking modules were all successful at a 90% success rate. Every module was tested with 10 test cases and it is very clear that the majority of the system works well. The modules with the 90% success rate will have to be improved in order for performance and reliability of the system to be taken to the next level.

From the above analysis, it is clear that the system performs well in all of its modules. Out of the 70 test cases done on all the 7 modules, 66 were successful which gives an overall success rate of around 94.3%. The Registration, Login and Admin Update modules all perform successfully, the other modules are also performing pretty well and only require a little tweaking.

B. Graph

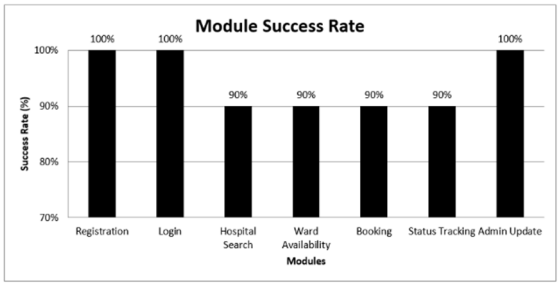


Fig 2: Graph of life slot

The performance graph indicates the success rate of the different modules in the LifeSlot Emergency Ward Booking System. There are various modules in the LifeSlot Emergency Ward Booking System which include: registration module, login authentication module, hospital search module, ward availability module, booking module, status update module and admin availability update module. This graph represents the performance of these different modules in performing their specific tasks.

The graph above shows that registration, login and admin update are at 100% success rate while hospital search, ward availability, booking process and status have 90% success rate each. Thus, it can be seen that auth and admin modules performed well during the test while the other modules also did well.

In general, this graph indicates the performance of the LifeSlot system. It seems that it can perform tasks like hospital search, checking of the availability of the emergency ward, booking request and status management. More testing and improvement of the modules with 90% success rate will definitely improve its performance.

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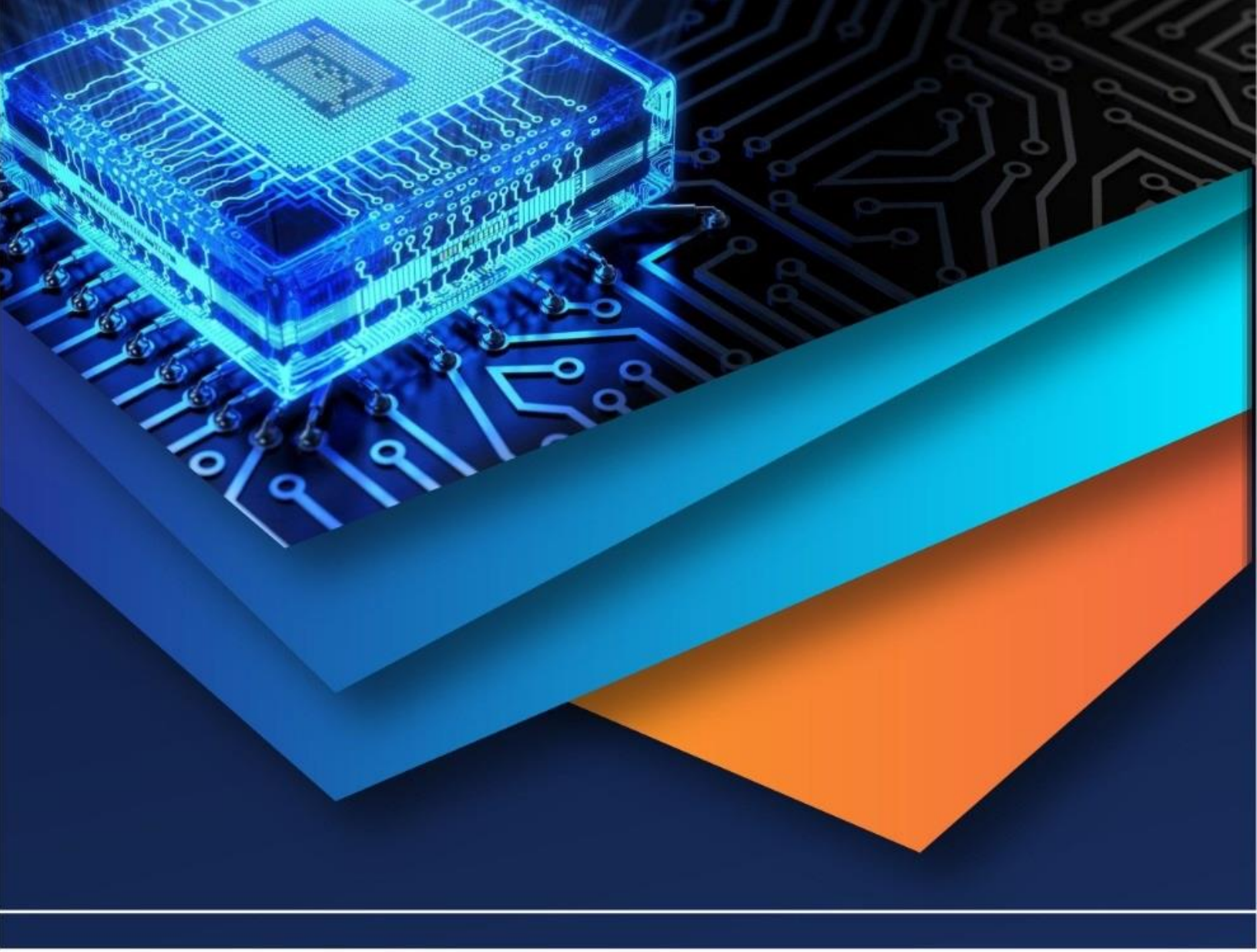
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