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Real-Time Patient Appointment Scheduling for Efficient Patient Management in Hospitals

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Abstract: *This project focuses on the integration of digital technologies and Artificial Intelligence (AI) to improve doctor availability and streamline appointment allocation in hospital settings. By harnessing AI algorithms, predictive analytics, and smart scheduling systems, this initiative aims to address the challenges associated with patient appointment management, ultimately enhancing the patient experience and optimizing resource utilization. By combining digital technologies and AI, our project seeks to streamline hospital operations, especially during the emergency patients do not have to wait for long hours since further delaying treatment could exacerbate the symptoms and lead to a longer recovery period, long-term disability, or death.*

Keywords: Artificial Intelligence (AI), Healthcare, Application Programming Interface (API), Optimization

I. INTRODUCTION

In today's dynamic and fast-paced world, healthcare accessibility and efficiency have become paramount. The traditional process of scheduling doctor appointments, coupled with the challenges of navigating healthcare facilities, often results in frustration and delays for both patients and healthcare providers. It is against this backdrop that our Rakshak : Doctor Appointment Scheduler with Advanced Navigator has emerged. We are driven by the belief that healthcare should be accessible, convenient, and patient-centered. Our platform seeks to eliminate the barriers that hinder this vision. By simplifying appointment scheduling and integrating an advanced navigation system, we aim to empower patients to take control of their healthcare journey, reduce wait times, and make navigating healthcare facilities a seamless process. Moreover, we recognize that the healthcare industry is embracing technology to enhance efficiency and improve patient care, and we are determined to be at the forefront of this transformation. The ongoing global health challenges have further underscored the urgency for innovative solutions that make healthcare more adaptable and resilient. With our application, we aim to bring this vision to life, setting new standards in the healthcare industry and ensuring that every patient's journey is as smooth and patient-centric as possible.

II. LITERATURE REVIEW

Malik, Shafaq & Bibi, Nargis & Khan [1] introduces "Mr. Doc: A Doctor Appointment Application System," an Android-based platform designed to simplify the process of scheduling doctor appointments for patients. The system includes modules for patients to register, view doctor and hospital details, request appointments, and receive notifications, as well as an admin module for managing doctor and appointment information. Limitations of the system may include reliance on internet connectivity, limited functionality, security concerns, and potential user adoption challenges.

[2] introduced an NFC-based mobile patient appointment system to streamline healthcare processes. Despite its innovative approach, the study falls short in detailed analysis, empirical support, generalizability, and future research directions. Further validation and development are necessary to address these limitations and enhance the effectiveness and applicability of the proposed solution in real-world healthcare settings.

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The Health Portal Android Smarter Healthcare Application, developed by S.Gavaskar, Sumithra, and A.Saranya [3] aims to provide a convenient and efficient system for scheduling medical appointments, managing patient records, and improving access to healthcare services through GPS integration and reminder features. The project addresses the challenges of busy work schedules and the need for accessible healthcare in today's fast-paced world.

Arthur Hylton III and Suresh Sankaranarayanan

[4] introduces an intelligent agent-based system for hospital appointment scheduling using Android 2.2, allowing patients and staff to prioritize appointments based on fuzzy preferences. While the system presents a unique approach to improving scheduling efficiency in healthcare, it lacks real-world implementation data, scalability discussions for larger facilities, and comparative analyses with existing systems. Further validation studies and considerations for practical implementation could enhance the system's effectiveness and applicability in healthcare settings.

III. METHODOLOGY

User Sign Up:

From the start box, an arrow leads to a box labeled "User sign up". This indicates that a new user, either a doctor or patient, will need to sign up for the system before proceeding.

User selects either doctor or patient option:

An arrow branches out from the "User sign up" box and leads to a decision diamond labeled "User selects either doctor or patient option". This diamond indicates that a new user will need to choose whether they are registering as a doctor or a patient.

Incorrect Input:

If a user enters an incorrect registration number (for doctors) , an arrow leads back to a box labeled "User have to input correct medical registration number". This indicates that the user will need to re-enter their credentials.

Account Created:

If a user enters a valid registration number (for doctors) or Aadhar number (for patients), an arrow leads to a box labeled "Account created". This indicates that the user's account has been successfully created in the system.

Select the type of doctor registered or the name of the doctor:

The system prompts the patient to either choose a doctor by category (e.g., pediatrician, cardiologist) or search for a specific doctor by name if they have someone in mind.

System will display available doctor based on the location (if selected):

If the patient chose a doctor by category, the system will display a list of available doctors matching that category. Here, location (optional) comes into play. If the patient specified a preferred location during the search, the system will filter the list to show doctors practicing in that area.

Patient will select the comfortable slot and confirm the appointment:

The patient gets to choose a convenient appointment time from the available slots for the chosen doctor (or doctors displayed based on category). Once a slot is selected, the patient confirms the appointment.

IV. SYSTEM ARCHITECTURE

The architecture for the application of a Doctor Appointment Scheduler with Advanced Navigator is designed to seamlessly integrate two critical healthcare components: appointment scheduling and indoor navigation. This architectural framework comprises a multi-layered system that ensures the efficient operation and interaction of these two functions. At its core, a robust database management layer stores and manages patient data, appointment details, healthcare provider availability, and the intricate layouts of healthcare facilities. This layer interfaces with both the scheduling module and the navigation module.

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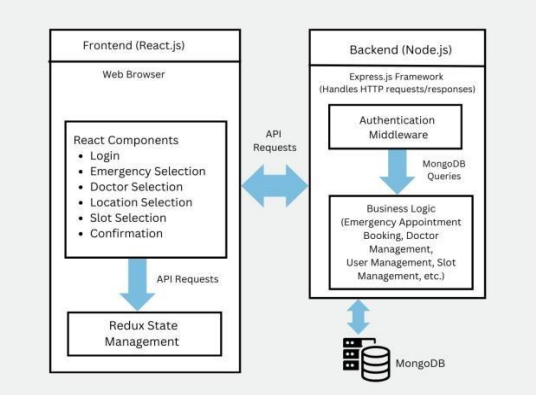

Fig.1. System Architecture

V. RESULT DISCUSSION

The Doctor Appointment Scheduler with Advanced Navigator represents a cutting-edge software solution designed to revolutionize the way healthcare facilities manage and streamline the process of appointment scheduling. At its core, this sophisticated system offers a comprehensive suite of features aimed at enhancing both the patient and healthcare provider experience. This website built using React.Js for frontend and Node.Js with Express.Js framework for backend. For storage purpose we use MongoDB. One of its primary functionalities is the intuitive appointment scheduling interface, which allows users to seamlessly book, reschedule, or cancel appointments with ease. Leveraging real-time synchronization with the availability of healthcare providers, the scheduler ensures accurate and up-to- date booking information, minimizing scheduling conflicts and optimizing appointment efficiency. Moreover, the Advanced Navigator feature stands out as a powerful tool, empowering patients with advanced search and filtering options to find the most suitable healthcare provider based on various criteria such as specialty, location, availability, patient reviews, and more. Beyond appointment scheduling, the software offers robust patient management capabilities, enabling healthcare providers to maintain comprehensive patient records, including medical history, treatment plans, prescriptions, and appointment history. Furthermore, the built-in notification and reminder system play a crucial role in reducing appointment no-shows and enhancing patient compliance by sending automated alerts regarding upcoming appointments, changes in schedule, or important healthcare reminders. Additionally, the system's seamless integration with Electronic Health Records (EHR) systems further enhances workflow efficiency by providing healthcare providers with easy and secure access to patient information during appointments.

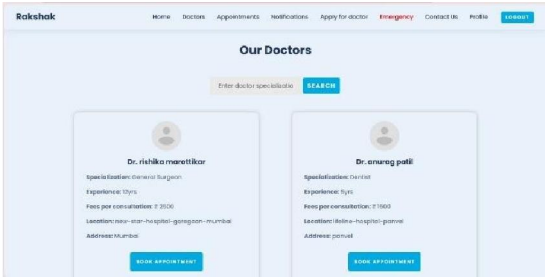

Fig. 2. List of available doctors

Fig. 2 shows a list of all the available doctors in our application.

Fig 3. Doctors appointment list

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Fig. 3 indicates the list of all the appointments on the doctor's side. Here, the doctor has the option to accept or reject the patient's request.

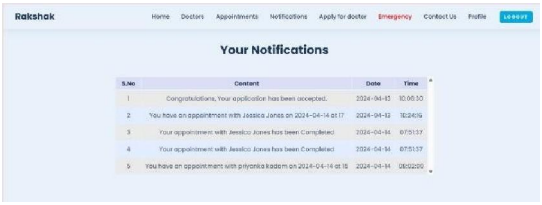

Fig 4. Notification Window

Fig. 4 shows all notifications on both the patient and doctor sides.

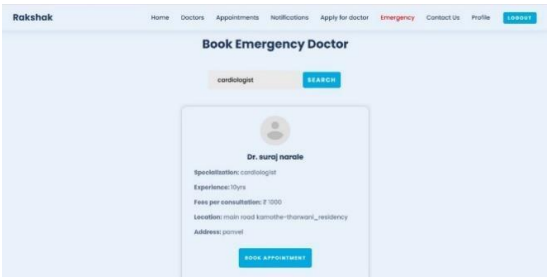

Fig 5. Emergency Window

Fig. 5 depicts the emergency window, which patients can use to book emergency appointments.

VI. CONCLUSION

In conclusion, the successful completion of our project signifies a significant leap forward in healthcare technology. Our system efficiently handles appointment requests, scheduling, and emergency bookings while managing patient data seamlessly. With careful planning and collaborative effort, we've created a solution that exceeds customer expectations. Moving forward, we're committed to supporting and enhancing our system to further improve healthcare delivery and patient outcomes.

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