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Development of Web application for Infectious diseases

تطوير تطبيقات الويب للأمراض المعدية

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Abstract

This paper presents a Development of Web application for Infectious diseases system. The system provides assistance to patients, identifies and selects doctors based on the location and the specialties of the doctors. The system allows patients to make appointments with doctors and assigns reminders to take the prescribed medications and vaccinations. The application provides various reports to the Ministry of Health on infectious diseases and the areas where these diseases are found in Sudan, which enhances the contribution of technology in combating infectious diseases. The results of testing the applications show a big saving of time and mobility of doctors and patients. Understanding the different steps in the prevention and treatment of Infectious diseases will help individuals make informed choices that contribute to maintaining their health and safety and preventing potential risks, this represents a positive reflection of the contribution of information technology in the health field.

Keyword: **Web application**, **Infectious diseases**, **Client**, **Web Server**, **php**, **Clint-Server Model**, **Mysql**.

الملخص

يقدم هذا البحث تطوير تطبيق ويب لنظام الأمراض المعدية. يقدم النظام المساعدة للمرضى، ويحدد الأطباء ويختارهم بناءً على موقعهم وتخصصاتهم. يسمح النظام للمرضى بتحديد مواعيد مع الأطباء ويحدد تذكيرات لأخذ الأدوية والتطعيمات الموصوفة. يوفر التطبيق تقارير مختلفة لوزارة الصحة عن الأمراض المعدية والمناطق التي توجد بها هذه الأمراض في السودان، مما يعزز مساهمة التكنولوجيا في مكافحة الأمراض المعدية. تظهر نتائج اختبار التطبيقات توفيرًا كبيرًا للوقت والتنقل للأطباء والمرضى. إن فهم الخطوات المختلفة في الوقاية من الأمراض المعدية وعلاجها سيساعد الأفراد على اتخاذ خيارات مستنيرة تساهم في الحفاظ على صحتهم وسلامتهم ومنع المخاطر المحتملة، وهذا يمثل انعكاسًا إيجابيًا لمساهمة تكنولوجيا المعلومات في المجال الصحي.

الكلمات المفتاحية: تطبيق ويب، أمراض معدية، عميل، خادم ويب، php، نموذج خادم العميل، MySQL.

Introduction

Various IT-based applications employed in building healthcare systems where Utilizing technology is primarily done so that we may easily access all the data we require for patient care [1].

Health data management underwent disruptive shifts with the transition of medical data from paper charts to electronic data to offer more precise and superior patient treatment while using this information qualitatively. Various health data management system concepts emerged due to the development of ITs supporting this transformation. Especially because of the increased frequency of data breaches and cyberattacks, security and privacy are the main requirements for a healthcare data management system [20]. Big data analytics requires hospitals to share patient information to obtain findings and predictive analysis from the data. It opens the door to a health data management system that will assist doctors and other medical professionals in improving Infectious diseases diagnosis and prognosis [21].

Many medical applications for web have been developed and widely used by health professionals and patients [1]. The use of these applications is very helpful because it leads to better communication between doctors and patients and help to enhance

the overall treatment quality [8] [11]. Our proposed Infectious diseases system is based on Web applications to provide medical assistance for patients who live in regions where mobility is difficult and limited and can save the doctor and the patient lots of time. The proposed application identifies and selects doctors registered in the system based on their location, specialty and availability. The application allows patients to make appointments with doctors and assigns reminders for the prescribed medications and vaccinations [13].

The paper is organized as follows; first we present the design of our Web application for Infectious diseases system and its different applications and service, followed by testing results and finally a conclusion.

In this paper, it has implemented a web-based platform-independent framework for its simple use and effective use of our technology.

Problem Statement and Objective

The main problem is the lack of information on infectious diseases due to the lack of a database that provides information on these diseases in Sudan, and thus the failure to take the right decision in combating these diseases in light of the scarcity of this information, especially in light of the current conditions in which communication between patients and doctors is difficult.

The aims of this paper, designed a website that provides the following:

1. Providing information about infectious diseases in Sudan
2. Easy communication between patients and doctors
3. Providing this information may help reduce and prevent these diseases
4. The system provides simple access of relevant information to the organizations

Web application for Infectious diseases system design

Our infectious diseases system three parts; the Client, the server and the data base as it shows in Figure 1. The client using the Web service where data can be transferred via GPRS, 4G or WIFI [6]. This system enables data communication between patients and doctors and saves lots of time and efforts in mobility. In addition to storing medical data in mysql database using the php language.

Regarding the database handling scenario in the Clint-Server Model, the client sends a request to the server, then the server receives the request and processes it

along with database interactions (if required) and generates the response in the client understandable format, and then the server sends that response to the client.

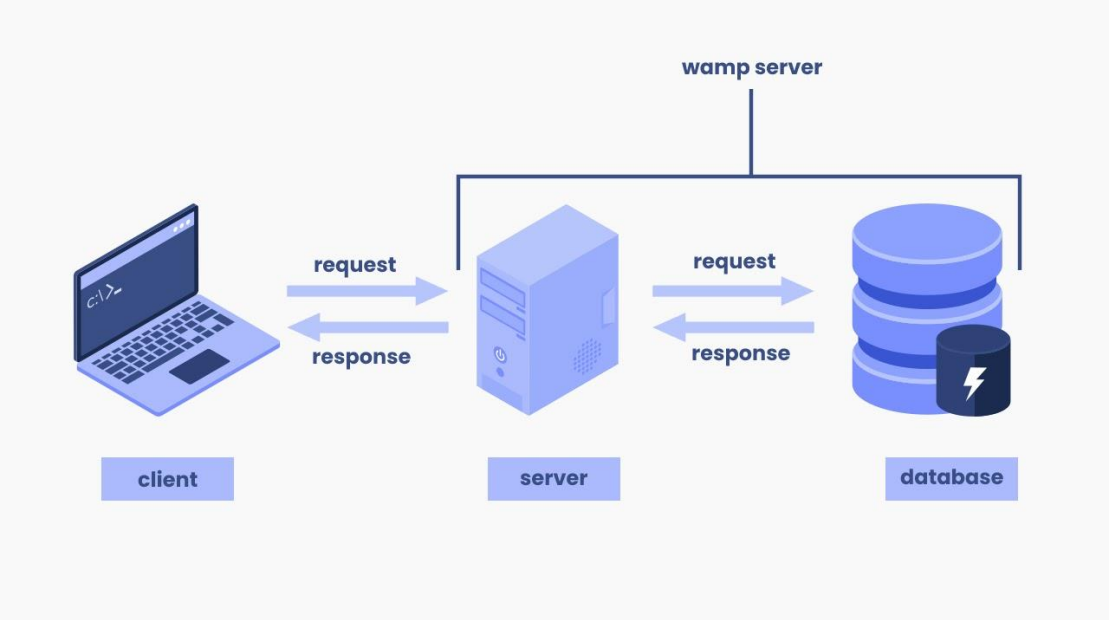

Figure 1: Infectious diseases system

When a Client request for a Webpage (suppose any page.php) to the server (here server is Apache) then server sends the request to the PHP interpreter which converts the request into machine language and then search that page in database, if the page was found in the database then it comes to PHP interpreter and interpreter sends the data to the Web Server. Now, Web Server sends the request-response to the client. See the fig 2.for example, entering medical record data through HTML forms and displaying medical reports [9].

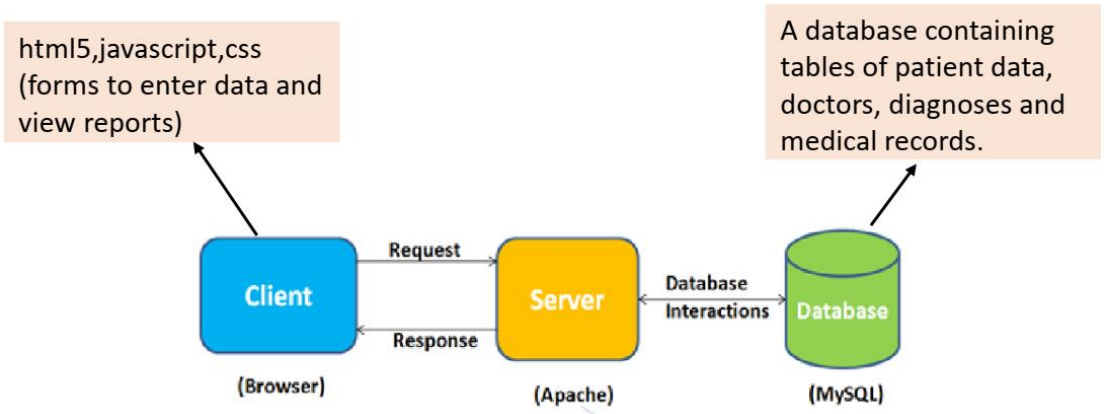

Figure 2: Application Architecture Design

Use case diagram

The Infectious diseases system **Use Case Diagram** showcases the key functionalities and interactions within the system (i.e. relationships between the actors (admin, patients and doctors)). It includes actions such as manage user, doctor log, manage queries, manage pages, medical history… etc.

The Figure 3 provides a visual representation of the essential actions performed by the doctor, admin, and the Patients in the Infectious diseases system.

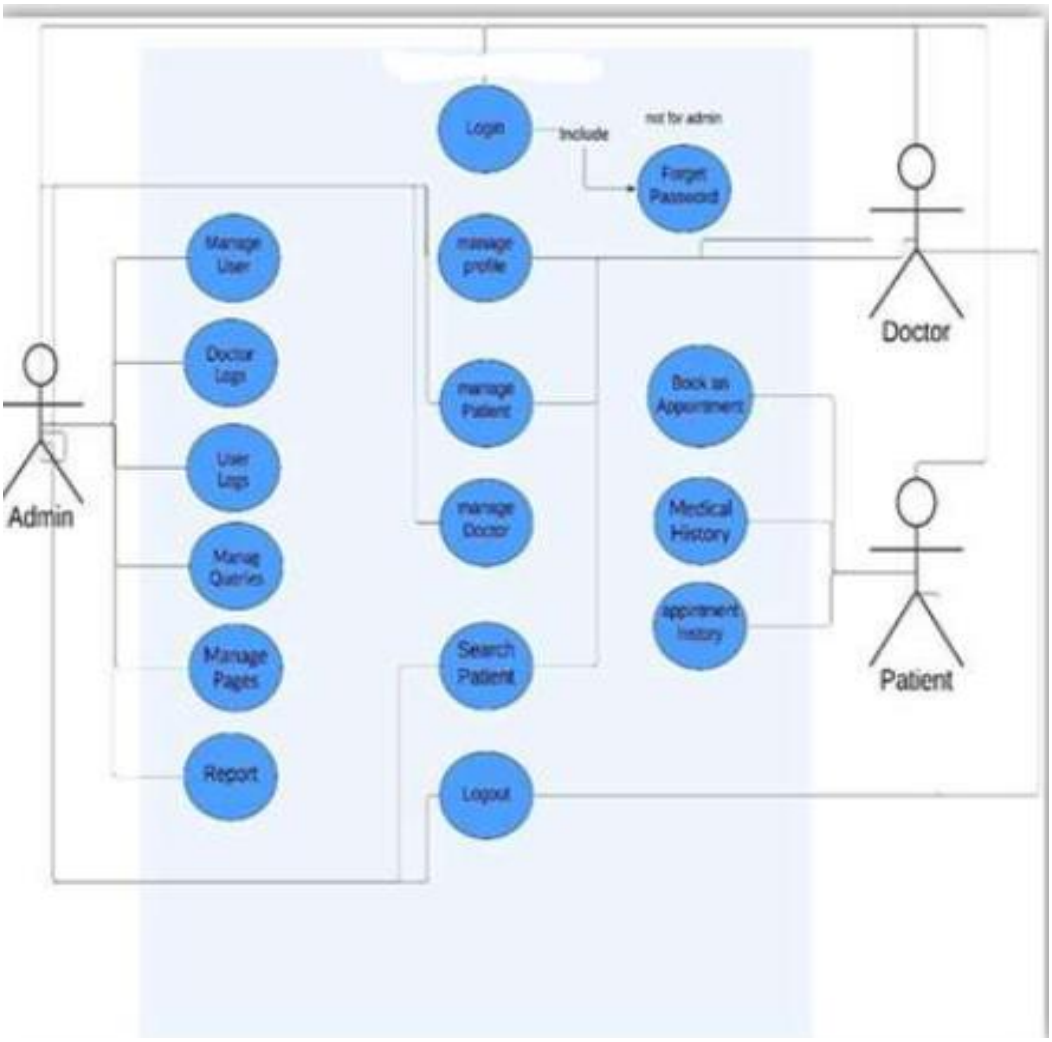

Figure 3: Infectious diseases system use case diagram

Class Diagram

The Figure 4 provides eleven classes which are patient, doctor, user, doctor log, user log, admin, doctor specialization, contacts. Medical history, page and Appointment. The patient, doctor, Medical history and Appointment classes are

the main classes which keeps the information of Infectious diseases system. The Infectious diseases system classes linked to gather as shown in Figure 4.

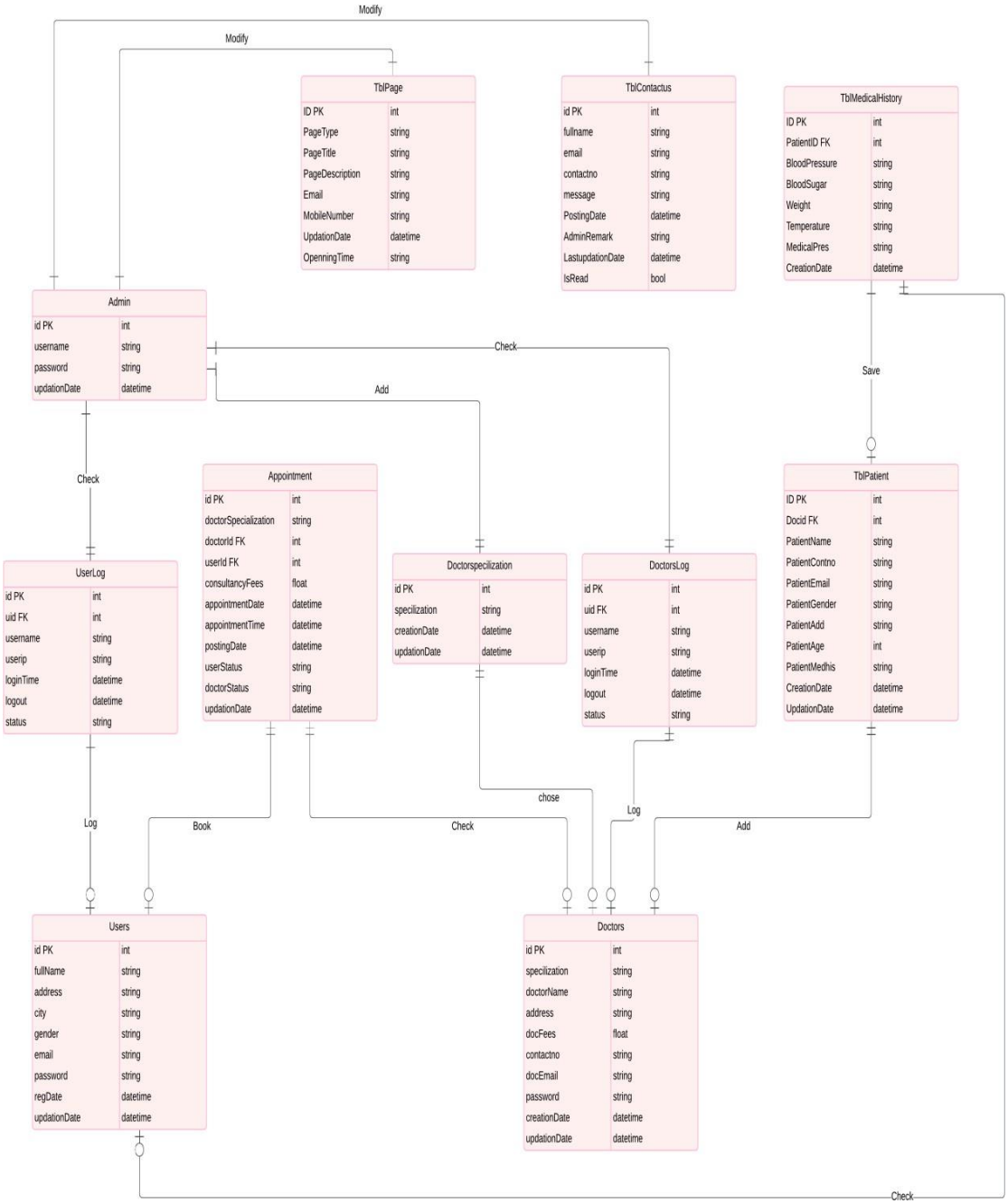

Figure 4: Infectious diseases system **Class Diagram**

System requirements:

6.1. Functional requirements:

- **User Registration**:

There should be a user registration interface for both patients and doctors, with data validation and confirmation.

- Appointment Management:

Capability to book and cancel medical appointments through the system.

- Online Consultations:

Opportunity for patients to communicate with doctors online.

- Electronic Health Record:

Access to an electronic health record for each patient, including diagnoses, prescriptions, and previous visits.

- User Management

Ability to manage user information, including updating profiles and modifying permissions.

- Medical Report Production

It includes various medical reports and links them with the Ministry of Health, including reports on infectious disease.

1.2. Users' Non–Functional Requirements:

Ease of use: It should be easy to interact with the system

- Legal/regulatory requirements: The system must follow the Supreme Ministry For health, rules and Practices of the Government of Sudan.
- Reliability.
- Performance: The system must be reliable with minimal no delay and delivery the required result.

1.3. Domain requirements:

- Provide network infrastructure in Infectious diseases areas including wired and wireless networks.
- A central computer that hosts databases of the Infectious diseases system at the level of the responsible health system or organization.
- Provide a web server to support web applications linked to the Infectious diseases system and ensure continuity of service.
- Provide support for related devices such as backup devices, additional storage units, UPS system to ensure the stability of power supply, etc.

- Ensure system compatibility with various client operating systems such as UNIX, Linux, MAC OS, and Windows to ensure easy access and use.
- Secure a web browser that is compatible with Java and JavaScript applications, such as Chrome, Firefox, Netscape, and Opera to ensure a smooth and efficient experience.
- Use network programs and protocols such as TCP/IP, HTTP, HTTPS, FTP to ensure a smooth and secure connection between different systems in the malaria control system.

1.4. Hardware Requirements

Table 1. Hardware Requirements

Requirement	Description
Smart phone or tablet	The device must be able to run Android or iOS operating system to support the app.
Built-in camera	A good camera with a resolution of at least 8 megapixels) to take pictures of infested animals or mosquitoes
Internet connection	The device must support Internet connection via Wi-Fi or mobile data to transfer data and receive updates.
Built-in GPS	The device must have GPS to locate infected users and provide necessary support.
Additional sensors	They can include temperature or humidity sensors to provide environmental data that aids in risk analysis.
Sufficient storage space	The device must have sufficient storage space to store data and information related
Powerful battery	It is preferable that the device be equipped with a long-lasting battery to support the use of the application in remote areas.

6.5. Software Requirements

Table 2. Software Requirements

Requirement	Description
Operating system	The application must support Android and iOS operating systems
Database	Use a local MYsql database as on-device data storage, with integration with a cloud database Fire base like
Scripting language	php language is used to deal with database.
Application Programming Interface (API)	The application must support API integration to collect data from external sources such as weather or maps
Development framework	Use a frame Development framework Work like Or Flutter React Native To develop an application Multi-platform
Security software	Data encryption tools and antivirus software should be included to protect users' data
Data analysis tools	Integrate with data analysis tools like Tensor Flow Lite to analyze data on the device
Notifications service	The app should support notification service to push updates and information to users
Map tools	The app must support integration with Google Maps or any other mapping tools to locate infected people.
Testing tools	Use testing tools such as J Unit and Espresso to ensure software quality.

2. System web site Diagram

In this paper, the site of the Infectious diseases system designed. Which consists of eight page (home, About us, contact us, search, services, Infectious diseases, login in \ new account, medical reports).

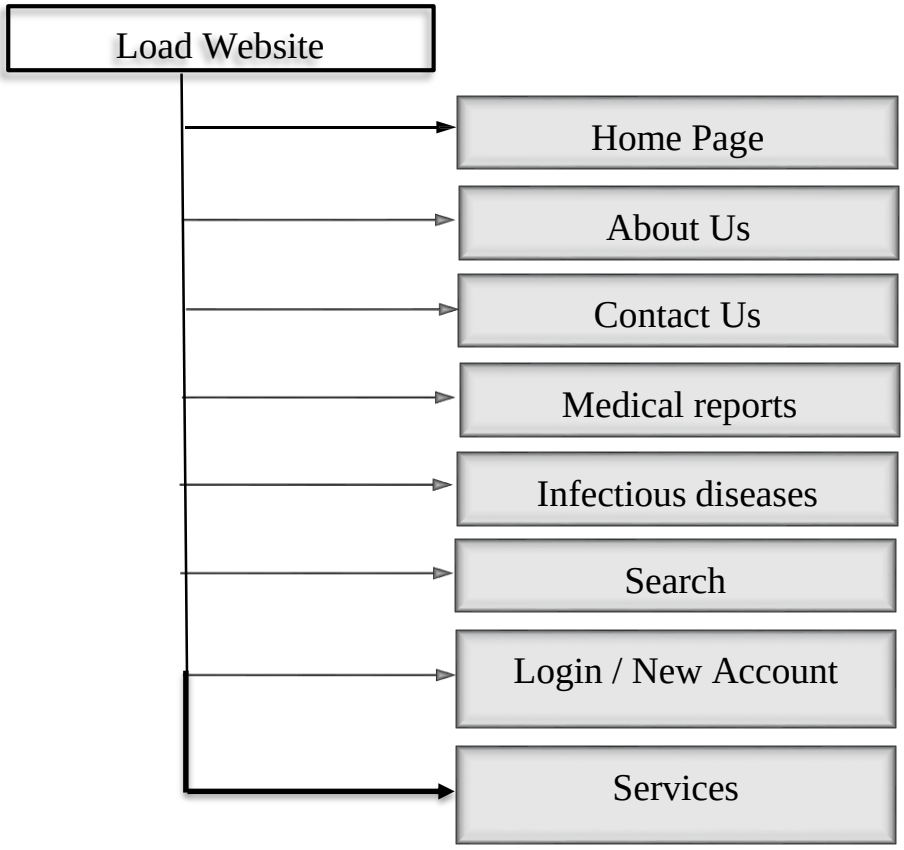

Figure 5: Block diagram of the Infectious diseases system

Conclusion

In this study, a complete of presents a Development of Web application for Infectious diseases system. Firstly, the proposed model for developing the system was explained and the client-server model was adopted as an ideal model for this type of systems. Secondly, Details of the use of analysis tools including use case diagram and class diagram are explained. At last, the functional, domain, hardware, and software requirements for the system to perform were identified, and the proposed website layout for the system was designed.

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