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MEDIFILE

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***Abstract*—The medical file used in today's world had existed since the beginning of medical care and patient management services. It consists of a paperback or plastic laminated file which is used to organise and store our medical records and reports. A doctor/practitioner writes down his/ her findings on a piece of paper and adds this paper to the file. This system has existed for a long time and hasn't evolved in any way. Even with the latest technological advancements, this field has remained untouched. As a result patients still have to carry these heavy and cumbersome file. In some cases it becomes really difficult to manage a file with a large number of documents. The app being developed aims at solving this problem by using the current technological advancements to digitise the file system and allow a paper-free, seamless and convenient way of storing medical records for a patient. The application, running on a mobile device, allows the doctor to create prescriptions/records on their Android enabled device and send the data to the patient via a QR code. QR codes allow extremely fast, simple and secure transfer of data. The patient can thus store his/her prescription on their device. The application is useful during emergencies when the patient is unconscious, as the doctor can access the patient's medical history stored on their device and perform a highly accurate and specific treatment regime, thereby potentially saving the patient's life.**

***Index Terms*—Mobile device; User authentication; Client-Server architecture; Data analysis; QR code.**

I. INTRODUCTION

This project aims at digitising the existing medical file system and provides a seamless and convenient way of storing a patient's medical records. The data will be securely stored on the patients device as well as on a remotely hosted database. The project does not in any way try to replace a doctor or a medical practitioner.

The user's data will be continuously evaluated and analysed to predict any deviation from the normal trend. The user will be notified based on the degree of deviation.

The project aims to create a highly optimised and efficient system, capable of running on low RAM devices, to allow seamless connectivity between the sender and receiver and to create a system that stores data securely and in a space efficient way. Proper security measures will be implemented to encrypt client-server communication and the application will adhere to the rules and guidelines provided by the Government regarding handling and storage of Personal Health Information (PHI).

The application is specially advantageous in emergency situations as it allows a medical practitioner to effectively administer medical help due to the availability of the patient's previous medical records. Developing the application on the Android operating system makes it widely available and compatible with majority of the mobile devices in the market.

II. EXISTING SYSTEM

A. *Existing system*

An Electronic Medical Record (EMR) is a real-time patient health record with access to evidence-based decision support tools that can be used to aid clinicians in decision-making. The EMR can automate and streamline a clinician's workflow, ensuring that all clinical information is communicated. It can also prevent delays in response that result in gaps in care. The EMR can also support the collection of data for uses other than clinical care, such as billing, quality management, outcome reporting, and public health disease surveillance and reporting. [1]

The electronic health record (EHR) is a longitudinal electronic record of patient health information generated by one or more encounters in any care delivery setting. Included in this information are patient demographics, progress notes, problems, medications, vital signs, past medical history, immunizations, laboratory data, and radiology reports. The EHR automates and streamlines the clinician's workflow. It has the ability to generate a complete record of a clinical patient encounter – as well as supporting other care-related activities directly or indirectly via an interface – including evidence-based decision support, quality management, and outcomes reporting.

B. *Drawbacks of existing system*

Majority of the technological advancements in the system exist on the medical practitioner/ hospital's side, with the patient having to rely on comprehensive paper based reports containing unnecessary jargon.

The existing medical file system includes numerous papers and documents compiled in a paperback file. This system

contains various drawbacks like carrying, managing and updating these files are a tedious process.

Also the patient needs to contact the hospital for any clarity or analysis of the records.

III. PROPOSED SYSTEM

The proposed system will allow the users to carry their vital medical information with themselves. This will allow doctors or paramedics to administer effective medication which can prove life saving for the user. The system also removes the need of a user to carry a physical file with themselves while visiting a doctor. This eliminates various seemingly trivial but time and energy consuming problems such as forgetting to bring reports, or loss or damage of reports. The system will provide a continuous analysis of the user's data, thereby warning him/her of anomalous trends in the reports. This will help early detection of potentially fatal diseases.

The system relies on QR codes as the primary method of communication between the user and the doctor's devices. QR codes have been proved to be fast, effective and efficient in terms of primitive data transfer.[2] The data will be transferred via QR codes in an alphanumeric format, and will be parsed on the device locally and displayed accordingly. [3]

The system does not require the user to purchase any additional hardware or software other than a mobile device running the Android operating system. The proposed system seamlessly merges with the existing system implemented in the various medical and healthcare institutions/organisations.

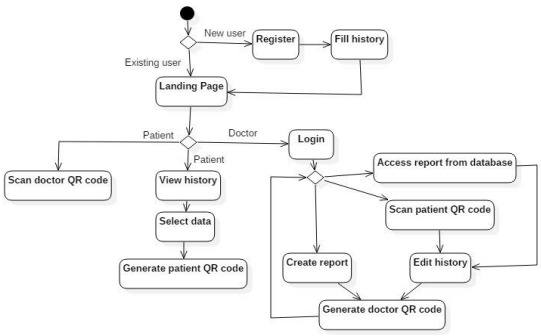

Fig. 1. Flowchart for proposed system.

IV. SYSTEM DESIGN

MediFile being a client-server approach, follows a specific hardware and software architecture. The main challenge here is integrating both the hardware and software components to work together while following strict security measures.

A. Software architecture

The software architecture consists of the database, the application and the server.

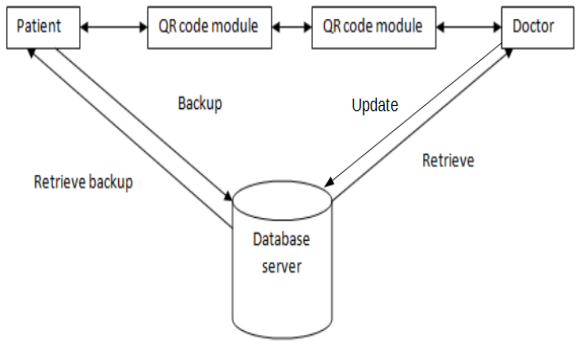

Fig. 2. Architecture for proposed system

1) The database: The database is managed by the phpMyAdmin RDBMS. The database consists primarily of 3 tables: Users, Doctors, History. Each table stores multiple records using primary and foreign keys for distinguishing intra-table records and joining inter-table records.

2) The application program: The application is developed on a mobile operating platform and is compiled with the minimum possible SDK for maximum outreach.

3) The server: The server is a third-party Apache HTTP web server having SFTP and MySQL support.

V. ANALYSIS

A. *Risk analysis*

When a large number of users are using the app at once, there may be a risk of the app crashing as its data is stored on a MySQL based database. As large amount of it is to be stored so it may be a little cumbersome process causing the lack of availability of the desired data when required.

Large amount of traffic on the network may cause higher data retrieval timing.

B. Feasibility analysis

1) Technical feasibility: The system builds upon the existing technology used in hospitals, thereby eliminating the need for any restructuring of the architecture used in such organisations. The system uses existing development environments and languages like Java, XML, MySQL and so the developers are well versed with the development environment.

2) Economic feasibility: Majority of the system uses free, open-source technology and thus the development cost is minimum. The only cost incurred is of renting/maintaining the web server and the database.

3) Legal feasibility: The application adheres with the rules and guidelines laid down by the Government of India regarding storage and management of PHI. [4] Also, the system does not infringe any existing copyrights or registrations. Thus the system is legally feasible.

VI. Future improvements

A. Data analysis

The users PHI can be further securely analysed using various data mining algorithms. We can use a 2 step process that uses ANOVA for Cancer classification of Bioinformatics data.[5] In step 1, we rank all genes in the training data set using a scoring scheme. Then we retain the genes with high scores. In step 2, we test the classification capability of all simple two gene combinations among the genes selected in step 2using a good classifier such as support vector machines.

VII. Conclusion

In general we believe that this system will greatly benefit all the users of the current medical system – patients and doctors. The system lays the base for a highly interactive and user-friendly application ecosystem that provides ease of access, lower maintainability and higher transparency of the user's medical records. This paper can be utilised by developers as the first step towards building applications that aid the transfer of medical and user data between a patient, doctor and a medical/healthcare organisation. Various enhancements can be added to the system that help the user in management, storage and analysis of his/her medical data.

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