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Medical Report Digitization

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Abstract: This paper aims to develop a model and an algorithm to design an application to save the details of the patient's medical reports in an organized manner. This desktop application is developed in Java Swing and MySQL is used for the backend. Medical (Lab) report digitization helps organize the reports given by doctors and helps determine the summary of lab reports through user-interactive graphs. It is the easiest means of handling medical documents and computerizing all the lab report details regarding patients' medical history in this digital era .

Keywords: Reports, Graphs, Java Swing, MySQL, JFreeCharts, GUI, Medical.

I. INTRODUCTION

The currently withheld infrastructure of global healthcare needs technical enhancements, but including that the patient also should not be in the dark regarding his/her conditions. Urgent need for digitizing healthcare records in a power duo that can handle complex medical records and lab reports efficiently and accurately. Unordered organization of reports and prescriptions given by doctors makes it very hazy and difficult to handle. We need a solution for ease of handling medical documents. Also, ease to determine a summary of lab reports through user-interactive graphs.

We need a way to see this data in a different way that is in digital format. Conversion to a standardized set of digitized values will help in automating a lot of backend approval processes. Also, the ability to read and classify comments/observations for common parameters will be a big plus. When a customer uploads his health check report regularly, a trend chart can be plotted for key parameters.

The key objectives were:

1. To design a dashboard that facilitates quick navigation between the information of all the patient's history of lab reports.
2. To design a system for better patient care
3. To reduce Operation costs and cut paper usage
4. To provide top management at a single point of control.

II. RELATED WORKS

The primary objective of the S. Ashwini Pratiba et al. [1] project was to allow the doctors to upload medical prescriptions which would be transferred to the drug store automatically. For secure access, RFID tags were used. The limitation is that any unauthorized person having an RFID tag can gain access to the databases and make unwanted manipulations.

Olawale Sobogun God et al. [2] main idea behind this project was to create hospital management software for small private hospitals in Nigeria. It is a basic windows GUI Application using SQL as a backend. This is a basic usage-based application for small hospitals without digital lab reports.

Apple Healthcare Application Keeps the health records from multiple institutions alongside their patient-generated data. It can be used only by iOS users [3].

B. Balaji et al. [4] in their paper mainly focuses on Optical Character Recognition. There is also an option to obtain audio recordings for blind people. The application works only for the scanning of hard copies and involves paper usage.

Sura Abed Sarab et al. [5] used the concepts of databases, object-oriented, and networking techniques in their project. It involves Java language for the front-end and MySQL for the backend. There is no use of lab report visualization or monitoring.

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Matarlo Marlou J et al. [6] in their paper mainly aims at upgrading the quality of information and management and speeding up the functioning of hospitals and helping the doctors and workers for managing the data. This application is not supported on Windows 10 which is the most used operating system today.

III. METHODOLOGY

A. Flowchart

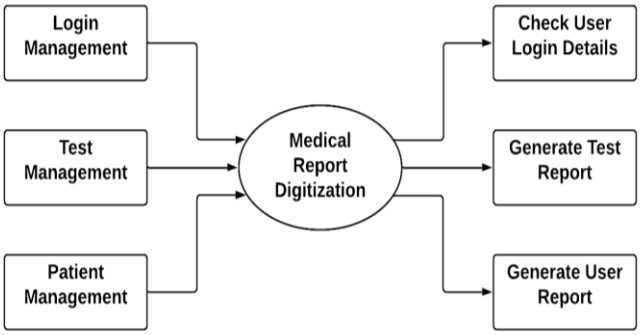

Fig 3.1.1 Data Flow Diagram (Level 2)

Application has different modules. First, the existing user needs to log in, if the user is new then he/she needs to register. This is then done by Login Management. Users can upload the information of his/her tests. This is done in the Test management and patient management module. Generate Test Report Module helps users to print their reports. The User Login Detail module enables users to change their details.

B. Application Flow

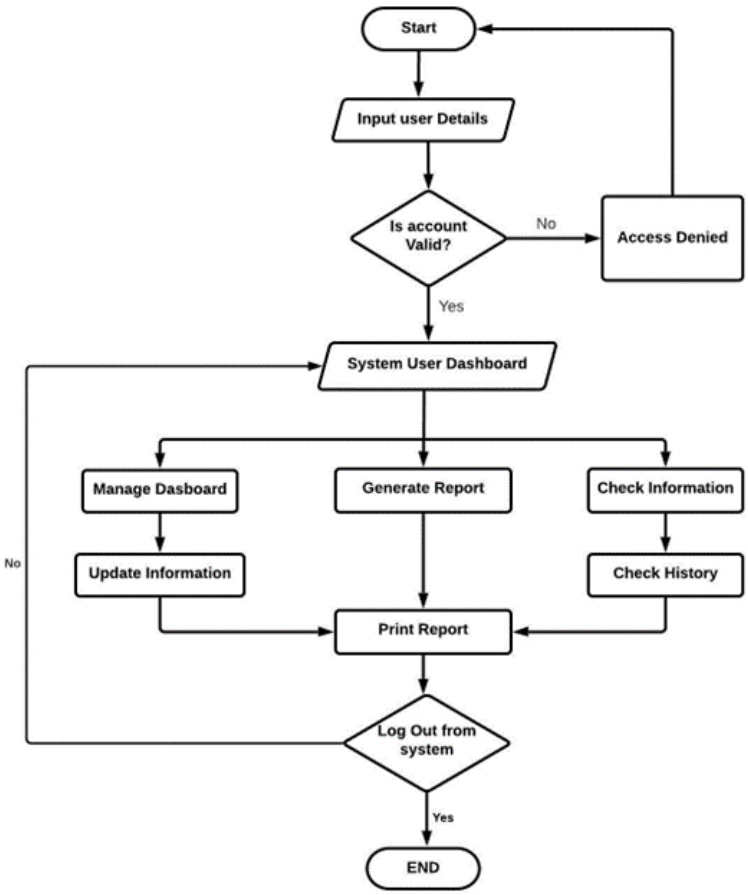

Fig. 3.2.1 FlowChart depicting application flow

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Firstly, the system will ask the patient to input his/her details at the time of registration. It will check the validity of the account. If the account is valid then the patient is directed to the dashboard. The patient can update his/her information from the manage dashboard option. Previous medical history can also be checked upon Medical Report of the patient can be generated containing all the medical details.

IV. Result and Discussion

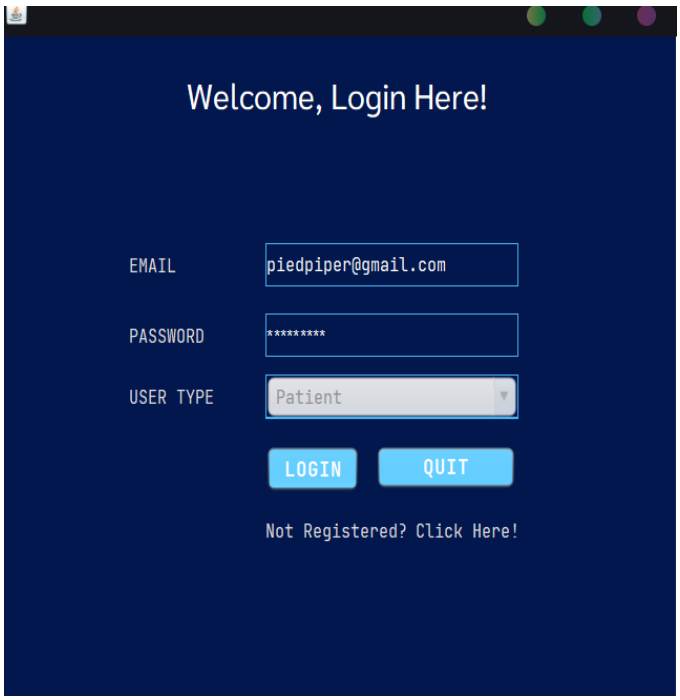

Fig 4.1. Login Page

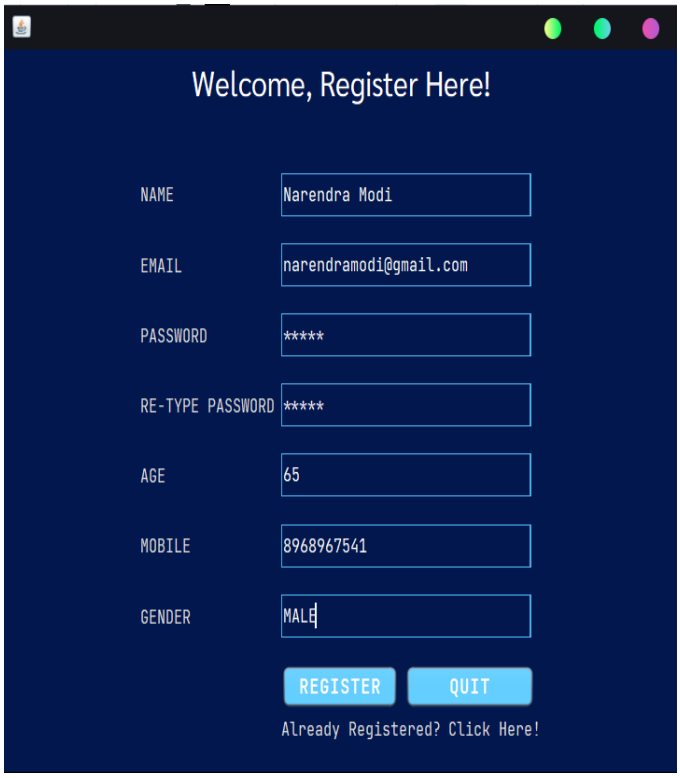

Fig 4.2. Registration Page

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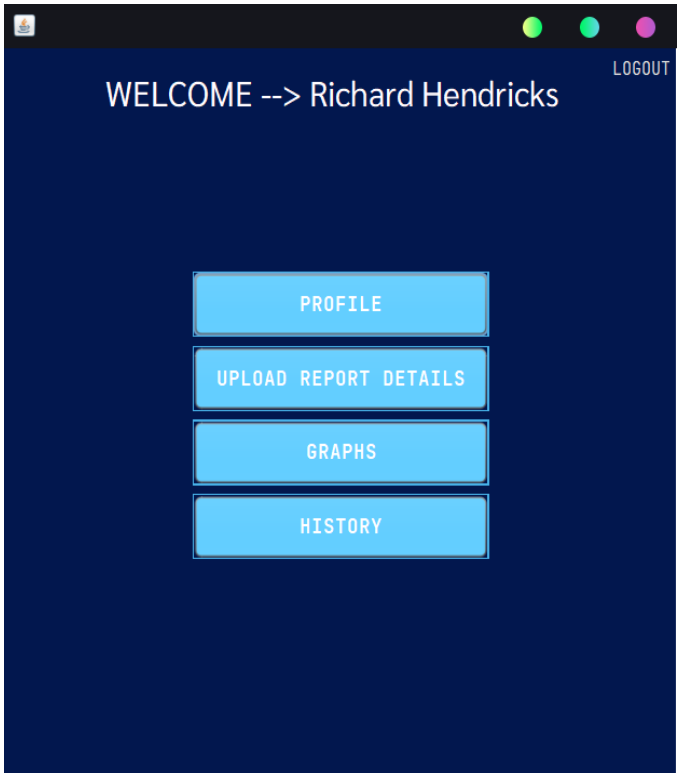

Fig 4.3. Main Dashboard

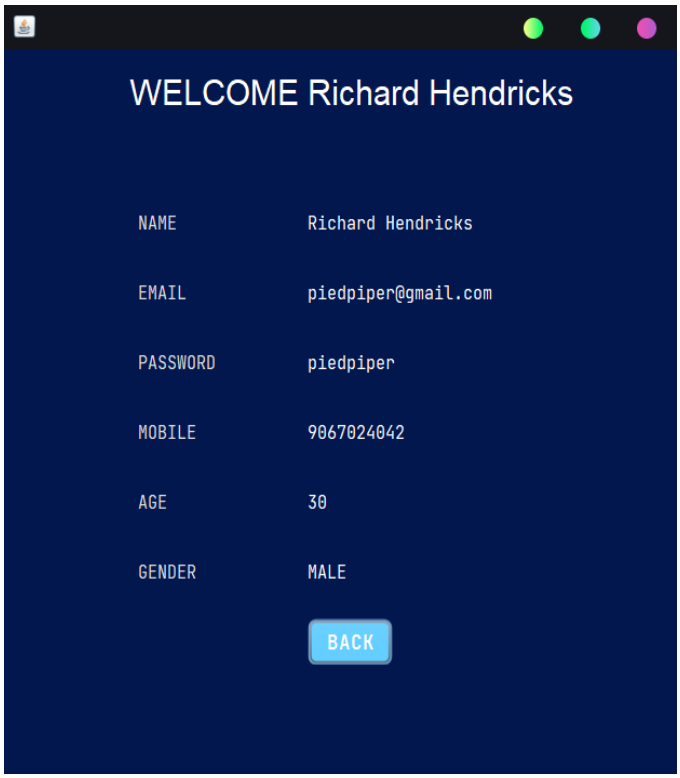

Fig 4.4. Profile Page

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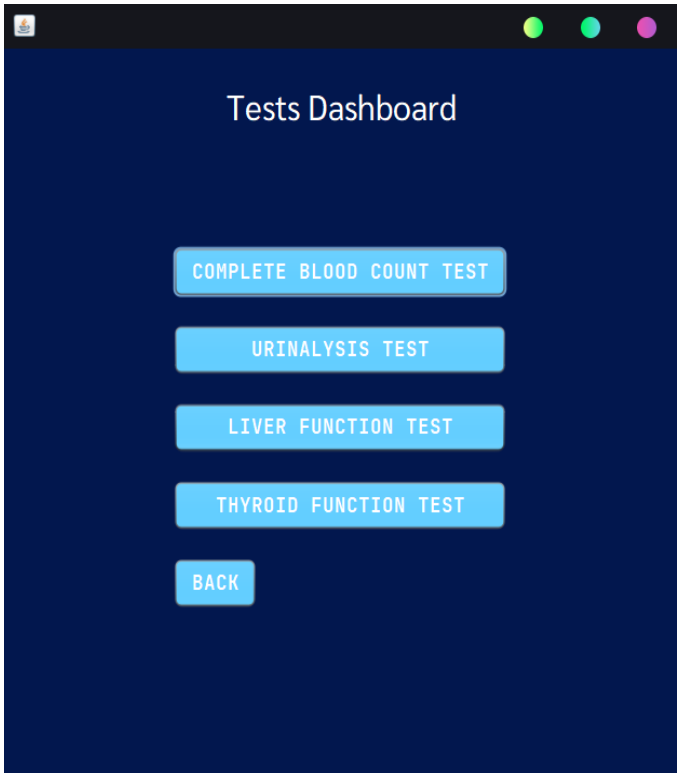

Fig 4.5. Test Dashboard

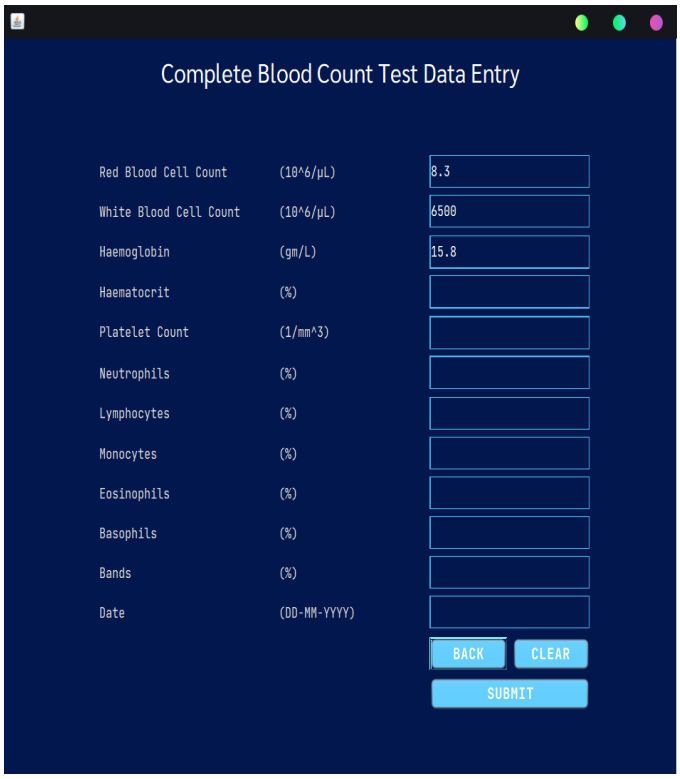

Fig 4.6. CBC Test Data Entry

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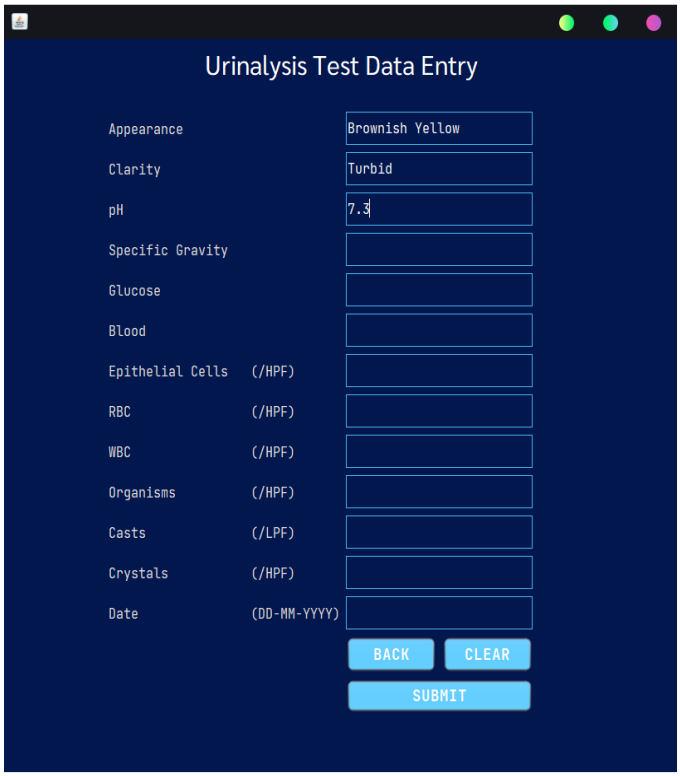

Fig 4.7. Urinalysis Test Data Entry

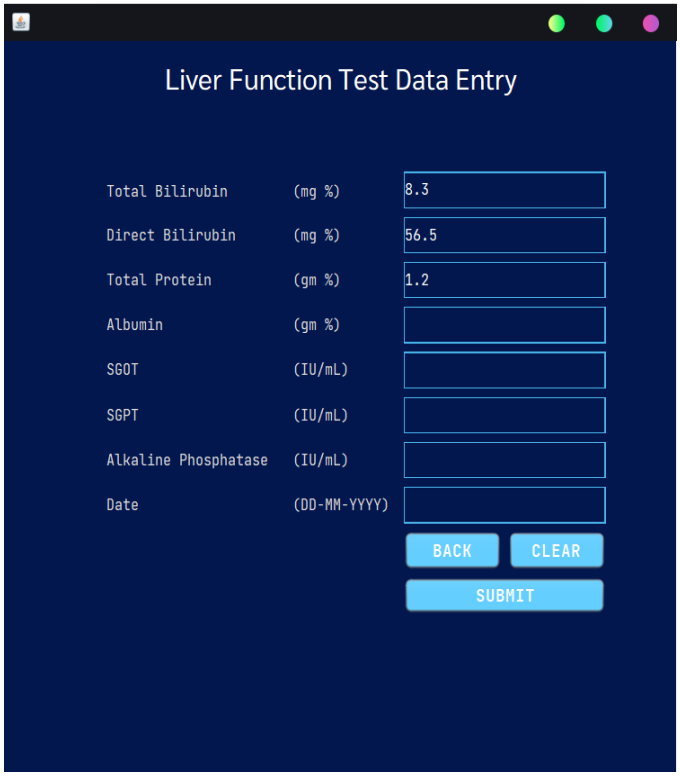

Fig 4.8. LFT Test Data Entry

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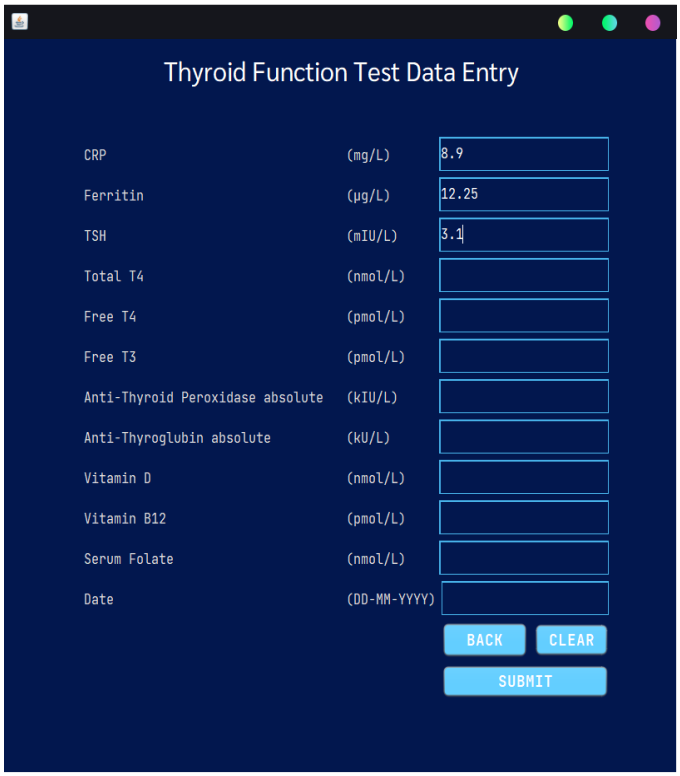

Fig 4.9. TFT Test Data Entry

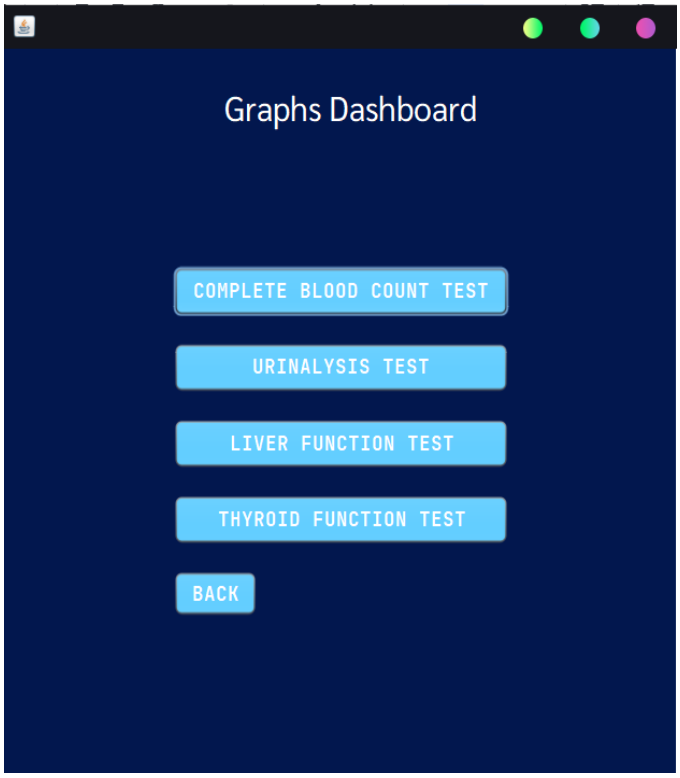

Fig 4.10. Graph Dashboard

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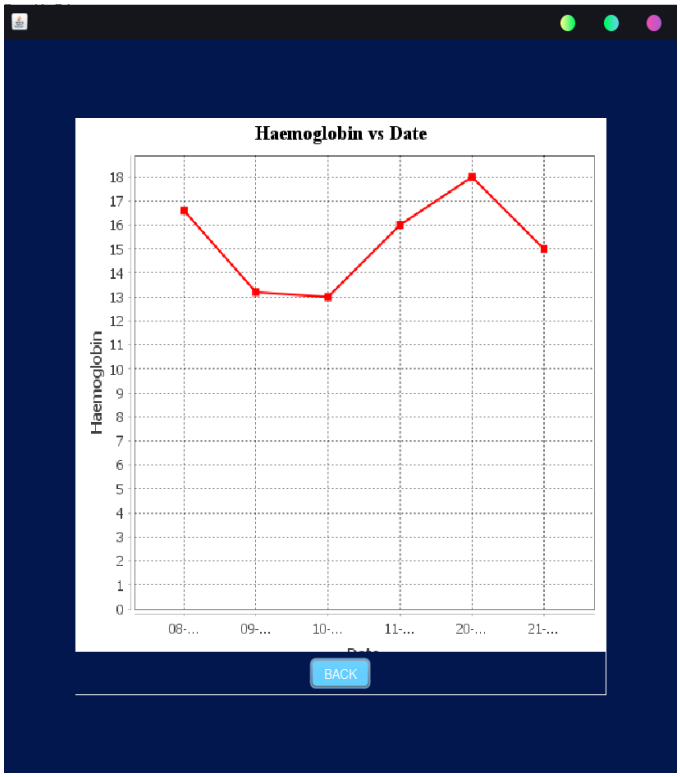

Fig 4.11Hemoglobin vs. Date Graph

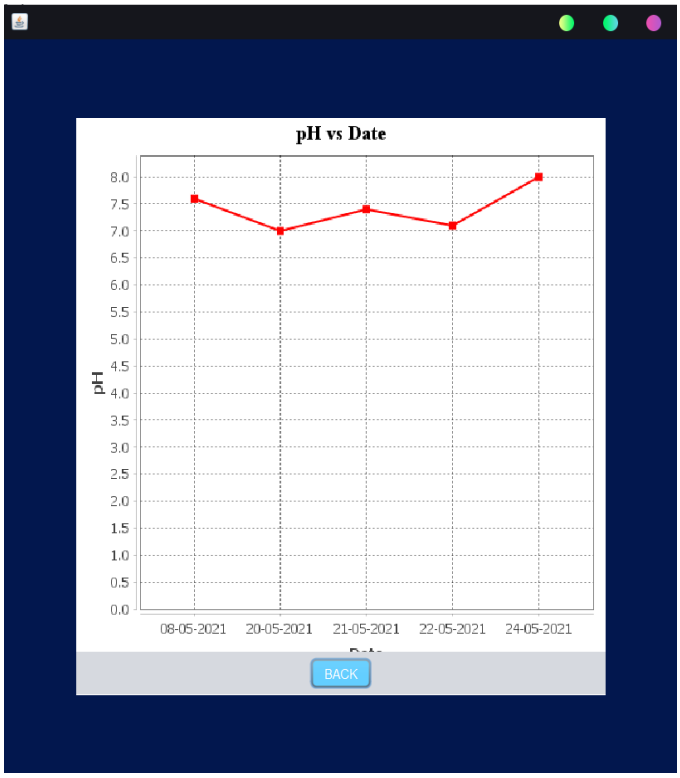

Fig 4.12. pH vs. Date Graph

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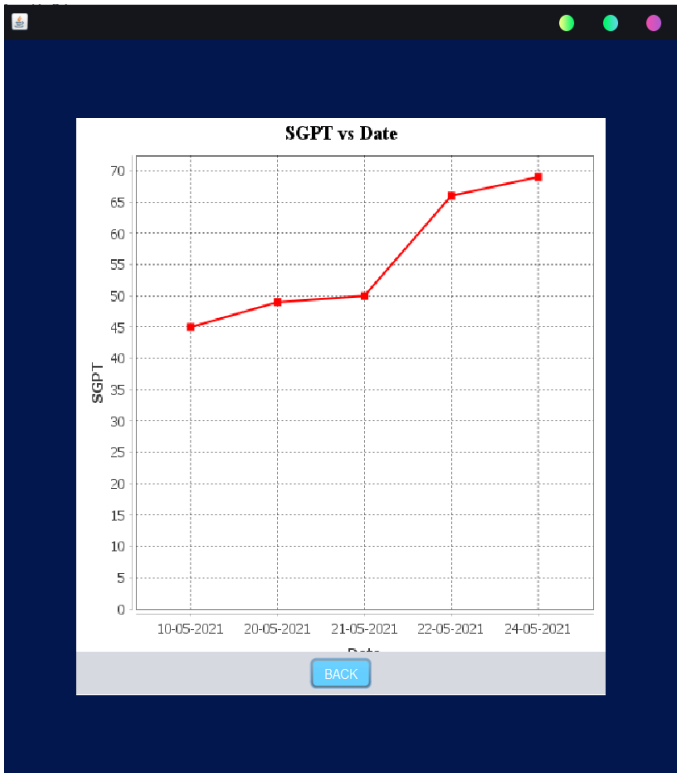

Fig 4.13. SGPT vs. Date Graph

Fig 4.14. TSH vs. Date Graph

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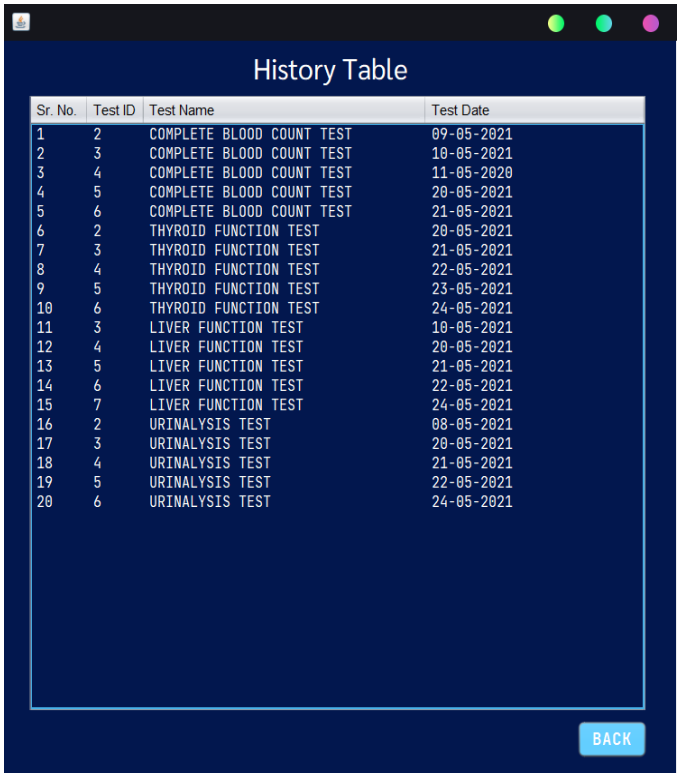

Fig 4.15. History Table

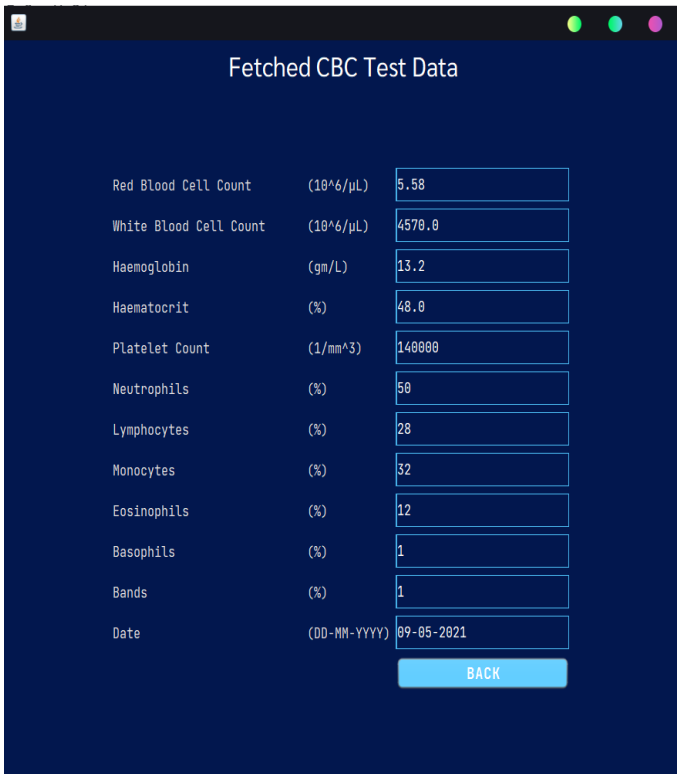

Fig 4.16. Fetched CBC Test Data

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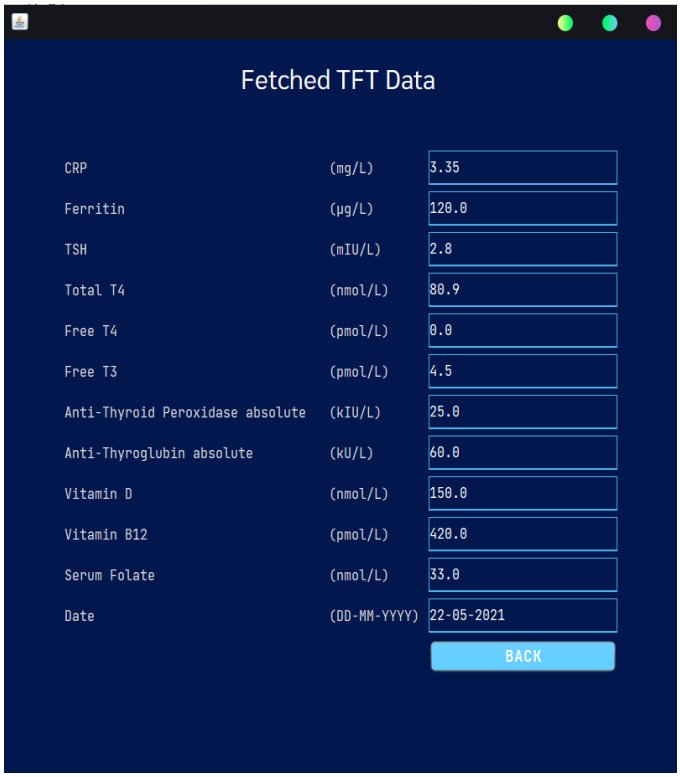

Fig 4.17. Fetched TFT Data

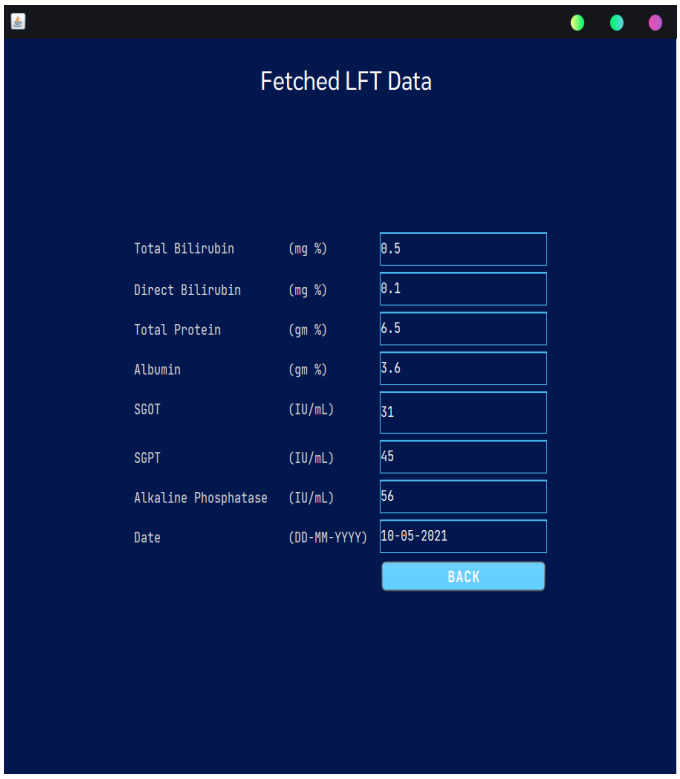

Fig 4.18. Fetched LFT Data

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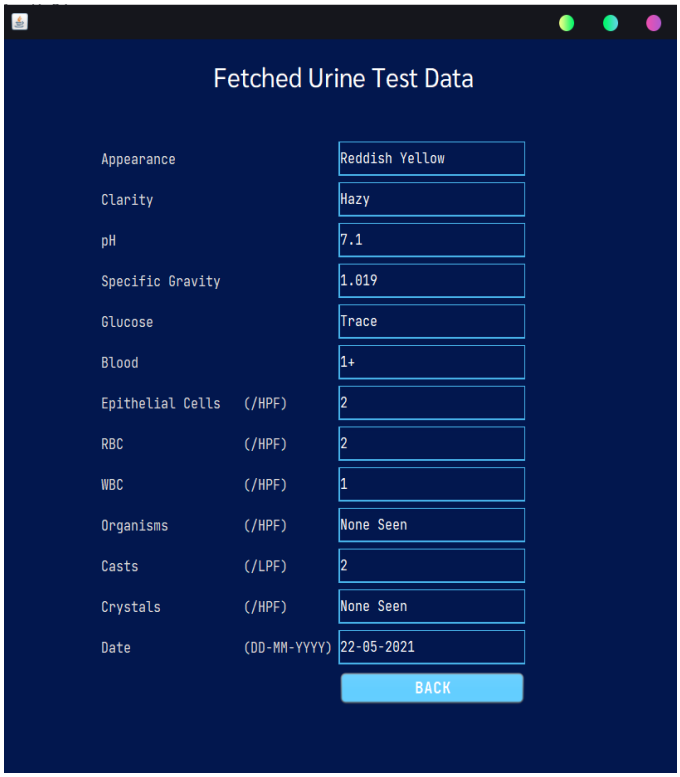

Fig 4.19. Fetched Urinalysis Data

In Fig 4.1 We can see the login page which prompts the user to the Patient Dashboard shown in Fig 4.3. Then the user can choose from up to 4 options where he/she can see his/her profile as seen in Fig 4.4. Then the user can choose which test to upload from the Test Dashboard in Fig 4.5

Then some partially filled data can be seen in Figs 4.6, 4.7, 4.8. 4.9. Moving to the Graphs Frame we can see the Graphs Dashboard as in Fig 4.10 and choose a particular graph to see out of 4 predefined graphs i.e Haemobglobin, pH, SGPT, TSH all against the date are plotted (Fig 4.11, 4.12, 4.13, 4.14 respectively). On the last option from the Patient's Dashboard, the upload history of the particular user can be seen in the form of a table (Fig 4.15). The table responds to mouse clicks. When the user double clicks on a particular row of that table, the data of that particular test is fetched and displayed on the particular Fetched Data Frames (Figs 4.16, 4.17, 4.18. 4.19)

V. Future Scope

1. The application further could be extended with Artificial Intelligence, so that patients could predict their tentative test results based on previous records.
2. The application could be made more secure using different techniques like blockchain, so that patient's records won't be misused and tampered with.
3. This application can be integrated with health tracking devices like Fitbit. So that pulse rate, breathing rate could be uploaded automatically by detecting these devices.
4. An implementation could be done, which would enable users to upload their imaging tests like CT scans, MRI scans.
5. Modules for doctors can also be implemented, where doctors can supervise the patients' data and could change if any anomalies are found.
6. A new feature that could enable users to book a visual appointment with doctors of the same platform.

VI. Conclusion

So, with the help of a few parameters such as the patient's details, the patient's willingness/patience to upload the data, and some more details we were able to apply processes such as validating and registering people and analyze it. The output provides report records and is able to visualize them with the help of line charts.

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Taking into account all the mentioned details, we can make the conclusion that the Medical Repost Digitization Platform is the inevitable part of the lifecycle of the modern medical institution. It automates numerous operations and enables smooth interactions of the users. Developing Medical Report Digitization Platform is a great opportunity to create a distinct, efficient, and fast delivering healthcare model. Implementation of this platform helps to store all kinds of records. Many clinics have already experienced its advantages and continue developing new report digitization project modules.

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