

SMART DOCUMENT TRACKING SYSTEM

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Abstract—In present days' documentation is very important and at the same time preserving it and its security is more important. As the time passes, the documents increase in number making its searching and tracking difficult and time consuming. Therefore, the proposed project tracks the documents, alerts its unauthorized access, as and when needed by the organization or person. A smart document tracking system is designed in this proposed work. The proposed system is being designed on embedded system and validated its working in the laboratory.

Keywords—Smart Document Tracking System, FRDM-KL25Z, nRF24L01p, accelerometer, mbed and node red.

I. INTRODUCTION

There are myriads of tracking systems. Some are 'lag time' indicators, the data is collected after an item has passed a point using a bar code or choke point or gate [1-3]. The others include are 'real-time' or 'near real-time' like global positioning systems (GPS) depending on how often the data is refreshed. There are bar-code systems which require a person to scan items and automatic identification is possible through RFID system [4-6]. In the current state of art, the tracking consists of both discrete hardware and software systems for different applications.

The bar-code systems are separate from Electronic Product Code (EPC) systems; GPS systems are separate from active real time locating systems or RTLS. A passive RFID system would be used in a warehouse to scan the boxes as they are loaded on a truck - then the truck itself is tracked on a different system using GPS with its own features and software [2-3].

The Smart Document Tracking System (SDTS) can avoid instances like the incident of CBSE (Central Board of Secondary Education, India) Xth and XIIth standard paper leaks which happened on April 7, 2018 resulting in thousands of students having to reappear for these exams, as per the news appeared in the Newspaper, next day. The results of class Xth and XIIth standard examination have serious implications.

Similarly, when companies lose sensitive documents, resulting in loss of hundreds of dollars to replace, or retrieve the file. Thus, by SDTS on files and paperwork with setting up the proper infrastructure, this proposed system can successfully locate files within minutes, reduces the cost, reduces stress, and increases effectiveness.

The SDTS implemented in this work provides various features which outstand it from the existing data management systems. The proposed system implements automatic collection and management of critical data. It also improves the productivity and achieves regulatory compliance. The files'

locations are fixed which helps in reducing the time to fetch them and also errors introduced during their retrieval. In addition, the proposed technique also offers quick and efficient record retrieval, integration and scalability with related business systems, web-based status retrieval, alerts for unauthorized access, multiple uses for many different departments. The system can also be implemented in various organizations including courts, law offices, police stations, financial offices, government agencies, insurance offices, pharmacies, and more.

The project proposed is real time in nature which uses the FRDM-KL25Z and nRF24L01p to send and receive data wirelessly [7-11].

II. PROJECT DESIGN

The proposed project tracks the documents, alerts its unauthorized access, to the authorized person. The SDTS designed in the proposed work performs in following steps:

- i. User authentication.
- ii. Real time tracking of unauthorized access of the document.
- iii. Real time detection of the status of the document.
- iv. Alert system (Node-red).

A. User Authentication

The user authentication system matches the details entered by the user on the webpage with the database of authorized users. If the details match the server displays welcome message and captures timestamp else it displays access denied message and the supervisor can classify it as a case of unauthorized access. The webpage is being designed using software tool called phpMyAdmin [11].

B. Real Time Tracking of Unauthorised Access of The Document

The accelerometer (MMA8451Q, 3-axis, 14-bit/8-bit digital accelerometer) gives the change in movement of the document. The accelerometer will give the information if the document is displaced or not. The accelerometer values are divided into 3 ranges: aligned, slightly tilted and extremely tilted. The status of the document is continuously updated and alerted [8].

C. Real Time Detection of the Status of the Document

The accelerometer data is being sent to the supervisor using nRF24L01p module. It also detects whether the document is

within the permitted area of access. As long as the document is well within the permitted range the system works properly and the nRF module continues to receive the document status. The continuous sending and receiving of the data can be seen with the help of the blinking of the led. As soon as it goes out of range the led stops blinking [8-9].

D. Alert System

The alert system is built using Node-RED. Node-RED is a programming tool for wiring together hardware devices, APIs and online services. In node-red we create a flow that takes input from the microcontroller using serial port and updates real time document status in the dashboard using features like alert and text box and sends email [10].

E. Block Diagram/System Diagram

As shown in figure 1, flow chart of the system;

The user is first authenticated then the document status is sent from FRDM-KL25Z Tx via nRF module to the FRDM-KL25Z Rx. The received status is observed in node-red dashboard and the alert is generated.

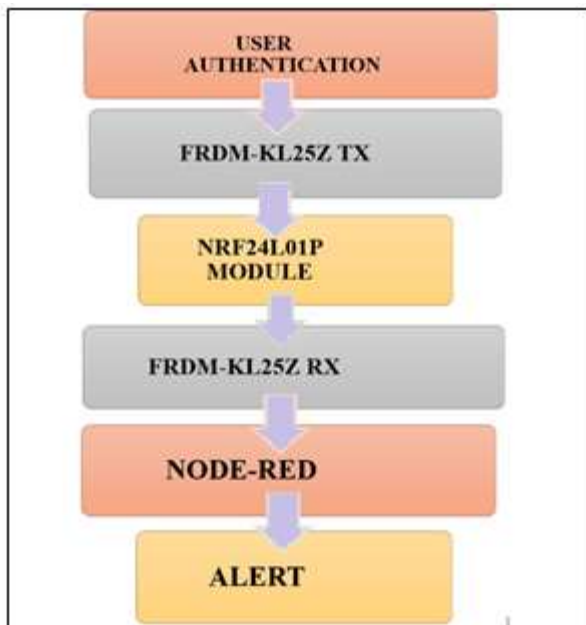


Figure. 1: Flow chart of working of proposed system

F. Algorithm

This algorithm integrates the hardware and software to effectively show the working of Smart Document Tracking system

User Authentication:

Step 1: Create database in phpMyAdmin

Step 2: Design a webpage for user login in php style it in

css.

Step 3: Style it in css.

Step 4: Define 2 cases in process

4.1: if username && password match

Output: Welcome!

4.2: else

Output: Access denied!

Mbed:

TX:

Step 1: Import all libraries and define all the functions

Step 2: Accept input from accelerometer of axes x and y

Step 3: Send this data to the rx, using nrf module

RX:

Step 1: Import all libraries and define all the functions

Step 2: Accept the x and y axes data from the tx

Step 3: Divide the values of the accelerometer in 3 ranges

Step 4:

1.1 If 1st range then display 'aligned'

1.2 Else if 2nd range the display 'slightly tilted'

1.3 Else display 'extremely tilted'

Step 5: Blink LED till there it is receiving data from tx.

Node-RED:

Step 1: Create the flow

Step 2: Accept input from serial port

Step 3: Design dashboard

III. RESULTS AND DISCUSSION

The proposed project was designed, and it implemented document tracking system in real time. The authentication page was implemented in phpMyAdmin, as shown in figures 2 to 7. The FRDM code was written in mbed online compiler. The alert system dashboard was designed in node-red, as shown in figures 8 to 10. In alert system, the text status, as shown in figures 8 to 10, was updated every second and sound alert has a delay of 10 seconds. The alert notification was sent to the authorized person's email id, as shown in figure 11.

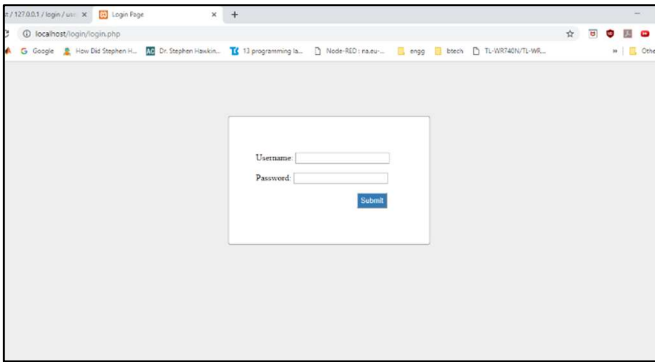


Fig. 2: Authentication page

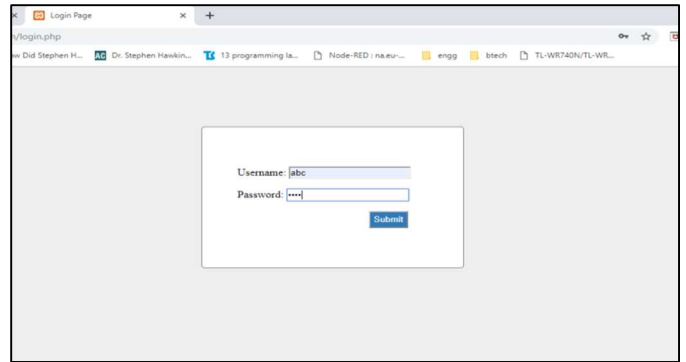


Fig. 5: Authentication page

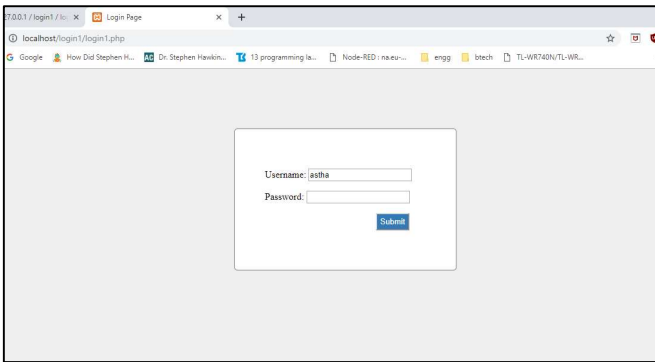


Fig. 3: Authentication page

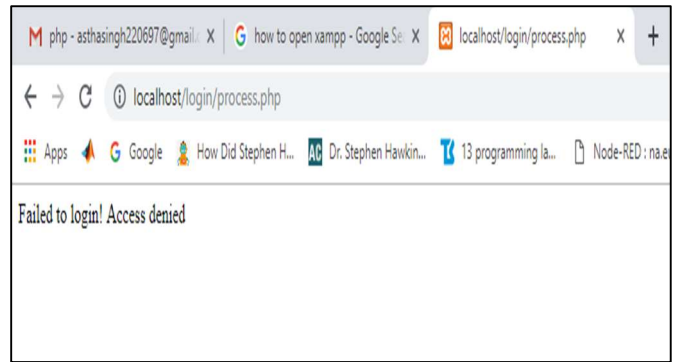


Fig. 6: Authentication page output

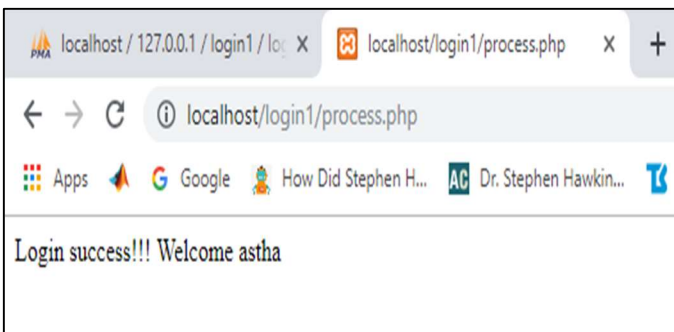


Fig. 4: Authentication page output

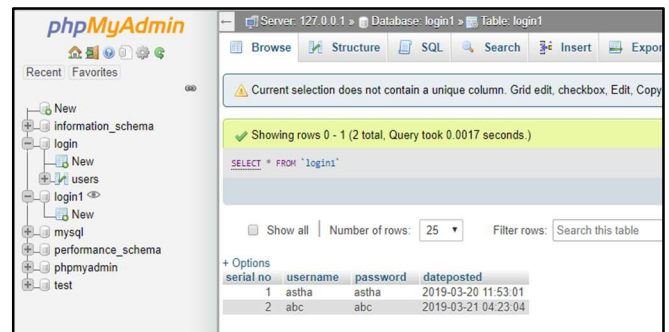


Fig. 7: Database

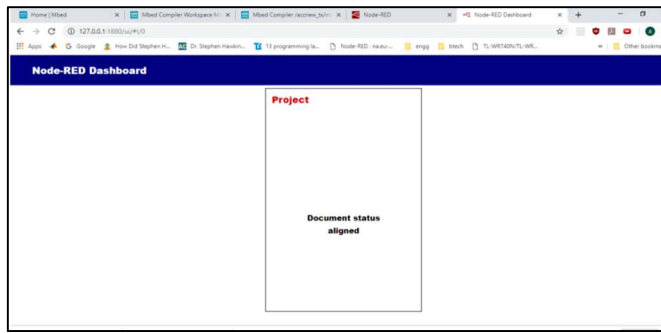


Fig. 8: Node-RED Dashboard (case 1)

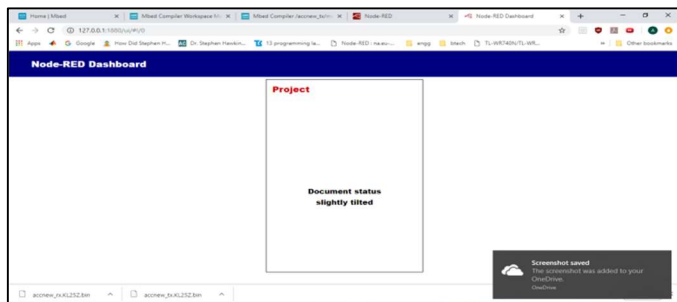


Fig. 9: Node-RED Dashboard (case 2)

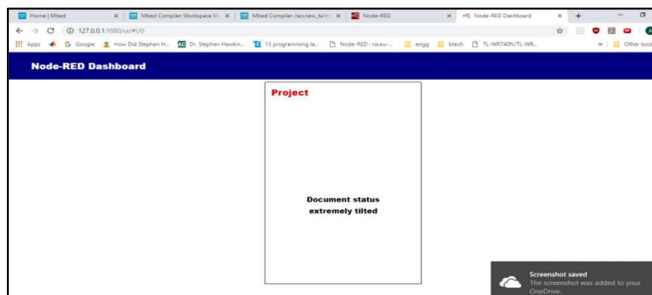


Fig. 10: Node-RED Dashboard (case 3)

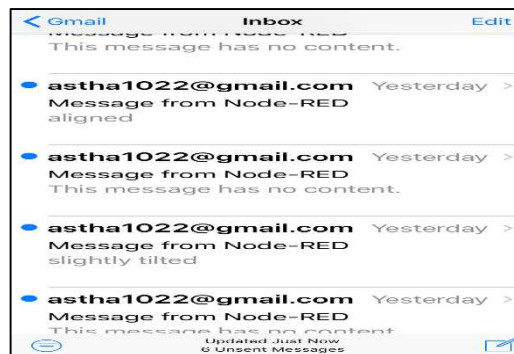


Fig. 11: Alert email

CONCLUSION

The User Authentication was implemented by using a login page created in php format and matching the entered data with phpMyAdmin database of authorized users and warn in case of authorized access. The nRF24L01p module having a range of 5-10m was interfaced with FRDM-kl25z board to detect any change in position or movement of document. The data received by the board was sent serially to node-red dashboard and a real-time alerting system was created. In case of any break in communication between the transmitter and receiver the LED stops blinking and the break can be detected. The future work involves the following: increasing the security of the system, making it more applicable for industrial use.

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