Finger Print Based Intelligent Locker System

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Abstract

The notion behind this article is to develop a prototype which assures fully automated highly secured locker system for the user in commercial centers such as malls, airport, tourist spots, hospitals, education institutions, railway station etc. System assigned to manage an array of lockers which are locked with digital solenoid locks, interaction between user and system is established with key pad and LCD display. Access to the lockers is secured with the deployment of finger print sensor to authorize it. System is fully automated with Arduino controller to avoid manual labour for monitoring and fee collection, RFID based prepaid card are provided to do initial registration and auto detection of fee collection. For validation, system is tested in real time by considering a locker system with (two* three) array of lockers that is six lockers, in that three slots were left vacant for user and user is availing the slot for three hours at a tariff of 20 rupees per hour. The total time for new registration completes in 115 seconds which is comparatively less time compared to existing automatic locker system. System offers simple cost effective, fully automated and highly secured locker system for commercial centers; hence system will be fruitful for both the users as well as service providers.

Keywords. RFID, Arduino, finger print Sensor, locker system, automatic, prepaid card.

1.   INTRODUCTION

It seems to be hectic tasks for people wonder with their luggage's in their travel. Hence it is necessary to provide a storage space for them to accommodate

their belongings safely. Not only for the traveller, even its required in places such as such as malls, tourist spot, education institutions, medical centres etc. it will greatly reduce burden of the people in carrying their belongings all the way they are roaming, this eases their work.

At the same time storage space can't be provided at free cost, in this world where even virtual cloud storages are in rent. But this process will require manual monitoring for allotment of lockers and payment collection. As manual labour seems to be more expensive, hence it is indispensable to automate the complete process.

In this process, concern priorities on the security aspect in accessing the locker and simple user friendly to the users. In the point of storage space provider, the system to has to be economical and fully automated.

2.   LITERATURE REVIEW

The concern of the article [1,6] was to assure the security in accessing the lockers, for this it has adopted face recognition technique for providing the required security, which seems to offers less degree of accuracy compared to finger print authorization. There were practical difficulties in revealing their facial details removing the mask in this COVID-19 pandemic situation. Moreover, it hasn't concentrated on fee collection.

Article [2,7] was deployed in rural area for logistic purpose, here process seems to be one way the, logistic will be placed by the service provider in one common point in rural area, reducing the delivery man work, the consignment details and secret code will be reaches the customer via mobile applications, here again security level and it cannot be used in other locations where user have to store their belongings.

System [3,8] was developed keep students as the end user in education institution where they can store their material instead carry daily to institution, system was developed with IoT and Bluetooth platform which offers a remote-control operation via mobile applications, again system was developed for a single specific user (students), under this condition payment collection was not mandatory in many institutions, so it hasn't focused on fee collection from the user.

Article's [4,9] concern was only with assuring the at most security to the locker, it is provided with alert system if any one tries to open the lock in unauthorized manner, it will activate the alter system and it is provided with a camera to take stills of person who is mishandling the system, again this system also haven't designed for fee calculation and collection.

Paper [5,10] disclose the complete survey on smart locker, it has covered various technology used in designing a smart locker system, it also display the different applications where smart locker can be employed as it was portrait in figure 2.1. The finds its utility in wide applications such as health, education, commerce, banking, condominium etc.
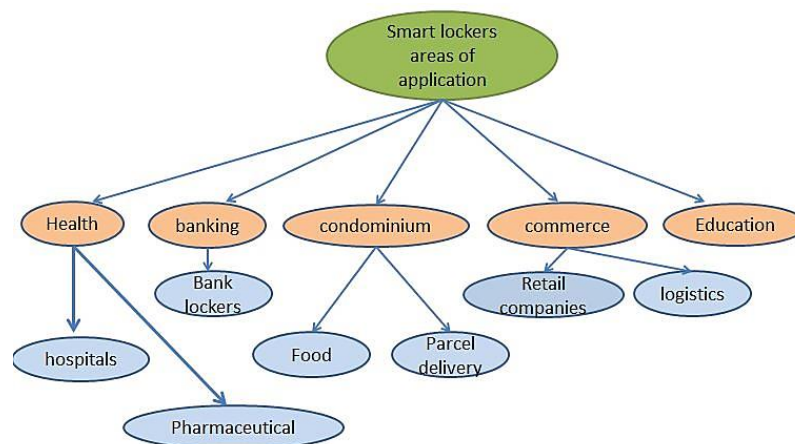

Figure. 2.1. Utilites of smart lockers.

All the above author's concern was to develop system keeping end user in mind and to offer them secured and user-friendly system. But system should have to be of mutual benefit to user as well as storage space provider. Hence it becomes indispensable to develop a system of high security, cost effective, fully automatic in monitoring and fee collection.

Few existing system deployed in various different applications are showcased in figure 2.2

Figure 2.2 a. Pharma collect b. lockers in hospital c. laundry lockers

3. PROPOSED METHODOLOGY

Figure 3.1 showcase the pictorial representation of the system what proposed it house finger print sensor to provide high degree authorization to the user, key pad act as tool to simplify the interaction between user and system. System holds an array of (2*3) solenoid digital lockers which open and close the individual locker units, controller interact with user via LCD display, it displays the necessary details to user and instruct the process to followed to move on to next stage.

Batteries are provided to power the controller and solenoid lockers; Arduino Uno controller is being used to manage the entire process in and payment collection. RFID scanner and RFID prepaid cards are provided for each locker separately and are used for registration process and auto fee payment.
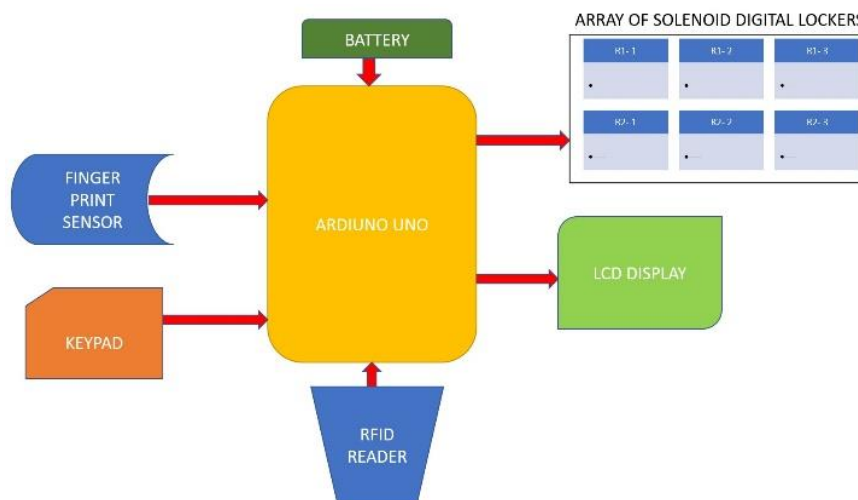

Figure 3.1. Pictorial representation of Proposed Methodology

The Figure 3.2 display the pictorial process flow image, the process house two parallel process of new registration and process involved with existing user for accessing the locker. Once the user pressed the enter key in the keypad, first query will be posted new registration if user enter "YES" then new registration process will be initiated, if user enter "NO" then another process to access the locker will be initiated.

If new registration is initiated by the user, then user will be asked to scan the prepaid RFID card, when details are stored, tariff will be displayed via LCD display. If user accepts the tariff through key pad, available slots (lockers) will be

displayed to user, so that they can select number lockers as per their requirement. Once slot is selected by the user, user will be asked to scan their finger print, finger print data will be mapped with the slot selected and if registration is completed it will move on to next level.

Controller will actuate particular solenoid lock to open the locker, in case if "NO" was feed by the user at initialization it will process another parallel process
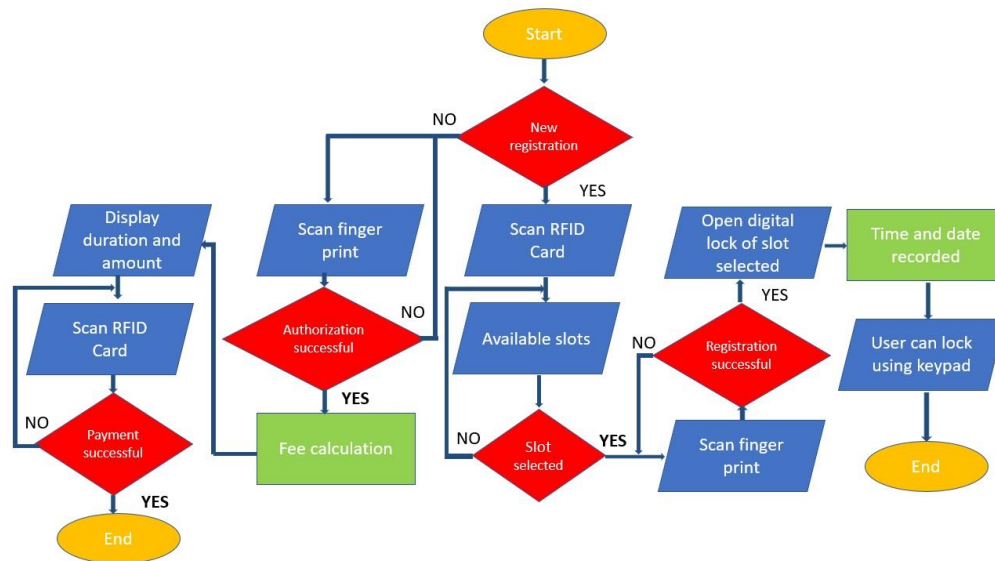
for existing user. User will be asked to scan the finger print for authorization, if authorization was successful, it will retrieve details mapped with particular finger print and calculate the fee to be collected based the duration of hiring. After manipulation fee detail will be displayed to the user. Next user will be asked to scan the RFID prepaid card to initiate the payment process, in this process respective fee will be auto detected from the prepaid card and once the fee collection was successful, it will display payment successful thankyou with that this process complete.

Figure 3.2. Process flow chart of Proposed Methodology

Figure 3.3 - the hardware interface displays clearly specific pin which are initialized as input-ports and output –ports, nearly seven pins are set as output ports, among which six pins are deployed for controlling the six solenoid locks, one pin is assigned for LCD display through which controller interact with user.
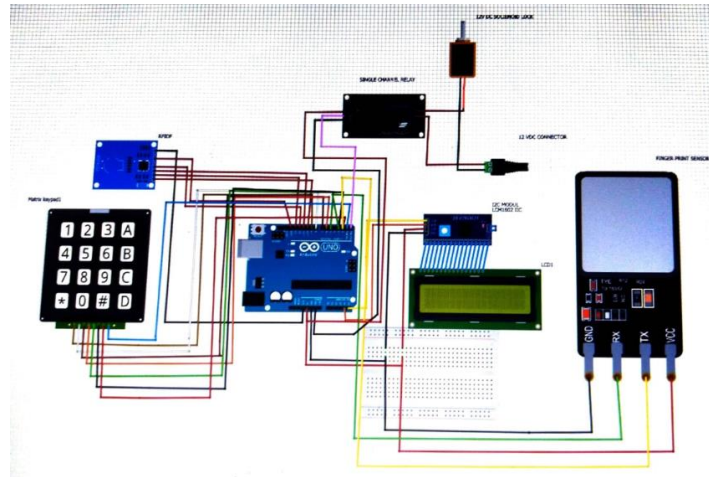
Figure 3.3. Hardware circuit interface

Three pins are configured as input-ports, among them one pin was assigned for keypad, via which user interact with the controller. One pin is configured for finger print sensor, through which finger print details are feed to the controllers. One pin is assigned for RFID reader which is used for initial registration and for fee collection. Power supply for controller is given at Vcc and Gnd of controller. Along with that power supply from battery has to be provided to solenoid lockers.

4. RESULTS AND DISCUSSION

For validation, system is tested in real time by considering three slots are vacant for user and user availing the slot for three hours at a tariff of 20 rupees per hour. Table 1 showcase the details displayed as per process flow in LCD display and its corresponding inferences

Table 1: Outcomes and its inferences.

LCD Display	Inference
	After user feed as new registration via keypad system initiate the registration process by asking to scan the RFID card, details of card will be recorded future processes.

Once the RFID card are registered tariff details will be displayed here, we have considered twenty rupees in Indian currency is charged for 1 hour and was fixed as the minimum base value to avail the lockers. Also based the duration of availing the locker the fee will be calculated.

Next to tariff display if user accepts to pay via keypad available slots will be displayed, so that user can select the locker he wants via key pad.

Once locker is selected finger print of user is registered with that particular locker, finger print offers unique authorization for user, thereby ensures the high security to the user and increase the reliability of the system.

If the finger print is feed via sensor got successfully registered with that particular selected locker, in LCD display following statement will be displayed "FINGER PRINT REG SUCESSFUL"

If fee amount to be collected from the user if he select the option "NO" for new registration at the time starting, this process is initiated for user who have already registered and kept his belongings in the locker assign to user, it will first ask to enter the locker details, then it will ask for finger print authorization, if authorization was successful then it will ask to scan the RFID card.

Once prepaid RFID card is scanned then based on the fee calculated, amount will be auto detected from the card. If the fee collection was successful then it will be displayed as "PAYMENT SUCCESS THANKYOU" entire process complete with this.

5.   CONCLUSION

The System is validated to function in a secured way for a locker system with (two* three) array of lockers that is six lockers. Total new registration completes in 115 secs which is comparatively less time compared to existing automatic locker system. System seems to be user friendly in selecting lockers and payment processes. From the point of component selection and process involved system is economical, system also eliminate manual labour in managing the locker system and collection of payment.

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