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Development of Biometric-Based Secure Public Locker With Automated Payment and Time Tracking

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***Abstract*- Development of a Biometric-Based Secure Public Locker with Automated Payment and Time Tracking.**

The suggested Biometric-Based Secure Public Locker Systems offer an intelligent and secure method for storing luggage at public locations like bus and railway stations. It uses fingerprint authentication to ensure that only the authorized user can access the locker. This makes things safer. Lowers the chance of someone stealing your stuff or you losing your personal belongings. The system works by itself so it does not need someone to watch over it. People who use it can keep their luggage safe by putting their fingerprint in the system to lock the compartment where their luggage is stored. The luggage system is really good because it helps keep your belongings safe. A timer starts to monitor the length of time it is used. The system charges 10 rupees for each hour based on how long it is used. When you come back to get your stuff you will need to use fingerprint verification to open the locker. The total amount you have to pay is displayed on the LCD screen. After you pay at the note counter the locker will open by itself. This makes the locker system easy to use. It saves you time. The fingerprint verification and automatic opening of the locker make the system very efficient and easy to use for the user.

Keywords- Arduino Uno, Fingerprint Sensor, IR Sensor, Solenoid Lock, 12V AC to Dc Adapter.

I INTRODUCTION

Studies show that using biometric locks instead of traditional mechanical locks makes things a lot safer. Digital and biometric locks really help to keep people from getting in when they are not supposed to. This is because digital and biometric locks are biometric locks that use special features to secure things. Digital and biometric locks make it easier for people to use locks. That is a big benefit of digital and biometric locks. Overall digital and biometric locks are a choice because digital and biometric locks provide a lot of security. However, most existing systems are tailored for bank lockers, office cabinets, or home security, whereas public luggage storage solution featuring integrated time tracking and automated payment have received far less attention.

Rohit R. Nair et al. [1]

One area of research centers on locker systems that utilize biometric authentication. Numerous studies indicate that fingerprint verification is one of the most practical and reliable methods for locker access due to the uniqueness, resistance to duplication, and ease of fingerprints. Recent studies on bank lockers and smart lock systems have shown that biometric authentication offers superior security compared to traditional key-based or password-based methods. Other research is looking at fingerprint recognition. Using it with RFID cards or letting administrators override the system to make it more flexible and easier to control. These systems are really good at keeping people who are not supposed to be from getting in and they help people trust the system when it is used in places that need to be very secure.

Ravi Kumar et al. [2]

Some other smart locker systems that people have written about use RFID cards send notifications to peoples phones have keypad passwords and use the internet to watch what is going on to control who can get in. These systems are convenient. People can manage them from far away but they also have some problems. For example RFID cards can get lost or someone can make a copy of them people can forget their passwords. Give them to someone else and sometimes people still have to pay with cash. These problems mean that these systems are not very good for places, where the system needs to be easy to use, secure and able to work by itself.

J. Thirumalai et al. [3]

New studies are showing that biometric authentication systems, like fingerprint recognition are becoming more important, for keeping things secure. Fingerprint recognition is a choice because it is accurate does not cost too much and is easy to set up. Fingerprint recognition systems are growing in significance for access applications because fingerprint recognition is a good

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way to keep things secure. Research carried out by A. K. Jain and his colleagues. Reference [4] points out that biometric systems provide enhanced security compared to conventional authentication methods by utilizing distinctive physiological characteristics unique to each person. This makes them well-suited for applications requiring strong identity verification.

In addition to biometric methods, smart locker systems that use IoT technology have gained interest due to their capacity to enable real-time monitoring and remote access. As K. Ashton [5] said, IoT is really important, for linking devices and making security systems work better. Some locker systems that use IoT let people check who accesses them from away. These systems often need internet to work and that can make them harder to set up and fix.

So automation using embedded systems is really helping to make security systems more reliable. A study by M. Margolis [6] found that using microcontroller platforms like Arduino is a way to create low-cost and adaptable embedded solutions. These systems can put together parts like sensors, displays and actuators to do tasks on their own with very little help from people. The thing is, these automation systems often do not have features like billing and time-tracking built in which is really important for things like luggage lockers that are used by the public. Automation systems like these need to have these features to be really useful for services, like luggage lockers.

Security systems have gotten a lot better lately. We need to use ways to check who people are to make things safer. D. Maltoni [7] and his team think that using fingerprint recognition with security steps makes it really hard for someone to break in. They make it harder for the wrong people to get in. D. Maltoni and his team found out that fingerprint systems are very good at telling who people are when they are used correctly. Fingerprint systems are also very reliable which makes them great, for life uses like keeping storage systems safe. Fingerprint recognition is a way to keep things safe because it is hard to fake someones fingerprints.

II METHODOLOGY

The system they are talking about has a lot of parts that work together. It has things like the hardware and the software. They all have to work together just right. The system only works when people use it. It responds automatically.

Each part of the system does its thing. Like the part that checks who the user of the system is. The system has a part that keeps track of time. The system also has a part that handles payments, for the user of the system. The part that locks and unlocks. The system works smoothly because of this. If something goes wrong with the system it is easier to find out what is wrong, with the system. The parts of the system talk to each other in a controlled way. This happens because the system has a set of rules that were programmed into the system. The system follows these rules. That is why the system works in a controlled way. So everything works together well.

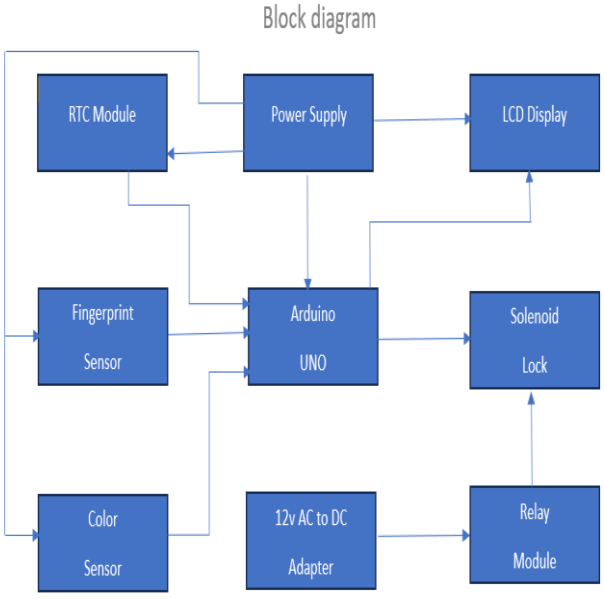
To make sure the system works correctly it was built with programming that keeps all the parts working together properly. The brain of the system, which is called a microcontroller is always checking the information it gets from sensors like the part that reads fingerprints and the part that detects when something is near. It looks at this information. Then decides what to do next.

The system tells the user what is happening at each step using a screen to show them what is going on. This makes the system easy to use and understand. The system is made with parts and uses less energy. This makes it practical, for use and many people can afford it. The system is designed to be cost-effective. It helps that it does not consume a lot of power. This way it can be used in real-life situations by a number of users.

A. HARDWARE COMPONENTS

The microcontroller is really important for the system. It does a lot of things to help the system work properly. The microcontroller is, like the brain of the system. It is like the brain of the system. It controls all the other parts. It can be something like an Arduino, which's a special kind of computer that can be used to control other things. The microcontroller looks at the information, from the fingerprint sensor keeps track of time figures out how much to charge and shows the user what is happening on a screen. In terms the microcontroller is what makes the system work.

Since each person fingerprint is unique this is a way to make sure only the right people can use the system. It provides a way to control who can use the system and it makes sure everything runs smoothly and according to plan based on who pays to use it. The fingerprint sensor is a part of the locker system. It is really helpful because it keeps the locker system secure. The fingerprint sensor is what helps to keep everything in the locker system.



The LCD screen displays messages. These messages include things, like prompts to register your fingerprint. It also shows you the status of your authentication. You can see what time you used it. The system they are talking about uses a screen to show people things like how much they have to pay if the locker is open or not and messages that say things like "You Paid" and "Your Locker Is Open". These messages are helpful because they make it easy for people to use the system and they make using the locker simple to understand.

They have a clock that keeps track of how long people use the locker and it figures out how much they have to pay based on

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how long they used it. When people pay the system checks to make sure the payment is okay. Then it opens the locker by itself. The system uses a computer to control all the parts, like the fingerprint reader, the sensor that detects people, the screen, the relay and the lock so everything works together safely and reliably. A regulated power supply helps to manage power, for all parts. The IR sensor looks for objects to see if there is luggage, in the locker.

B. SYSTEM WORKING PROCEDURE

The new public locker system that uses fingerprints to keep things starts working when you first put your fingerprint in the system. This fingerprint enrollment process is the beginning of how the public locker system worksThe public locker system uses fingerprints, for security. When you use it you first touch the fingerprint sensor. The sensor takes a picture of your fingerprint. Turns it into a digital code. This code is used to unlock the locker. The fingerprint scanner makes sure only you can access your locker. This template is subsequently stored in the system's memory for future authentication process. When you are done signing up you can use the locker to store your luggage. The locker is where you put your luggage inside so you can store your luggage in the locker. Close the door. The locker will lock by itself to keep your stuff safe. At the time a timer starts and this is when you begin using the locker. You can store your luggage in the locker. The locker will keep it secure.

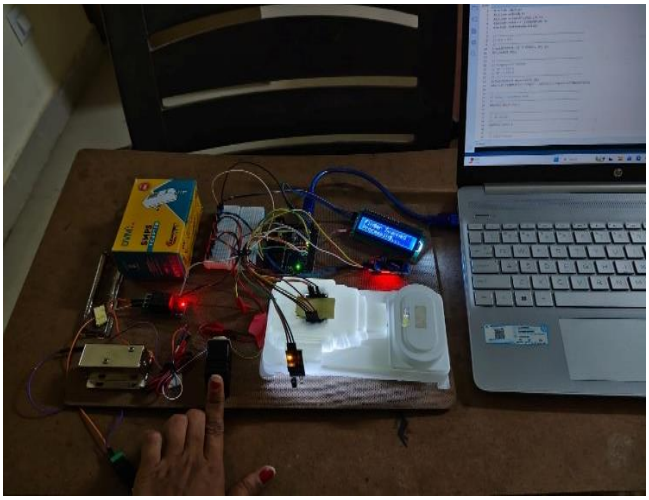
The system always keeps track of how the locker is occupied. When people return to collect their bags they need to put their finger on the scanner. The machine then checks their fingerprint to make sure it matches the one it has on file. This is done by comparing the two fingerprints. The system uses the fingerprint they provided earlier. This way it knows it's really them. It looks at the print closely to see if it matches. If the fingerprints match the system lets the user proceed to the step. The system only allows the user to move on if their fingerprint is a match.. If the fingerprint does not match the lock stays locked.

When the fingerprint is verified the system figures out how much the user has to pay based on how they used the locker. There is a timer that keeps track of how the locker is being used. The system uses this time to calculate the amount the user has to pay. The locker costs 10 rupees, for every 30 minutes that it is used. The user has to pay this amount when they are done using the locker. The calculated amount appears on the LCD screen, promoting the user to insert payment into the payment unit or note counter. Once the system verifies that the full payment has been received, it displays a "Payment Successful "message on the LCD. Finally, the microcontroller engages the electronic lock to open the locker, enabling the user to safely retrieve their luggage. The methodology of the proposed system comprises hardware design, Software development, and the functional integration of different modules. The complete operation of the system is based on s sequence of user interactions and automated control responses.

The system's software is implemented using embedded C within the Arduino environment The program is engineered to manage all system functions, such as fingerprint enrollment, authentication, time tracking ,and payment verification. Logical conditions and control statements manages various scenarios ,including successful access, failed authentication, and incomplete payments. The software is always reading the sensor input. It then processes this information. Comes up with outputs. These outputs are used to control the locking mechanism and display messages on the LCD. This means the software works in time. It automates things. Makes sure the locking mechanism and the LCD and other parts of the system all work together correctly. The software does this by managing the locking mechanism and showing messages, on the LCD. This is how the systems different parts work together smoothly with the software making sure everything happens at the time.

III RESULTS AND DISCUSSIONS

The public locker system that uses information was made and it works really well. It was built with an Arduino UNO, a fingerprint sensor, an RTC module an LCD display, a relay module, a solenoid lock, a color sensor and an IR sensor. All the parts of the system were put together in a way that makes sense. The whole thing does what it is supposed to do. When we tested the locker system we found out that the public locker system can do a lot of things. The public locker system can sign people up with their fingerprints. The public locker system checks if the fingerprints are real. The public locker system keeps track of time. The public locker system finds notes. The public locker system calculates how much people have to pay. The public locker system also controls the lockers.



The fingerprint sensor is a way to keep things safe. It works by saving the fingerprint information of the user when they first sign up. Then when the user wants to get in the sensor checks their fingerprint. Makes sure it matches the one it has on file. If the fingerprints match then the locker will open. This way people who are not supposed to get in cannot get in. The fingerprint sensor always seems to work so it is a good choice for keeping the public lockers safe. The fingerprint sensor is really good, at its job the fingerprint sensor makes sure everything is secure.

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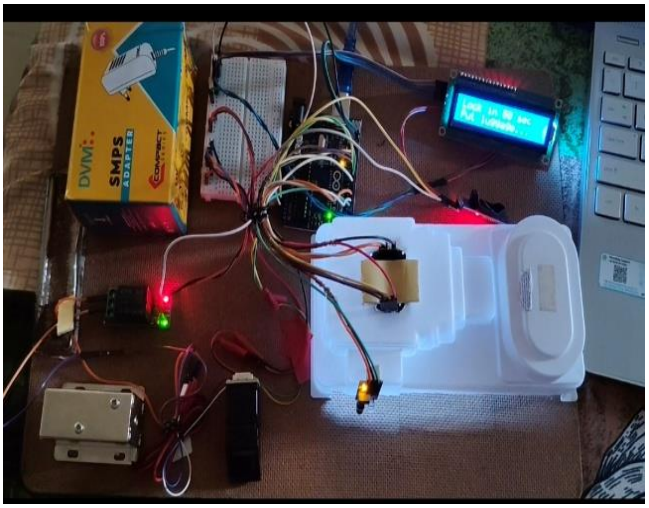

The RTC module is good, at keeping track of how the locker's being used. It helps figure out how much people have to pay based on their locker usage. The color sensor and IR sensor work together to identify the type of money being used. They can tell bills apart by the colors they detect. The LCD screen shows the amount of money being taken out so people can see what's happening. The relay module and solenoid lock work together to unlock the locker. Only after the fingerprint sensor confirms it's okay and the payment has been made. This public locker system that uses information and all these parts works well and is easy to use.

It uses fingerprint scanning to make sure only the right person can get in. You also have to pay based on how you use it and it locks up automatically. This makes the biometric locker system a great choice for places, like railway stations, bus. Shopping malls where people need to store their bags for a little while. Maybe one day they will add ways to pay online and use a phone app with the locker system.

IV CONCLUSION

The public locker system that uses security was designed and built to give people a safe and easy way to store their luggage. This system uses fingerprint authentication. It also keeps track of time and it can process payments and it can lock automatically. The biometric-based secure public locker system makes sure that only the right people can get into the lockers. The biometric-based secure public locker system is great for places like railway stations and bus terminals and shopping malls and airports.

The biometric-based secure public locker system is a solution for storing luggage because it is easy to use and it is reliable.

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