CoMBInES
CONFERENCE ON MANAGEMENT, BUSINESS, INNOVATION, EDUCATION AND SOCIAL SCIENCES

Volume 1 No 1 (2021)

Received : February 01, 2021
Accepted : February 05, 2021
Published : February 24, 2021

Conference on Management, Business, Innovation, Education and Social Science
https://journal.uib.ac.id/index.php/combines

Smart Key Based Locker Desıgn Wıth Arduıno

Stefanus Eko Prasetyo[1], Jonathan Felix Andrianto[2]
stefanus@uib.ac.id[1], 1932006.jonathan@uib.edu[2]

[1]Faculty of Computer Science, Internasional Batam University, Batam, Indonesia
[2]Faculty of Computer Science, Internasional Batam University, Batam, Indonesia

Abstract

A locker is a small cupboard that functions as a temporary storage area for items such as bags, wallets, and others. Lockers are widely used, especially in public places such as swimming pools, tourist attractions, and even factories where we are not allowed to carry goods for safety and security reasons. Unfortunately, there is one drawback of lockers, namely the locking feature still uses keys in general which are prone to loss. To reduce the risk of loss, this research was conducted to implement an IoT (Internet of Things) system on a locker using the "Blynk" application and Arduino media devices to control the locker without having to fear losing keys (Doshi et al., 2017).

Keywords: *Arduino, Internet of Things, Blynk.*

Introduction

The majority of the people in this world is not familiar with the term "Internet of Things". While IoT have been around since the 70s, it was previously known as "Embedded Internet". Simply said, IoT or Internet of Things is made to make human life much easier. Basically, IoT in principal is connecting mechanical or electrical device in a network so that they can communicate with each other, usually with the help of a microcontroller. Even though human use cellphone or computers in their daily life, connecting devices through Internet of Things is still unknown to them (Media's et al., 2019; Villamil et al., 2020).

So what if we use and implement this IoT into basic objects that are widely used in human life? For example we can use IoT in a locker system. Imagine going to your company that doesn't allow the use of any form of mobile phone, then you go to your locker to put your phone. Somehow, you loss your key during your work and you cannot find it anywhere. With the use of simple IoT, we can make things like "keyless locker". By using this keyless locker, it eliminates the possibility of losing the key to your locker (Sharma & Goen, 2018; Venukumar & S, 2016).

By implementing IoT in human life, there will be a lot of things that can be done automatically without human interaction or just a single press of button from a smartphone. Imagine what possibilities we can achieve by implementing this into our daily life. Automatic door lock, motion or thermal sensors, or maybe even something as simple as an automatic touchless handsanitizer. However, the majority of people do not understand or even sceptical with the use of automated devices in their daily lifes (Al-Mutawa & Eassa, 2020; Chioran & Valean, 2020).

This project is aimed to eliminate the problems that we encounter when using a key to unlock a locker door. Further improvement of this project is very possible with the advancement of technology. So this is not a static and rigid tool that dies with time, in the future we can add new features and attachment to the tool (Bohara et al., 2020).

Literature Review

Internet of Things

The Internet of things describes the network of physical objects that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet (Villamil et al., 2020).

Arduino

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices . Its hardware products are licensed under a CC-BY-SA license, while software is licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially from the official website or through authorized distributors (Barrett, 2020a, 2020b).

Locker

A locker is a small, usually narrow storage compartment. They are commonly found in dedicated cabinets, very often in large numbers, in various public places such as locker rooms, workplaces, middle and high schools, transport hubs and the like. They vary in size, purpose, construction, and security.

Relay

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.

Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

Solenoid Lock

A solenoid from the Greek σωληνοειδής sōlēnoeidḗs, "pipe-shaped" is a type of electromagnet, the purpose of which is to generate a controlled magnetic field through a coil wound into a tightly packed helix. The coil can be arranged to produce a uniform magnetic field in a volume of space when an electric current is passed through it. The term solenoid was coined in 1823 by André-Marie Ampère to designate a helical coil. In the study of electromagnetism, a solenoid is a coil whose length is substantially greater than its diameter. The helical coil of a solenoid does not necessarily need to revolve around a straight-line axis; for example, William Sturgeon's electromagnet of 1824 consisted of a solenoid bent into a horseshoe shape (Sharma & Goen, 2018).

Research Method

In a school of more than 200 students, each students are given their own locker and locker key. This helps them put their belongings such as study books, notes, and even laptops or other things that can help and enhance their ability to study. This locker is placed in the hallway in front of every classroom so that the students can access it easily and in no time. This helps minimize the burden that the students have by leaving the books tha they do not need to take home in their locker.

Each month, an average of 2-3 students report to their teacher that they lost their locker keys. The reasons range from forgetting where they put it, fell off in public transport, or even stolen and hidden by their own classmates. This is a very inefficient way of handling things because now the school need to charge the parents of the responsible students some mone in order to make up for the loss of their keys. And the school needs to frequently requests to make some duplicate keys everytime a student lose it.

Now, imagine this happening in a company of more than 1000 people working everyday, 3 shifts of work, 24 hours non-stop. Especially when the company excels in outdoor works such as shipbuilding docks, factories, fabrication plants. This will increase the risk of losing keys drastically especially for companies where the workers do heavy labours such as in fabrication or other metalworks.

With the help of this smartlock device, we can negate the risk of losing keys because we are not carrying any key at all. The workers can ask the admin attending the locker system to unlock his locker everytime he wants to take or put something in it. The admin then controls the corresponding locker to open or close via a smartphone, tablet, or even a computer. This will help the company to avoid troublesome management everytime a worker lose his/her key at work.

Results and Discussion

When implemented, we can connect every locker room to a solenoid doorlock that replaces the old mechanical lock. The workers will not have to be afraid to lose their keys anymore and the company will not need to deal with problems that occur when a key is lost. The locker system will be controlled with a microcontroller that is connected to the internet via a wireless Wi-Fi connection. And the locker will be supplied with the power of and accumulator or any other rechargable power source.

When the worker requests the admin to open his locker, the admin will command to open the corresponding locker via a "Blynk" application that is already

installed in a company tablet. The command to open the locker will be transmitted from the application to the Blynk server on the internet which then receives it. The server the proceeds to tell the connected microcontroller to discharge an ouput signal from it's assigned output digital pin.

The digital pin then transmit a weak electrical current of low voltage that controls a relay to activate. When activated, ther relay will connect the solenoid lock to a power supply. The solenoid lock then activates after receiving power from the supply. When the admin switches it off, the output signal will be gone and the realy deactivates cutting the power to the solenoid lock.

This system is aimed mainly to a big company or organization that have a lot of members. Usually, a big company already have a backup power source like from a generator set to avoid problem when encountering a blackout. This generator set also helps the system by making the Wi-Fi stays online so that the locker system will always be active at all time. Even when all power source is gone, the system will be in a locked state so that the items inside the lockers will still be safe. An emergency button can be installed in time of disaster to force open the lockers.

Conclusions

This system will be the ultimate countermeasure for the problem of losing keys in a mechanical locker system. This system is also subject to further improvements and modifications that may be added in the future when needed. Improvements to this system can be done in complex or simple way. With this, it is hoped that this system will help to achieve more that it's current goal right now to help ease the life of human especially workers in their company.

References

Al-Mutawa, R. F., & Eassa, F. A. (2020). A smart home system based on internet of things. *International Journal of Advanced Computer Science and Applications*, *2*. https://doi.org/10.14569/ijacsa.2020.0110234

Barrett, S. F. (2020a). Arduino I: Getting Started. In *Synthesis Lectures on Digital Circuits and Systems* (Vol. 15, Issue 1). https://doi.org/10.2200/S01001ED1V01Y202003DCS058

Barrett, S. F. (2020b). Arduino II systems. *Synthesis Lectures on Digital Circuits and Systems*, *15*(2). https://doi.org/10.2200/S01024ED1V01Y202006DCS059

Bohara, B., Maharjan, S., & Shrestha, B. R. (2020). IoT based smart home using blynk framework. In *arXiv*.

Chioran, D., & Valean, H. (2020). Arduino based smart home automation system. *International Journal of Advanced Computer Science and Applications*, *11*(4). https://doi.org/10.14569/IJACSA.2020.0110410

Doshi, H. S., Shah, M. S., & Shaikh, U. S. A. (2017). INTERNET of THINGS (IoT): INTEGRATION of BLYNK for DOMESTIC USABILITY. *Vishwakarma Journal of Engineering Research (VJER)*, *1*(4).

Media's, E., . S., & Rif'an, M. (2019). Internet of Things (IoT): BLYNK Framework for

Smart Home. *KnE Social Sciences*, *3*(12). https://doi.org/10.18502/kss.v3i12.4128
Sharma, A., & Goen, A. (2018). Smart Home Security System. *2018 International Conference on Advanced Computation and Telecommunication, ICACAT 2018*. https://doi.org/10.1109/ICACAT.2018.8933780
Venukumar, J., & S, N. (2016). Arduino Based Door Access Control. *International Journal of Research in Advent Technology*, *4*(8).
Villamil, S., Hernández, C., & Tarazona, G. (2020). An overview of internet of things. *Telkomnika (Telecommunication Computing Electronics and Control)*, *18*(5). https://doi.org/10.12928/TELKOMNIKA.v18i5.15911