

SpringerBriefs in Applied Sciences and Technology

Muhamad Husaini Abu Bakar ·

Tajul Adli Abdul Razak · Andreas Öchsner *Editors*



IT Applications for Sustainable Living

**SpringerBriefs in Applied Sciences
and Technology**

SpringerBriefs present concise summaries of cutting-edge research and practical applications across a wide spectrum of fields. Featuring compact volumes of 50 to 125 pages, the series covers a range of content from professional to academic.

Typical publications can be:

- A timely report of state-of-the art methods
- An introduction to or a manual for the application of mathematical or computer techniques
- A bridge between new research results, as published in journal articles
- A snapshot of a hot or emerging topic
- An in-depth case study
- A presentation of core concepts that students must understand in order to make independent contributions

SpringerBriefs are characterized by fast, global electronic dissemination, standard publishing contracts, standardized manuscript preparation and formatting guidelines, and expedited production schedules.

On the one hand, **SpringerBriefs in Applied Sciences and Technology** are devoted to the publication of fundamentals and applications within the different classical engineering disciplines as well as in interdisciplinary fields that recently emerged between these areas. On the other hand, as the boundary separating fundamental research and applied technology is more and more dissolving, this series is particularly open to trans-disciplinary topics between fundamental science and engineering.

Indexed by EI-Compendex, SCOPUS and Springerlink.

Muhamad Husaini Abu Bakar ·
Tajul Adli Abdul Razak · Andreas Öchsner
Editors

IT Applications for Sustainable Living

Editors

Muhamad Husaini Abu Bakar
Malaysian Spanish Institute
Universiti Kuala Lumpur
Kulim, Kedah, Malaysia

Tajul Adli Abdul Razak
Malaysian Spanish Institute
Universiti Kuala Lumpur
Kulim, Kedah, Malaysia

Andreas Öchsner
Faculty of Mechanical Engineering
Esslingen University of Applied Sciences
Esslingen am Neckar, Baden-Württemberg
Germany

ISSN 2191-530X ISSN 2191-5318 (electronic)
SpringerBriefs in Applied Sciences and Technology
ISBN 978-3-031-40750-5 ISBN 978-3-031-40751-2 (eBook)
<https://doi.org/10.1007/978-3-031-40751-2>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2023

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Contents

Smart Home Door Lock Alarm System	1
Ahamad Zaki Mohamed Noor, Farhan Raeed Mohd Azri, Mohd Fahmi Anuar, Dona Emira Heinko Dona, Aiman Azim Azmi, Mohammad Azim Hamzah, and Fairul Azni Jaafar	
Development of an IoT-Smart Parking Mall Sensor Using Blynk and ThingSpeak	11
Ahamad Zaki Mohamed Noor, Muhammad Zahid Mohd Kamil, Nor Hanis Najeeha Mohd Hisban, Nurul Najwa Mohd Anuar, Siti Nurlina Mohd Khairudin, and Fairul Azni Jafar	
Development of a Smart Travelator Using Blynk and ThingSpeak for Monitoring Customer’s Temperature	17
Ahamad Zaki Mohamed Noor, Herroney Ryan Herman, Khairi Juwaidi Mansor, Anis Sofi Ahamad Salleh, Nur Syakinah Muhamad Fauzi, and Fairul Azni Jafar	
Development of Smart Agriculture (Smart Hydroponic) to Monitor Soil Humidity Level	25
Ahamad Zaki Mohamed Noor, Muhammad Shahimi Dzulkafle, Najib Mohamad Bohri, Muhamad Haikal Mohd Khaireez, Siti Sarah Jupri, and Muhammad Hafidz Fazli Md Fauadi	
Earthquake Monitoring and Detection Using the Internet of Things as Communication Protocol	35
Ahamad Zaki Mohamed Noor, Muhammad Helmi Jasni, Mohamad Khairul Amirin Mohd Yusoff, MimiYana Mohd Ghazali, Alya Athirah Mohd Fadzil, Nurul Hazwani Izzati Abdul Nasir, and Muhammad Hafidz Fazli Md Fauadi	

**Development of a Malaysian Plate Number Recognition System
for Parking Violation** 43
Mohd Fauzi Alias, Fahmi Fitri Abdul Rahim,
Mohamad Rosyidi Ahmad, Mohamed Yusof Radzak,
Mohd Suerdy Omar, and Muhamad Husaini Abu Bakar

**Smart Recycle Bin Prototype Using Convolutional Neural Network
for Trash Classification** 59
Mohd Fauzi Abu Hassan, Muhammad Khusairi Osman,
Fadzil Ahmad, Mohaiyedin Idris, Khairul Azman Ahmad,
Ahmad Shukri Firdhaus Kamaruzaman, Zuraidi Saad,
and Mohamed Mydin M Abdul Kader

**On Optimization of Selective Mapping and Clipping Hybrid
Scheme Using Firefly Algorithm for PAPR Reduction** 71
Aeizaal Azman Abdul Wahab, Nur Qamarina Muhammad Adnan,
Syed Sahal Nazli Alhady, Wan Amir Fuad Wajdi Othman,
and Hazmarini Husin

Embedded RFID System: OKU Smart Card Detector 81
N. A. C. Yasser Cheah, Mohamad Tarmizi bin Abu Seman,
M. N. Abdullah, and Sattar Din

**Quality Improvement of Small Form-Factor Pluggable (SFP)
Units Assembly Using Robotic Automated System** 91
Choong Chee Guan, Saw Chun Lin, Robert Kerk Swee Tian,
and Nadzri Che Kamis

**An Energy-Efficient Clustering Protocol for the Lifetime
Elongation of Wireless Sensors in IoT Networks** 103
Ali Mohammed Kadhim Abdulzahra and Ali Kadhun M. Al-Qurabat

Smart Vending Machine for B40 Student 115
Ahmad Azharudin, Siti Maryam Sharun,
Muhammad Firdaus Asyraf Abdul Halim Yap,
and Syamimi Mohd Norzeli

Smart Home Door Lock Alarm System



Ahamad Zaki Mohamed Noor, Farhan Raeed Mohd Azri,
Mohd Fahmi Anuar, Dona Emira Heinko Dona, Aiman Azim Azmi,
Mohammad Azim Hamzah, and Fairul Azni Jaafar

Abstract The future is the Internet of things (IoT) that will transform the real-world objects into intelligent virtual objects. The Internet of things (IoT) aims to gather everything under a common infrastructure, giving us to manage and control things around us and keeping us informed of the state of the things. The main objective of this paper is to provide an overview of the Internet of things based on the example of a smart door. A smart door lock is a combination of a traditional door lock and the futuristic technology of the IoT system. With the help of the IoT system, the door lock can be controlled from anywhere with many features such as voice command, heat sensor, ultrasonic, humidity, push and email notification and alarms. This smart door lock with IoT offers mobile application that allows the user to lock and unlock the doors by clicking an icon.

Keywords Smart home · IoT · Blynk · NodeMCU

A. Z. M. Noor (✉) · F. R. M. Azri · M. F. Anuar · D. E. H. Dona · A. A. Azmi · M. A. Hamzah
Universiti Kuala Lumpur Malaysian Spanish Institute, Kulim Hi-Tech Park, 09000 Kulim, Kedah,
Malaysia

e-mail: ahamadzaki@unikl.edu.my

F. R. M. Azri

e-mail: farhan.azri@s.unikl.edu.my

M. F. Anuar

e-mail: mfahmi.anuar@s.unikl.edu.my

D. E. H. Dona

e-mail: dona.heinko@s.unikl.edu.my

A. A. Azmi

e-mail: aiman.azmi06@s.unikl.edu.my

M. A. Hamzah

e-mail: azim.hamzah@s.unikl.edu.my

F. A. Jaafar

Centre of Smart System and Innovative Design, Faculty of Manufacturing Engineering, Universiti
Teknikal Malaysia Melaka, Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia

e-mail: fairul@utem.edu.my

© The Author(s), under exclusive license to Springer Nature Switzerland AG 2023

1

M. H. Abu Bakar et al. (eds.), *IT Applications for Sustainable Living*,

SpringerBriefs in Applied Sciences and Technology,

https://doi.org/10.1007/978-3-031-40751-2_1

1 Introduction

Malaysia has been experiencing accelerated urbanization which is often associated with increasing crimes in cities. Crime in housing area has become a trend; according to the statistics, the crime index in Malaysia showed an increase and which about 90% of crimes in Malaysia are property crimes, which mainly occur around the housing areas. To prevent the house crimes from skyrocketing, the usage of IoT systems to improve the house security with the assistance of smart home systems is suggested (Soh 2012).

In early 2000, most of the international airports around the world have implemented the IoT system to invent the smart gate by recognizing the people faces, ages and gender to avoid illegal immigrants. Besides, in 2016, a RFID system has been introduced in the most highway's toll system in Malaysia (Lieshout et al. 2007).

So, by using this idea concept, the system of IoT can be implemented in residential areas for every house to avoid gate breaches. The idea is that the house owner will get a notification by a specific application in the smartphone using Blynk application even wherever they are when someone tries to open the gate or door without the permission of the owner. As for design, the circuit was set up using specific component. The simulation was set up according to the controller that was used to run the coding and circuit. Once the circuit has been designed on the breadboard, the code programming that has been created needs to be running using Blynk and the program was performed (Media's et al. 2019).

The main problems that this project attempts to solve are to get a notification for an open door. There must be a reliable system to help users especially a house or a building owner to get notified for an open door. Even if they are away from home or building, the system will automatically send a notification to the phone. Most people are usually very busy, especially with routine jobs. So, they are very difficult to monitor house surveillance and the safety.

The main objective of this project is to study and develop a security monitoring notification system that is used for security and notification systems. The purpose of this system is to increase security by designing a system which is efficient, low cost and can be implemented in home and office security systems. Furthermore, developing a security system gives security in home and office persistently (Anitha 2017).

2 Literature

The Internet of things (IoT) technology has become an evolution in the technology industry which gives a lot of potential benefits toward the community. The basic idea of the IoT was to connect any device with physical substance to the Internet. Then, the Web of things (WoT) is able to connect sensors with the Web and translate it into useful data and information (Theekakul et al. 2010).

The authors proposed a smart home using the IoT application that has combinations of the systems which were related to a portable electronic device. For instance, cloud computing and wireless sensor nodes are used and give an authority to the user to control home appliances such as door locks.

Furthermore, the IoT communication protocol is suitable for any application (Fauadi et al. 2020). The IoT application in a smart home system needs to be low cost since it uses Android application to transmit the information to the cloud. This system removes the use of personal computer (PC) which give such a big impact to the public since nowadays people preference change as technology grows. People prefer portable technology, especially youngsters. This proves that the uses of the IoT can give effectiveness toward the smart home system.

According to Mittal et al. (2017), the procedure of smart home system is using Bluetooth and Ethernet. The Bluetooth connection between the Arduino software and a smartphone has increased the possibility of short-range wireless communication that is commonly used in indoor environments while the Ethernet module is applied to the Arduino board or NodeMCU.

Besides, Media's et al. (2019) had designed a system based on the Blynk software which can be controlled and monitored by any portable device such as smartphones using Wi-Fi. All the sensors were connected to the Internet via NodeMCU.

Plus, Mahindar et al. (2018) state that the application of the Blynk app helps their project of a smart home system and increases the security level with the help of Wi-Fi which connects NodeMCU to the Blynk app. Then, the Blynk app translates the data from the sensors. This gives benefits such as detection of any unfavorable incident so that people can take early precautions.

3 Methodology

The circuit was designed according to a schematic diagram that was created. The ESP8266 Wi-Fi module and all the electronic components were attached to the breadboard.

The piezo buzzer (see Fig. 1) was connected to D5 and D2 on the ESP8266. It is used to generate basic beeps and tones when the door is opened by someone else and will be notified to the owner.

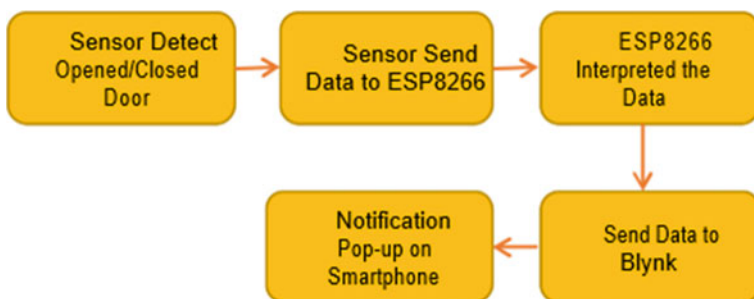
The push button as shown in Fig. 2 was connected to the piezo buzzer pin D5 and ESP8266 D2 from pin 3V3. It is for the open-closed system for the door when it is been pressed or depressed to open or close by someone that used the door.

The resistor as shown in see Fig. 3 was connected to the ground (GND). It is to delimit the electric current, voltage division, heat generation, matching and loading circuits, control gain and fix time constants.

Fig. 1 Piezo buzzer**Fig. 2** Push button**Fig. 3** Resistor

4 Process Flow

The sensor detects an opened or closed door. Next, the sensor sends data to the processing unit ESP8266. The ESP8266 interprets the data and sends data to Blynk. The user receives a notification on the smartphone informing that the door is closed or opened. Figure 4 shows the process flow.

**Fig. 4** Process flow

5 Result and Discussion

The system will be implemented at the main door where the user is notified every time the door is opened via an app on the user’s smartphone. The system works when the door is closed and the button, which is embedded in the door frame, is pressed. When the door is opened, the piezo buzzer will also sound to inform the potential intruder that the owner of the premises has been alerted and provided thus acting as a deterrent for the intruder. Figure 5 shows the location of push button switch was placed.

When the door is opened, the button is depressed thus sending the user a notification through an app that informs the user that the door is opened. Figure 6 shows the condition of push button when the door closes, and Fig. 7 is the push button condition when the door opened.

5.1 Prototype of the Project

In this section, the information on the prototype of the door operation embedded with sensors and circuit is shared. Figure 8 shows a prototype when the door is closed. The sensor shown in Fig. 9 is for the configuration when the door is opened. Figure 10 shows circuit connection of the prototype door. A buzzer is attached so that the people staying in the house not just get a notification from the phone but also hear an alarm from the buzzer.

Fig. 5 Example on placing/ locating push button to door



Fig. 6 Button when the door is closed

