BLIND'S SUPPORTING VEST USING EMBEDDED SYSTEM

BY

ABU SUFIEN
ID: 161-15-7401

This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

Supervised By

MS. SHARMIN AKTER
Lecturer (Senior scale)
Department of CSE
Daffodil International University

DAFFODIL INTERNATIONAL UNIVERSITY

DHAKA, BANGLADESH

JANUARY 2023

APPROVAL

This Project titled "**Blind's supporting vest using embedded system**", submitted by Abu Sufien to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 24.01.2023.

BOARD OF EXAMINERS

28/01/23

Chairman

Dr. Touhid Bhuiyan
Professor and Head
Department of Computer Science and Engineering
Faculty of Science & Information Technology Daffodil International University

24.01.23

Internal Examiner

Dr. Mohammad Shamsul Arefin
Professor
Department of Computer Science and Engineering
Faculty of Science & Information Technology Daffodil International University

24.01.23

Internal Examiner

Md. Sabab Zulfiker
Senior Lecturer
Department of Computer Science and Engineering
Faculty of Science & Information Technology Daffodil International University

24.1.2023

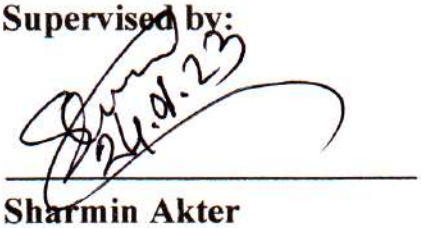
External Examiner

Dr. Ahmed Wasif Reza
Associate Professor
Department of Computer Science and Engineering
East West University

DECLARATION

I hereby declare that, this project has been done by us under the supervision of **Sharmin Akter, Lecturer, Department of CSE** Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

Supervised by:



Sharmin Akter
Lecturer
Department of CSE
Daffodil International University

Submitted by:

Abu Sufien

(Abu Sufien)
ID: 161-15-7401
Department of CSE
Daffodil International University

ACKNOWLEDGEMENT

First I express my heartiest thanks and gratefulness to almighty God for His divine blessing makes us possible to complete the final year project successfully.

I am really grateful and wish my profound our indebtedness to **Sharmin Akter**, **Lecturer**, Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of "*Embedded system*" to carry out this project. Her endless patience ,scholarly guidance ,continual encouragement , constant and energetic supervision, constructive criticism , valuable advice ,reading many inferior draft and correcting them at all stage have made it possible to complete this project.

I would like to express our heartiest gratitude to **Dr. Touhid Bhuiyan, Professor and Head,** Department of CSE, for his kind help to finish my project and also to other faculty member and the staff of CSE department of Daffodil International University.

I would like to thank our entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, I must acknowledge with due respect the constant support and patients of my parents.

ABSTRACT

The lives of blind individuals are extremely terrible. Their daily lives are incredibly difficult because they are unable to see. They have a lot of difficulty performing daily tasks since they can't move properly. They move with a cane or stick and use it to feel for obstructions. But they will never be helped by these things. Accidents do happen, and occasionally they can be fatal or extremely serious. They might even die. Even if they survive, serious injuries might happen and they might end up living their life in a bed. A family might lose their member or a disable person might become more helpless with new disabilities. That is why I developed this idea, a practical and cost-effective handheld device for blind people. They can carry this and wear it with ease. They will receive alerts from this device about what is in front of and behind them. This will warn them and protect them from harm and mishaps.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION:

In our country, blind persons typically utilize a crutch or a helping hand to walk around or travel. They can hardly move alone, while those that do are not completely safe or able to move freely because of numerous obstructions and mishaps. Accidents sometimes occur, and they occasionally have the potential to be fatal or very serious. They might even pass away. Even if they live, they can get severe wounds and have to spend the rest of their days in a bed. A family member may pass away, or a disabled person may acquire new disabilities that render them even more helpless. I created this project specifically for folks of this type to provide them the independence to move around without the aid of a stick or other aids. I've set up sensors that will pick up on any impediments or moving objects in front of or behind them. Additionally, sensors will let them know where the impediment is. The obstacle "S positions will be made known by a buzzer and two vibration modules. I think this will facilitate the movement of blind individuals and make daily living for them much simpler.

1.2 MOTIVATION:

I have been seeing blind folks. They can roam around freely, but their everyday life is unpleasant. To move around and complete their daily tasks, they always require a device or a firm hand. Accidents do happen, and occasionally they can be fatal or extremely serious. They might even die. Even if they survive, serious injuries might happen and they might end up living their life in a bed. A family might lose their member or a disable person might become more helpless with new disabilities. Electronic equipment has grown more widely available as technology has advanced. However, accessible technologies for the blind are still expensive. For this reason, I came up with the notion of providing these people with an affordable technology that will improve their quality of life.

1.3 OBJECTIVE:

The major goal of this research is to make it easier for blind individuals to identify barriers without the aid of any instruments. The sensors will be integrated into a wearable vest, alerting blind persons to the obstacle's location and allowing them to perceive it with ease.

Based on sensor data and device results, they can take appropriate action.

1.4 EXPECTED OUTCOME:

Wearable technology will be called "the smart vest for blind." It will have three ultrasonic sensors on the front panel and two in the back panel. Two of the three front panel sensors will be fastened to the body, while one will be fastened to a hat. Therefore, a buzzer or beep will sound if any barriers are discovered via sensors attached to a bodily component. Blind individuals can recognize that there is barrier in front of their body part with ease. A sensor attached to his headgear will also detect any impediments in front of the head and activate a gentle vibration module. As a result, it will notify him that his head is being blocked. once more

1.5 REPORT LAYOUT:

There are a total of six chapters in the report. The first two are descriptive and goal oriented. Details of the technical jargon that make the project's fundamental concept and operating principle evident. The third chapter is devoted to the necessary and designated equipment. The complete build process is described in the fourth chapter. It includes

- Front-end coding. Models and diagrams that explain the device's exterior have been used to describe it.
- The implementation of all of the equipment and its setup.
- Back-end coding.

CHAPTER 2
BACKGROUND ANALYSIS

2.1 INTRODUCTION:

Production of prototype projects has become simpler thanks to Arduino and other organizations and local. Additionally, it is hassle-free and has decreased production costs. Basically, this project is for blind people. Blind people have been observed struggling to perform daily activities. To facilitate their movement on a daily basis, I created this straightforward but useful project. This undertaking is easy. The "Ultrasonic Sensor" is the lone and primary sensor used in this research. It recognizes things at a specific range. The project's actuators are an active buzzer and a vibration module. These components will be turned on in accordance with the sensor data.

2.2 RELATED WORK:

For blind people, there are several intelligent devices. The one with the most users is "ORCAM MY EYE PRO[2]." A blind person can point at an object, and this AI-based system will take photographs of it and transform the images into sound for them. It can also be reprogrammed so that a blind person can keep the image of a favorite person and receive notifications when the device takes that person's picture. There is also "we walk[3]." It is essentially a cane or staff, but not just any stick. Numerous features are present. A smartphone can wirelessly connect to it. Every smartphone notification will be informed. And it has intelligent AI. It provides the user's Gps coordinates, bus stop location, local population, and other information.

2.3 COMPERATIVE STUDIES:

As Bangladeshi has not yet advanced technologically, such contemporary goods and equipment are not yet imported, As a result, I had to research a blind person's everyday activities, watch how they are carried out, and identify any obstacles they may encounter.

The project needed to be designed and implemented in the best way possible so that it would be easy to use.

2.4 SCOPE:

As I've already indicated, there is a ton of potential for this initiative because Bangladesh hasn't yet imported these technology. This concept is practical, space-efficient, and economical, and I think it has a tremendous future in our nation.

2.5 CHALLENGES:

The primary hurdles I experienced while building the project were: I had to learn "embedded C" in order to use the "Arduino UNO R3" There were several challenges and difficulties I had to overcome.

It was difficult to create an active buzzer, so I had to locate a blind person to spend the day with in order to observe his problems. I used an active buzzer to alert the user.

CHAPTER 3
REQUIREMENT SPECIFICATION

3.1 BUSINESS PROCESS MODEL:

A wearable vest will be attached to this device. A portable power bank will be used to power the vest. The sensors will turn on if they get any data. The user will be informed by the sensors.

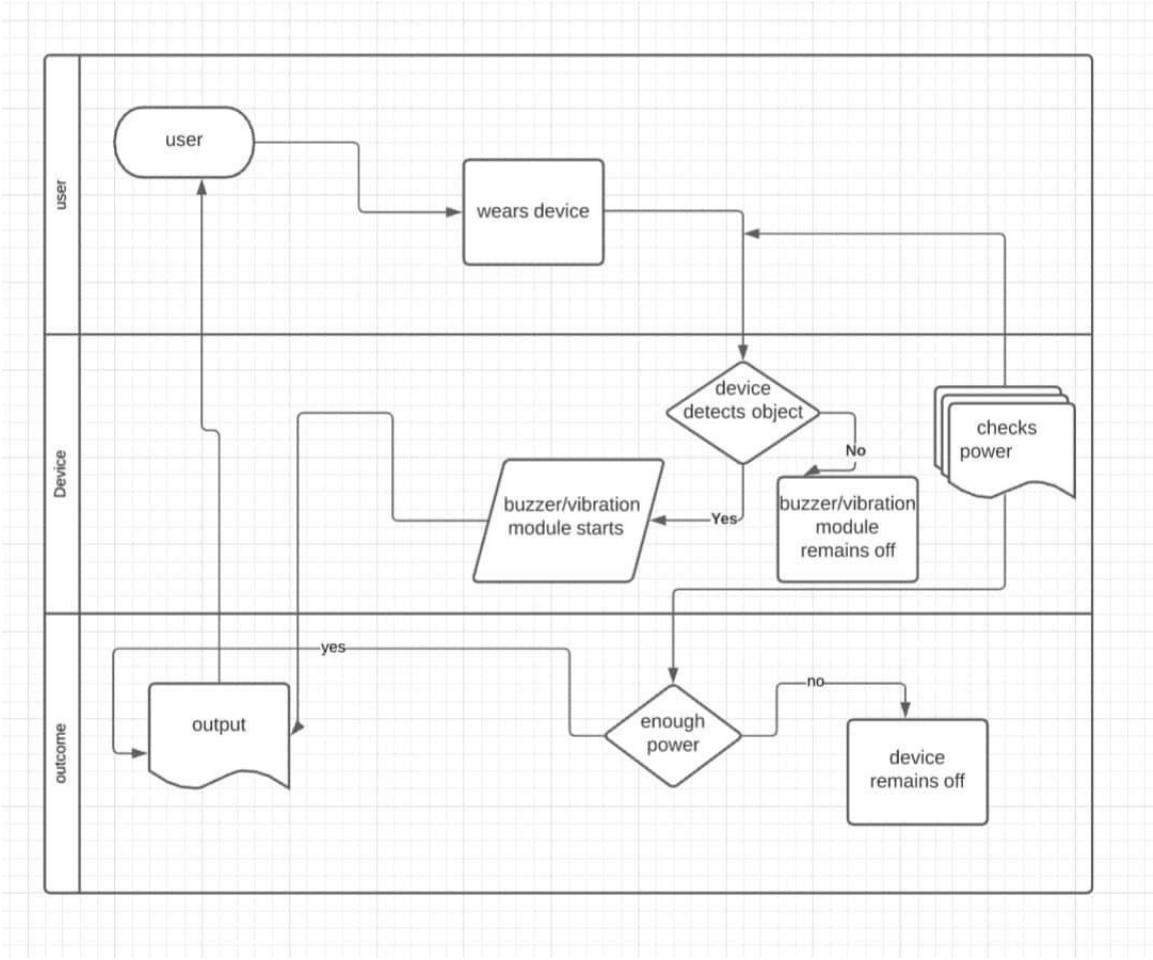


figure 3.1: Business Process model

3.2 USE-CASE MODELING & DESCRIPTION:

This thing is going to be mechanized. The sensors will turn on when it is powered up. Front sensors will turn on the vibration module 1 and buzzers. The vibration modules 2 will be activated by the back sensors.

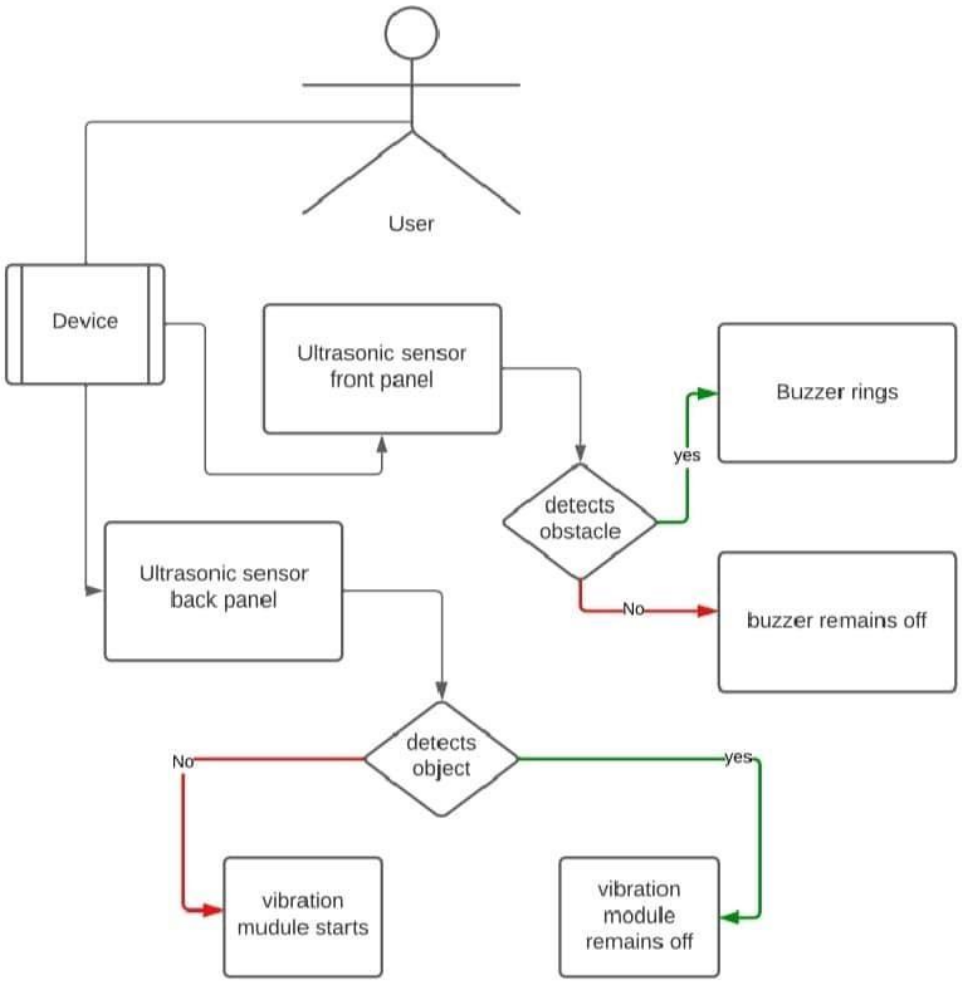


figure 3.2: Use-case model

3.3 REQUIRMENT COLLECTION & ANALYSIS

The following tools were utilized to create this project:

- UNO R3 Arduino
- Sensor Ultrasonic
- Current buzzer
- Module for vibration
- Module for relays
- Wires
- Battery pack

3.3.1 ARDUINO UNO R3:

The microcontroller-based Arduino UNO R3 development board can be programmed using "embedded C." It is coded using the "Arduino IDE"

figure 3.3.1: Arduino UNO R3

3.3.2 Ultrasonic Sensor:

There are two uses for an ultrasonic sensor. Two modules are combined with it. An echo module with a trigger module. Ultrasonic sound is sent by the trigger module. We are all aware that sound reflects. Therefore, the echo employing the concept any obstacles that

the ultrasonic sound encounters and reflects back. The distance of the obstacle is calculated from the interval between the triggered sound and the echo. receiver and transmitter. It operates on the fundamental tenet of light. Keep track of the light scattering and produce the information as a bit stream.

figure 3.3.2: Ultrasonic Sensor

3.3.3 Active Buzzer:

Active buzzers are not your typical buzzers. This buzzer's sound can be programmed[4]. It runs on 3.3v DC power supply.

figure 3.3.3: Active Buzzer

3.3.4 Vibration Module:

When the vibration module is powered on, vibration is produced**.** It runs on 3.3v DC power supply. It is a very low power consuming electronic module with a high end user output.

Figure 3.3.4: Vibration module

3.3.5 Relay module:

Relay modules are switchable relays. This switch can be programmed to manage the power supply for various pieces of equipment[5]**.** It runs on 5v DC power source. But it can work with high end electric equipment which operates with higher voltages like 220v.

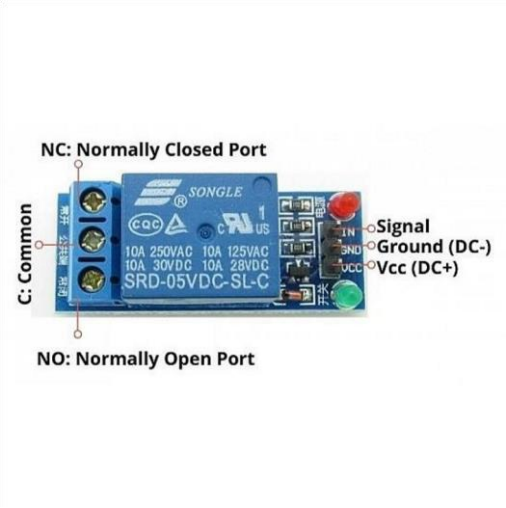


figure 3.3.5: Relay Module

3.3.6 wire:

To link various pieces of equipment, we need cables. I am using jumper wires to build this project. These jumper wires can be operated with 3v-12v power sources.

figure 3.3.: wire

3.3.7 Power bank:

We chose a powerbank to power the entire project because it operates without issue on a 5v DC power supply.

figure 3.3.7: Power Bank

CHAPTER 4
SYSTEM DESIGN AND IMPLEMENTATION

4.1 Front-End design:

Setting up this ultrasonic sensor, the active buzzer, as well as the relay switch to supply the vibration module are all part of the front end design.

4.1.1 Setting up the ultrasonic sensor: 4 wires make up the ultrasonic sensor. Echo, VCC, GND, and trigger. The VCC pin must be connected to the Arduino's 5V pin, the GND pin to the ground pin, and the data pin to the trigger and echo pins.

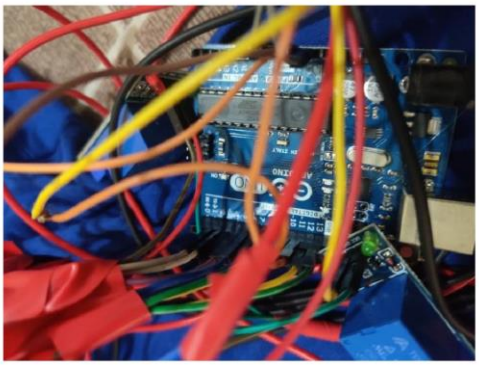


figure 4.1.1: Arduino with ultrasonic sensor

4.1.2 Setting up the Active Buzzer: The buzzer that is in use has three pins. Data pin[4], Vcc, and GND. The buzzer will be configured via a data pin.

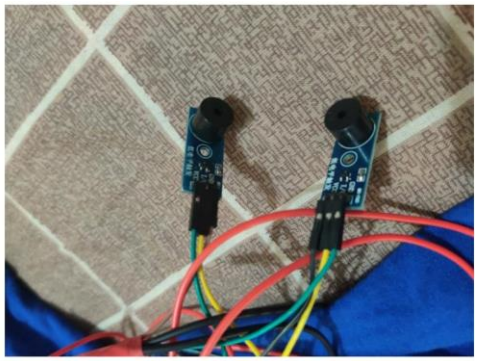


figure 4.1.2. The buzzer

4.1.3 Setting up the relay module: Three wires are on the relay module. Data, Vcc, and GND.

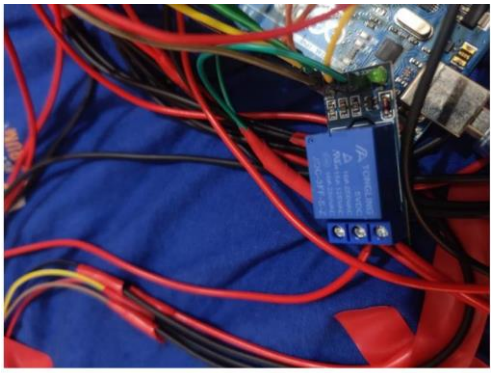


figure 4.1.3 Relay module

4.1.4 Setting up the vibration module: Two pins are on the vibration module. GND and Vcc. We will attach the ground pin to the ground pin on the Arduino, and the Vcc pin to the data output pin on the relay module[6].

4.2 Back-End Design: Since the Arduino UNO R3 is my main development board, I utilized the "Arduino IDE" to design the back end.

4.3 Complete setup of the project

figure 4.3 Complete setup

CHAPTER 5
TESTING AND DISCUSSION

5.1 Testing & Discussion:

Arduino is used to link each component. The buzzers and relay modules are powered on, and the ultrasonic are supplying data. Relay is used to connect vibration modules.

5.2 Final output:

Our project is operating flawlessly. Obstacles are being precisely detected by the ultrasonic sensors. Sound is being provided by the buzzers. The vibration modules are perfectly powered by the relay modules.

Table on Test result & reports

Test Case	Result	Comment
Put obstacle in front of ultrasonic sensor	Buzzer or relay module is not activated	Sensor is not working
Put obstacle in front of ultrasonic sensor	Only buzzer is working	Relay module is not working
Put obstacle in front of ultrasonic sensor	Only vibration module is working	Error in connection
Put obstacle in front of ultrasonic sensor	Both Buzzer and Relay is activated	Device is working perfectly

Table 1: Test Result & report

CHAPTER 6
CONCLUSION AND FUTURE SCOPE

6.1 Discussion and Conclusion:

The application is done exactly as I had envisioned. The individual may quickly identify things and barriers when all the sensor are fully functional and actuating the actuators. I think this gadget will make their daily activities simpler and less troublesome for them.

6.2 Scope for Further Developments:

This project has a broad range of potential development. This device might be upgraded with GPS, which will track the user's current location. It can be used to set a GSM module as well. The sharing of data across the GSM network will be beneficial. The Bluetooth module can be used to link it to our phones. This project allows for the addition of many more features.

APPENDIX

Appendix -A

List of tools and their fundamental uses:

Arduino uno r3 Programmable board for developing embedded systems

Object detection with an ultrasonic sensor a buzzer that makes noise

Relay Module: switch that is programmable

Module for Vibration: Produces vibration

REFERENCE

[1] W. Wolf, Computers as Components Principle of Embedded Computing System Design. Morgan Kaufman, 2000

[2] J. C. Knight, "Safety critical systems: challenges and directions," in ICSE, 2002, pp. 547–550.

[3] J.-L. Boulanger and V. Q. Dao, "Requirements engineering in a model-based methodology for embedded automotive software," in RIVF, 2008, pp. 263–268.

[4] A. I. Wasserman, "Towards a discipline of software engineering," EEE Software, vol. 13, no. 6, p. 23U31. ″

[5] D. Garlan and D. Perry, "Introduction to the special issue on software architecture," IEEE Transactions on Software Engineering, vol. 21, pp. 269–274.

[6] R. J. Allen, "A formal approach to software architecture," Ph.D. dissertation, Carnegie Mellon University.

[7] D. C. Luckham, "Rapide: A language and toolset for simulation of distributed systems by partial orderings of events," in Princeton University.

[8] Unified modeling language v. 2.3.

[9] J. Ivers, P. Clements, D. Garlan, R. Nord, B. Schmerl, and J. R. O. Silva, "Documenting component and connector views with uml 2.0," Software Engineering Institute (Carnegie Mellon University), Tech. Rep. CMU/SEI-2004-TR-008.

[10] E. Y. Nakagawa, P. O. Antonino, and M. Becker, "Reference architecture and product line architecture: A subtle but critical difference," in ECSA.

[11] U. Eklund, O. Askerdal, J. Granholm, A. Alminger, and J. Axelsson, "Experience of introducing reference architectures in the development of automotive electronic systems," in International workshop on Software engineering for automotive systems, ser. SEAS '05. New York, NY, USA: ACM.

[12] M. Guessi, "A contribution to the representation of reference architectures of embedded systems." Master's thesis, University of São Paulo.

[13] ISO/IEC/(IEEE), “ISO/IEC 42010 (IEEE Std) 1471-2000 : Systems and Software engineering - Recomended practice for architectural description of software-intensive systems.

[14] R. Kazman, G. Abowd, L. Bass, and P. Clements, “Scenario-based analysis of software architecture,” IEEE Software.

[15] E. Y. Nakagawa, “Uma contribuição ao projeto arquitetural de ambientes de engenharia de software.” Ph.D. dissertation, University of São Paulo.

[16] P. Clements, F. Bachmann, L. Bass, D. Garlan, J. Ivers, R. Little, P. Merson, R. Nord, and J. Stafford, Documenting Software Architectures: Views and Beyond, Addison-Wesley, Ed. Addison-Wesley.

[17] N. Rozanski and E. Woods, Software Systems Architecture - Working with stakeholders using viewpoints and perspectives, Addis, Ed. Addison-Wesley Professional,.

[18] R. F. Barcelos and G. H. Travassos, “Arqcheck: Uma abordagem para inspeção de documentos arquiteturais baseada em checklist,” in V Simpósio Brasileiro de Qualidade de Software, SBQS.

[19] E. Y. Nakagawa and J. C. Maldonado, “Reference architecture knowledge representation: An experience,” in SHARK.

[20] M. Guessi, E. Y. Nakagawa, F. Oquendo, and J. C. Maldonado, “Architectural description of embedded systems: a systematic review,” in ISARCS,

[21] D. Feitosa and E. Y. Nakagawa, “Simus - uma arquitetura de referência para sistemas multirro A. Sadat, M. Yasin, Sadia Binte Anwar, “Computer Vision Techniques for Supporting Blind or Vision Impaired People: An Overview”, Semantic Scholar, vol 2, page.

[22]Learnt about active buzzer “Create Arduino”, available https://create.arduino.cc/projecthub/arduino_uno_guy/the-simplest-alarm-in-the-world-usingactive buzzer-35f570 >>.

Report

ORIGINALITY REPORT

27%	26%	5%	23%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Daffodil International University Student Paper	16%
2	dspace.daffodilvarsity.edu.bd:8080 Internet Source	9%
3	Submitted to Coventry University Student Paper	1%
4	Submitted to South Bank University Student Paper	1%
5	dspace.bracu.ac.bd:8080 Internet Source	1%
6	citeseer.ist.psu.edu Internet Source	<1%
7	Leonardo Frizziero, Alfredo Liverani, Giampiero Donnici, Paola Papaleo, Christian Leon-Cardenas. "Smart Cane Developed with DFSS, QFD, and SDE for the Visually Impaired", Inventions, 2021 Publication	<1%