IoT BASED PERSON FALL DETECTION FROM WHEELCHAIR AND SHOWING BODY TEMPERATURE

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DHAKA, BANGLADESH

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APPROVAL

This Project titled "**IOT BASED PERSON FALL DETECTION FROM WHEELCHAIR AND SHOWING BODY TEMPERATURE**", submitted by **Atquia Farah Chowdhury, ID: 181-15-11316; Md. Arifuzzaman, ID: 181-15-11325** and **Md. Nazmol Hasan, ID: 181-15-11099** 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 27.11.2020.

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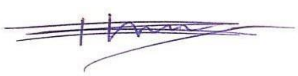

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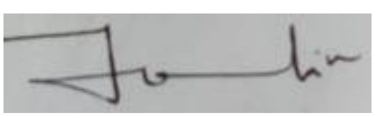

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We hereby declare that, this project has been done by us under the supervision of **Israt Jahan, Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted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

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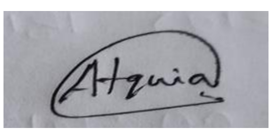

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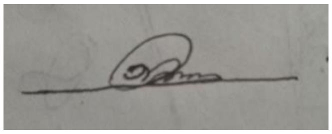

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First, we express our heartiest thanks and gratefulness to Almighty God for His divine blessing making us possible to complete the final year project/internship successfully.

We are grateful and wish our profound indebtedness to **Ms. Israt Jahan**, **Lecturer**, Department of CSE, Daffodil International University, Dhaka. Deep Knowledge & keen interest of our supervisor in the field of "*Machine Learning and Natural Language Processing*" to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior drafts, and correcting them at all stages have made it possible to complete this project.

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

Finally, we must acknowledge with due respect the constant support and patients of our parents.

ABSTRACT

Falls are the second biggest cause of accidental or unintentional injury deaths globally, according to the World Health Organization. Adults over the age of 65, as well as patients, have the highest rate of fatal falls. As a result, adopting automatic fall detection systems can improve the quality of life of older persons or patients. This study shows a fall detection system as well as the temperature of the patients. Three key components make up the system: a wearable device, a cell phone, and a temperature sensor. The wearable device may communicate with a cell phone via GPS. When the wearable device senses a fall, it sends a notification to the phone as an alert. When a fall occurs, all data, including the wheelchair's location, is relayed to the Blynk mobile application. The IoT system will send an email to the registered individual to notify them that a fall event has occurred and that assistance is required. Furthermore, this method is less expensive to build and delivers a quick response. It can be installed in any commercial wheelchair. However, this technology has a drawback in that it requires a strong Wi-Fi connection. A better GUI design, as well as more detection, can be put into the system in the future for future recommendations. . To improve the accuracy of the system, an add-on system can be incorporated.

Keywords- Sensor, Cell phone, Body temperature, Fall detection, Internet of Things.

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CHAPTER 1
INTRODUCTION

1.1 Overview

The most common cause of injury among the elderly is a fall. These accidents occur as a result of numerous debilitating fractures that may lead to death as a result of complications. The majority of the elderly (those over 75 years old) fall at least once a year, with 24 percent suffering serious injuries [1]. This is a major public health issue with significant implications for health and healthcare expenditures [2]. The cost and hardship of caring for elderly people is rising significantly [3]. The likelihood of falling is three times higher in those with Alzheimer's disease. Sensors that monitor patients' vital signs and activities and remotely convey this information to toothier doctors and caregivers can improve elderly care. A fall can result in everything from scrapes to fractures, and in severe circumstances, death. Even if there are no immediate effects, waiting on the floor for aid for an extended period of time increases the risk of mortality from the injury. As a result, fall detection is a hotly debated topic. Passive monitoring technologies have made inroads into health monitoring systems in households, assisted living facilities, and nursing homes in recent years. In the event of an emergency, they give prompt assistance [4, 5]. The majority of accelerometer-based research on falls focuses on assessing the magnitude of acceleration change. The descent is detected when the acceleration value reaches a crucial threshold [6, 7]. Wearable and active sensors allow for more accurate monitoring [8]. By compiling the most relevant parameters, data filtering procedures, and testing approaches from previous studies, a contribution to standardization is produced. The effectiveness of state-of-the-art fall detection techniques was studied, showing the disparities in their effectiveness. For the fall study, a standard database structure was designed that highlights the most significant features of a fall detection system that must be considered when creating a robust system [9], as well as the restrictions and problems. Furthermore, for training systems, fall activity patterns are particularly difficult to establish. With sensitivity, these devices successfully detect falls. However, concentrating just on large acceleration can lead to a slew of false positives from fall-like behaviors as assisting down quickly and running. Furthermore, earlier research used complicated algorithms to detect the fall, such as support vector machine (SVM) [10] and Markov model [11].

These systems' precision, on the other hand, has not been demonstrated to be very successful. They also consume a lot of computer resources and can't reply quickly enough. In this paper, we propose a new microcontroller-based gadget (Adriano-UNO).

1.2 Project objectives and benefits

- ❖ Using a Smartphone and a wireless sensor node, create an intelligent and effective fall detection and alert system.
- ❖ Develop a fall detection and alarm system that is both dependable and cost-effective.
- ❖ Develop a fall detection system that is both user-friendly and does not disrupt elderly people's everyday activities.

Our motivation to assist

Figure-1.1: Our motivation to assist

Figure-1.2: Our motivation to assist

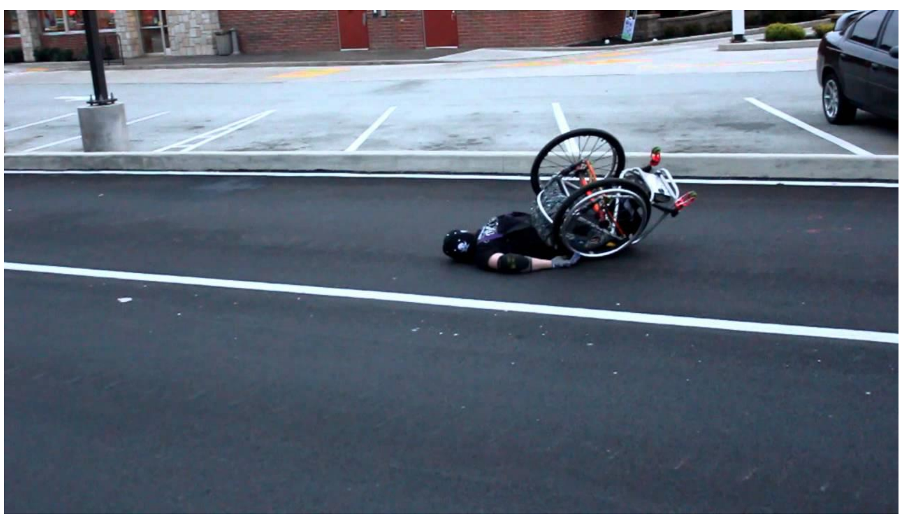

Figure-1.3: Our motivation to assist

1.2.1 Project perspective

Medical attention must be offered immediately in order to limit the danger of older persons being injured as a result of a fall. As a result, an effective fall detection system can assist in detecting falls in the elderly and notifying the nearest healthcare agency for assistance and support. The fall detection system must be user-friendly, which implies that it should be simple for the elderly to use. The technology must also not interfere with or disrupt older people's regular activities. The system must be both cost-effective and long-lasting.

ESP8266 Wi-Fi Module is a self-contained SOC with an inbuilt TCP/IP protocol stack that can provide access to your Wi-Fi network to any microcontroller. The ESP8266 may either host an application or offload all Wi-Fi networking functionality to a separate application processor. Each ESP8266 module comes pre-programmed with AT command set firmware, so you can just plug it into your Arduino and get about as much Wi-Fi functionality as a Wi-Fi Shield (right out of the box)! The ESP8266 module is a low-cost board with a large, and rapidly increasing, community.

We connect this module to a microcontroller and use different acceleration thresholds to see if there is any false triggering or if the user has truly fallen. If the readings exceed the thresholds, we receive a notification on our Android device via the Blynk app.

1.3 Project management and finance

Our esteemed advisor, Ms. Israt Jahan, was extremely helpful in ensuring that the project was completed properly. Our team consists of three members. To finish the project, we all put in a lot of effort. We arrange the finances as a team, and since this is our own initiative, the cost is quite minimal.

CHAPTER 2

THEORETICAL FRAMEWORK

2.1 IoT technology

The term "Internet of Things" refers to situations in which network connectivity and computing capabilities are extended to objects, sensors, and ordinary items that aren't traditionally thought of as computers, allowing these devices to generate, trade, and consume data with no human intervention. There is no single, universal definition, though.

2.1.1 IoT: Concept & definition

The Internet of Things (IoT) is a sophisticated automation and analytics system that uses networking, sensors, big data, and artificial intelligence to create comprehensive systems for a product or service. When applied to any industry or system, these systems provide more transparency, control, and performance. Because of its inherent versatility and ability to work in any environment, IoT systems have applications in a variety of industries. They use smart devices and sophisticated enabling technologies to improve data collecting, automation, operations, and much more. Users can gain deeper automation, analysis, and integration inside a system using IoT systems. They increase the reach and precision of these areas. For sensing, networking, and robotics, the Internet of Things makes use of both existing and emerging technology. IoT takes advantage of recent software advancements, lowering hardware prices, and modern attitudes about technology. Its innovative and advanced aspects result in significant changes in how products, goods, and services are delivered, as well as the social, economic, and political consequences of those changes.

The key features of IoT:

Artificial intelligence, connection, sensors, active involvement, and the usage of small devices are among the most important elements of the Internet of Things. The following is a quick rundown of these features:

AI - The Internet of Things (IoT) effectively turns anything into a "smart" device, enhancing every area of life through the use of data collecting, artificial intelligence algorithms, and networks. This may be as simple as adding sensors to your refrigerator and cabinets to detect when milk and your favorite cereal are running short and placing an order with your chosen grocer.

Connectivity - New networking enabling technologies, particularly IoT networking, imply networks are no longer only dependent on large suppliers. Networks can be built on a much smaller and less expensive scale and yet be functional. These small networks are created by IoT between its system devices.

Sensors - Without sensors, the Internet of Things loses its uniqueness. They function as defining instruments, transforming the Internet of Things from a passive network of devices to an active system capable of real-world integration.

Active Engagement - Passive engagement accounts for a large portion of today's connection with linked technologies. The Internet of Things (IoT) ushers in a new era of active content, product, and service interaction.

Small Devices - Devices have become smaller, cheaper, and more powerful over time, as projected. To achieve precision, scalability, and versatility, IoT relies on purpose-built tiny devices.

Advantages of the internet of things:

The benefits of IoT may be found in every aspect of life and business. Here's a rundown of some of the benefits that the Internet of Things has to offer:

- **Improved customer engagement** - Current analytics have blind spots and substantial accuracy issues, and engagement remains passive, as previously stated. This is fundamentally transformed by the Internet of Things in order to generate a richer and more effective relationship with audiences.
- **Technology optimization** - The same technologies and data that improve the customer experience also increase device use and help to make more powerful technological advancements. The Internet of Things (IoT) opens up a world of vital functional and field data.
- **Reduced waste** - IoT identifies areas for improvement. Current analytics provide only a surface level of insight, whereas IoT gives real-time data that leads to more efficient resource management.
- **Enhanced data gathering** - Modern data collection has limitations and is designed to be used passively. IoT takes it out of those settings and puts it right where humans want to go to analyze their surroundings. It provides a complete picture of everything.

Disadvantages of the internet of things:

Though the Internet of Things has a lot of advantages, it also has a lot of drawbacks. Here's a rundown of some of the significant issues:

- **Security** - The Internet of Things (IoT) generates a networked ecosystem of constantly connected gadgets. Despite any security safeguards, the technology provides little control. As a result, users are vulnerable to many types of attackers.
- **Privacy** - The sophistication of IoT allows for the collection of significant amounts of personal data in great detail without the user's active participation.
- **Complexity -** Because IoT systems involve numerous technologies and a huge collection of new enabling technologies, some people find them difficult to design, install, and maintain.
- **Flexibility** - Many people are concerned about an IoT system's ability to seamlessly interact with other systems. They are concerned about ending up with multiple contradictory or closed systems.
- **Compliance -** The Internet of Things, like any other business technology, must adhere to regulations. Because of its complexity, the issue of compliance appears to be extremely difficult, even if many people perceive standard software compliance to be a battle.

Platforms, embedded systems, partner systems, and middleware are all used in IoT software to address the main areas of networking and action. Within the IoT network, these individual and master apps are in charge of data gathering, device integration, real-time analytics, and application and process extension. In the execution of associated tasks, they take advantage of integration with important business systems (e.g., ordering systems, robotics, scheduling, and so on).

Data collection:

Sensing, measurements, light data filtering, light data security, and data aggregation are all managed by this software. Certain protocols are used to help sensors connect to real-time, machine-to-machine networks. The data is then collected from many devices and distributed according to the parameters. It also works in reverse, disseminating data among multiple devices. The system eventually sends all of the data it has gathered to a central server.

Device integration:

The body of the IoT system is created by software that binds (dependent relationships) all system devices. It guarantees that gadgets work together and are connected in a stable manner. These apps are the IoT network's defining software technology because it wouldn't be an IoT system without them. To allow communication, they handle the numerous apps, protocols, and limits of each device.

Analytics in real-time:

These programs gather data or input from a variety of sources and turn it into actionable steps or patterns that can be analyzed by humans. They analyze data using a variety of settings and designs in order to conduct automation-related tasks or offer industry with data.

2.1.2 IoT enabling technologies

Wireless Sensor Networks, Cloud Computing, Big Data, Embedded Systems, Security Protocols and Architectures, Protocols Enabling Communication, Web Services, Internet, and Search Engines form the backbone of the Internet of Things.

- Wireless Sensor Network (WSN): It is made up of a number of sensors/nodes that are linked together to monitor various types of data.
- Cloud Computing: Cloud computing, often known as on-demand computing, is a sort of Internet-based computing that allows computers and other devices to access shared processing resources and data on demand. It can take many different forms, such as IaaS, PaaS, SaaS, DaaS, and so on.
- Big Data Analytics: Big data analytics is the practice of analyzing big data sets encompassing a variety of data kinds (i.e., Big Data) to identify hidden patterns, unknown relationships, market trends, customer preferences, and other important business data.
- Communication Protocols: These protocols enable data exchange formats, data encoding, and addressing, and they form the backbone of IoT systems to enable connectivity and coupling to applications. They also ease data sharing over the network because they enable data exchange formats, data encoding, and addressing.

- Embedded Systems: It's a type of computer system that combines hardware and software to do specific tasks. Microprocessors/microcontrollers, RAM/ROM, networking components, I/O units, and storage devices are all part of it.

2.1.3 Application and process extension

These applications broaden the scope of existing systems and software, allowing for a more comprehensive and effective system. They connect preset devices for specific objectives, such as granting access to specific mobile devices or technical instruments. It contributes to increased productivity and more precise data collection. Standard protocols and networking technologies are primarily used in IoT. RFID, NFC, low-energy Bluetooth, low-energy wireless, low-energy radio protocols, LTE-A, and Wi-Fi-Direct are the primary IoT enabling technologies and protocols. These technologies, in contrast to a normal uniform network of common systems, support the specific networking capabilities required in an IoT system.

Wi-Fi direct:

There is no requirement for an access point with Wi-Fi-Direct. It enables P2P (peer-to-peer) communications at Wi-Fi speeds with minimal latency. Wi-Fi-Direct removes a component of a network that slows it down, and it does so without sacrificing speed or throughput.

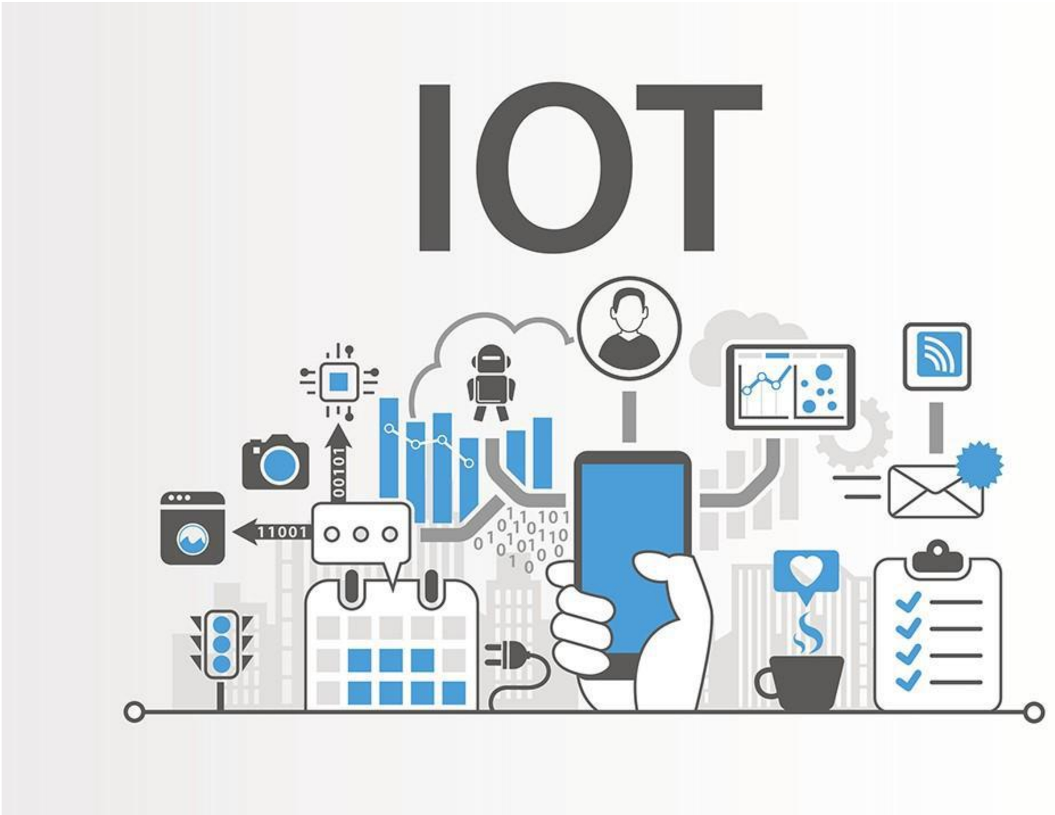

Figure-2.1: Internet of Things(IoT)

2.2 Risk factors for falling

Because a person's risk of falling varies depending on a variety of risk variables, a classification based solely on age is insufficient. In fact, medical research has identified a series of "risk factors":

Intrinsic:

1. Age (over 65)
2. Long-term illness
3. A history of falls
4. A lack of balance
5. Bone fragility and low mobility
6. Visual impairments
7. Dementia and cognitive issues
8. Parkinson's disease
9. Use of mind-altering substances
10. A bad way of life (inactivity, use of alcohol, obesity)

Internal environment:

1. Requirement to reach high things
2. Slippery surfaces
3. Staircases
4. Inappropriate footwear and clothing

External environment:

1. Damaged roads
2. Dangerous maneuvers
3. Insufficient illumination
4. Overcrowding.

2.3 Literature review

All of these journal papers were read in order to help me create my idea. Review of fall detection techniques: A data availability perspective by Shehroz S. Khan and Jesse Hoey. A smartphone-based fall detection system by Stefano Abbate, Marco Avvenuti, Francesco Bonatesta, Guglielmo Cola, Paolo Corsini, Alessio Vecchio. Development of a Wearable-Sensor-Based fall detection system by Falin Wu, Hengyang Zhao, Yan Zhao and Haibo Zhong. Fall detection system for the elderly by Joseph Santiago, Eric Cotto, Luis G. Jaimes, Idalides Vergara-Laurens. SmartFall: A Smartwatch-Based Fall Detection System Using Deep Learning by Taylor R. Mauldin, Marc E. Canby, Vangelis Metsis, Anne H. H. Ngu , and Coralys Cubero Rivera. Automatic fall detection of elderly living alone at home environment by Ivo T. Iliev, Serafim D. Tabakov and Ivan A. Dotsinsky.

2.4 The project schedule

This project overview essentially gives us a bird's eye view of the complete system, which is broken down into five steps: PLANNING, DESIGNING, IMPLEMENTATION, TESTING, and EVALUATION.

We employ an accelerometer and a gyroscope to analyze the user's body motions and anticipate whether or not a sharp change in acceleration has happened, indicating the possibility of a fall.

The MPU6050 sensor module is a 6- axis (three-axis accelerometer and three-axis gyroscope) sensor module. Acceleration, velocity, rotation, displacement, and a variety of other motion-related metrics are all measured using Micro-Electro-Mechanical Systems (MEMS). Aside from that, it contains a built-in temperature sensor as well.

The MPU6050 module is tiny in size and consumes less power. Aside from that, it has a high repetition rate, a high shock tolerance, and a low user price. The MPU6050 is equipped with an I2C and Auxiliary I2C interface. As a result, other sensors such as magnetometers and microcontrollers may be readily harmed.

After considering the serious repercussions of elderly people falling and the present market choices for dealing with the problem, we devised a plan to provide an Arduino-based kinematic solution. When a fall occurs and the user is discovered lying down on the ground, a notification is sent to the caretaker's phone via the BLYNK application.

2.5 Circuit diagram

A programmed ARDUINO is coupled to sensors and a wireless module in this circuit. The model's basic principle is to use an ARDUINO to store data from sensors and then send it to a wifi module. The wifi module uses cloud computing to provide data updates to a device. WIFI is used to deliver real-time data to the device. The circuit is powered by a rechargeable battery that is attached to the ARDUINO's power supply. For charging the battery, there is also a charging circuit with an AC/DC converter.There is also an adaptor that can expressly provide power to ARDUINO circuits if the battery is not charged.

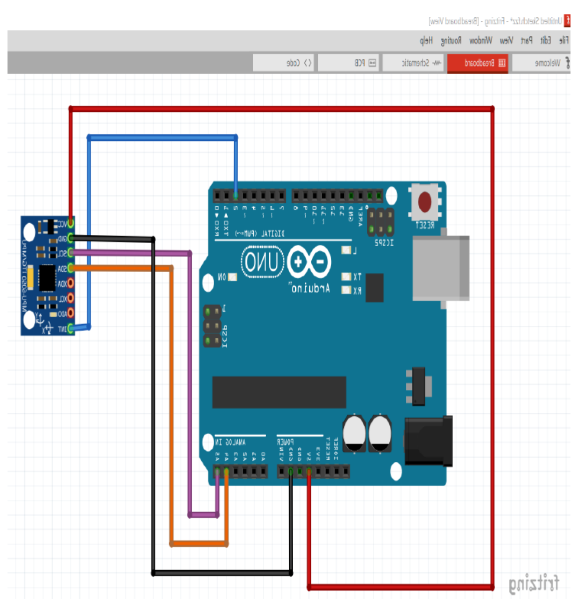

Figure-2.2: Circuit Diagram

CHAPTER 3

HARDWARE SIMULATION

3.1 Components and modules

A component is a reusable, encapsulated software function. The functionality (i.e. the control programs) of intelligent devices is encapsulated in component-based automation. Each intelligent gadget has a corresponding component. The OEM creates this component especially for each application.

The mechanics, electronics, and control hardware, as well as the corresponding control program, make up a technical module.

3.1.1 Wi-Fi module

The ESP8266 Wi-Fi enabled system on chip (SoC) module was created by Espressif. It's typically used to build embedded Internet of Things (IoT) applications.

The ESP8266 has the following capabilities:

- 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2),
- General-purpose input/output (16 GPIO),
- Inter-Integrated Circuit (I2C) serial communication protocol, analog-to-digital conversion (10-bit ADC),
- Serial Peripheral Interface (SPI) serial communication protocol,
- I2S (Inter-IC Sound) interfaces with DMA (Direct Memory Access) (sharing pins with GPIO),
- UART (on dedicated pins (PWM).

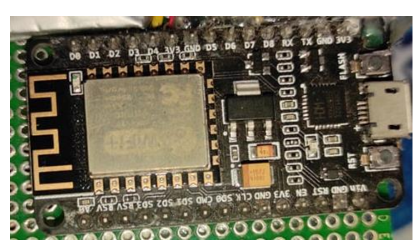

Figure-3.1: Wi-Fi Module

3.1.2 Sensors

A sensor is a device that detects physical input from its surroundings and converts it into data that can be evaluated by humans or machines. The majority of sensors are electronic (data is transformed to electronic data), although some are simpler, such as a glass thermometer that displays visual data.

3.1.2.1 Body temperature sensor

The DS18B20 digital thermometer measures temperatures from 9 to 12 bits in Celsius and has a non-volatile alarm function with user-programmable upper and lower trigger points. The DS18B20 communicates with a central CPU through a 1-Wire bus, which requires only one data line (and ground) by definition. Furthermore, the DS18B20 may get power directly from the data line ("parasitic power"), removing the need for an external power supply.

Figure-3.2: Body Temperature Sensor

3.1.3 Power supply

An electronic circuit that changes the voltage of an alternating current (AC) into a direct current (DC) voltage is known as a power supply. It is made up of the following components: a transformer, a rectifier, a filter, and a regulator circuit. Computers, amateur radio transmitters and receivers, and other electronic equipment that uses DC voltage as an input need power supply units (PSUs). For computers that retain volatile data from time to time, an uninterruptible power supply is a necessary. This not only protects your computer against a sudden shutdown, but it also avoids data damage due to power outages and low voltage.

3.1.3.1 Rechargeable battery

In contrast to a disposable or primary battery, which is delivered fully charged and discarded after use, a rechargeable battery, storage battery, or secondary cell (or archaically accumulator) is a form of electrical battery that may be charged, discharged into a load, and recharged several times. One or more electrochemical cells make up this device.

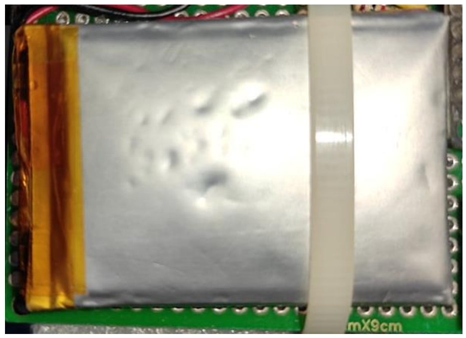

Figure-3.3: Rechargable Battery

3.1.3.2 Battery charging circuit

It's a basic approach that charges the battery with a little steady current throughout the charging process. CC charging ends when the battery reaches its predetermined value. This method is commonly used to charge NiCd, NiMH, and Li-ion batteries.

Figure-3.4: Battery Charging Circuit

3.1.3 Arduino UNO

The Arduino Uno is an open-source microcontroller board designed by Arduino.cc and based on the Microchip ATmega328P microprocessor. The board has a number of digital and analog input/output (I/O) pins that can be used to connect to different expansion boards (shields) and other circuits. The board features 14 digital digital I/O pins and is programmable through a type B USB connector with the Arduino IDE. It can be powered by a USB cable or an external 9-volt battery, with voltages ranging from 7 to 20 volts.

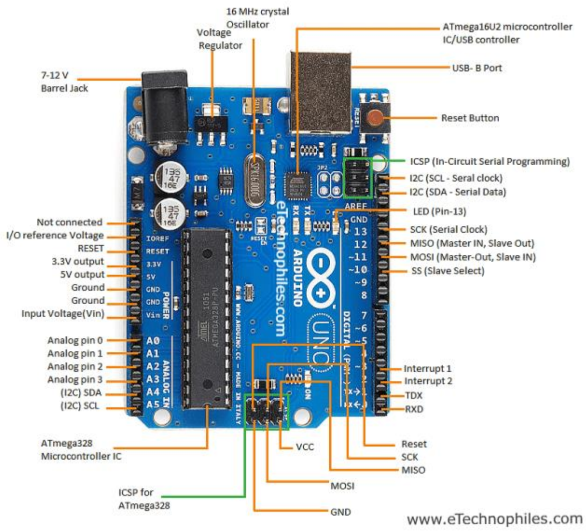

Figure-3.5: Arduino UNO

3.1.4 MPU6050

The MPU6050 is a Micro Electro-Mechanical Systems (MEMS) with a 3-axis Accelerometer and 3-axis Gyroscope. This allows us to measure a system's or object's acceleration, velocity, orientation, displacement, and many other motion-related parameters. This module also has a (DMP) Digital Motion Processor, which is capable of doing difficult calculations and therefore freeing up the Microcontroller's time. Two auxiliary pins on the module can be used to interface external IIC modules such as a magnetometer, however this is optional. The AD0 pin can be used to link more than one MPU6050 sensor to a Microcontroller because the module's IIC address is customizable. This module also comes with well-documented and updated libraries, making it simple to use with well-known platforms like Arduino.

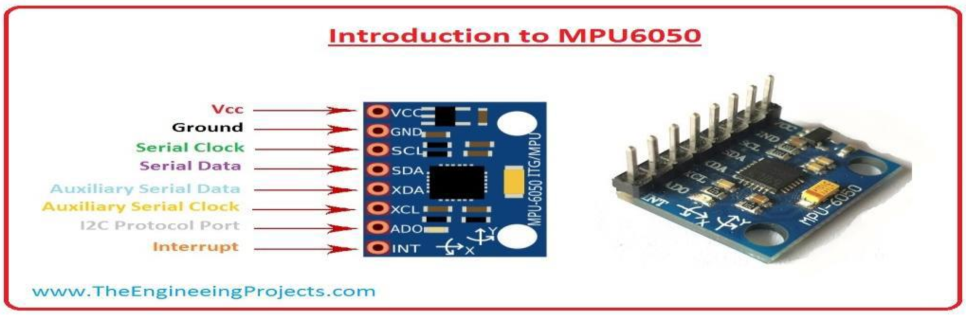

Figure-3.6: MPU6050

3.1.5 Blynk application

Blynk was created with the Internet of Things in mind. It has the ability to manage hardware remotely, show sensor data, store data, visualize it, and perform a variety of other fascinating things. The platform is made up of three primary components:

- Blynk App enables you to create stunning interfaces for your projects by combining multiple widgets.
- Blynk Server is in charge of all data transfers between the Smartphone and the hardware.
- Blynk Libraries enable communication with the server and process all incoming and outgoing commands for all popular hardware platforms.

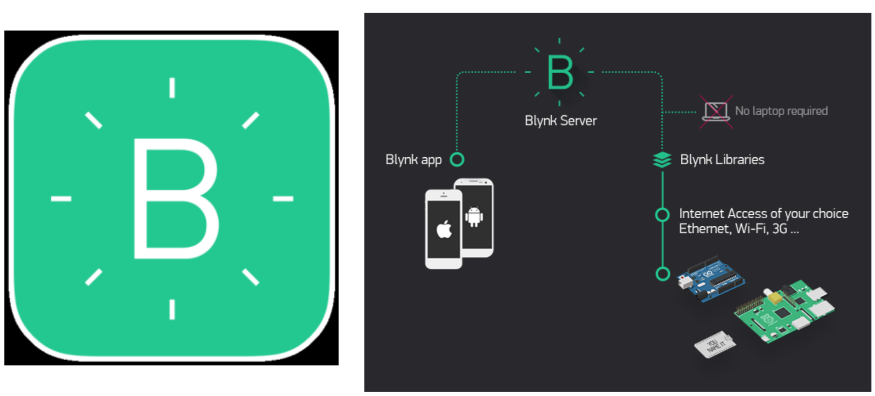

Figure-3.7: Blynk Application

3.2 The prototype's main characteristics

- Light weight
- Low price
- Automatic control
- 5V operation

CHAPTER 4

LOGIC & OPERATION OF THE IMPLEMETATION

4.1 Basics

After putting the system together, the only thing left to do is examine how it works and how efficient it is. The overall system is broken down into numerous subsystems, such as:

- The Arduino Portion
- Body Temperature measurement
- The Application System.

4.2 Algorithm

The Algorithm of overall process:

Step 1: Start the process

Step 2: Connect to the Wi-Fi

Step 3: Read temperature and fall detection

Step 4: Get temperature values and fall detection from analog pins

Step 5: Send data to THINGSPEAK API

Step 6: Delay 10 Seconds

Step 7: Repeat step 4,5 & 6 until the process end

Step 8: End

4.3 Methodology: Flowchart

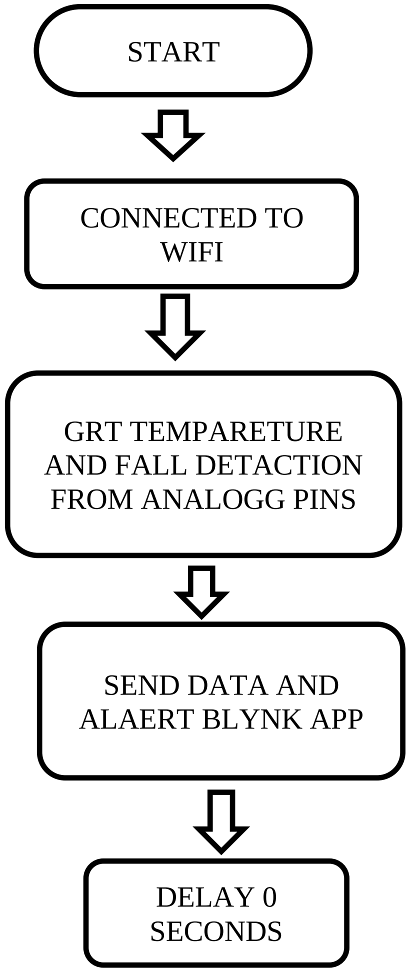

Figure-4.1: Flow Chart

4.4 Principles and procedures

Planning, design, implementation, testing, and evaluation were the five steps of this project. The project's flow was more ordered and systematic after it was broken into five parts. The planning stage of this project is the initial step. A comprehensive plan is essential in order to accomplish the project on time and on budget. Information such as the acceleration and orientation of a person falling was immediately referred to a previous research report during this stage.

The designing stage entails brainstorming ideas and solutions to address the project's problem statement. . Multiple ideas are developed and become alternatives after performing study during the planning step, each of which can be employed to solve the problem. The best design was chosen after considering aspects and constraints such as money, time, and component availability. A flow chart and pseudo code were built and prepared to better comprehend the fall detection and warning system's procedure. Cost, availability, quality, and compatibility are all factors in the selection of components. The fall detecting device's position on a person's body is established based on past study and experimentation.

Following the completion of the design and component selection, the implementation step began. To avoid project delays, components were acquired and delivered on schedule. A prototype of the fall detection and alert system was created at this stage. Aside from that, programming code or an algorithm is created to be programmed into the microcontroller, in this case the ArduinoUNO. Because it is easier to debug when errors arise, it is critical that the algorithm be basic and easy to grasp. Aside from that, programming code or an algorithm is created to be programmed into the microcontroller, in this case the Arduino UNO. Because it is easier to debug when errors arise, it is critical that the algorithm be basic and easy to grasp.

The prototype is put through a series of tests throughout the testing stage. Several tests are carried out to confirm that the prototypes work as intended, including front fall, rear fall, and side fall. Acceleration and orientation data are collected during the testing phase and compared to the acceleration value from a prior study publication. To attain the best result, necessary modifications and adjustments were made during this step.

Finally, the evaluation stage confirms that the fall detection and alert system works properly. It is critical to assess the prototype's performance in terms of repeatability and precision. At this level, the prototype must be capable of reliably detecting a person's fall and accurately distinguishing it from everyday activity (ADL).

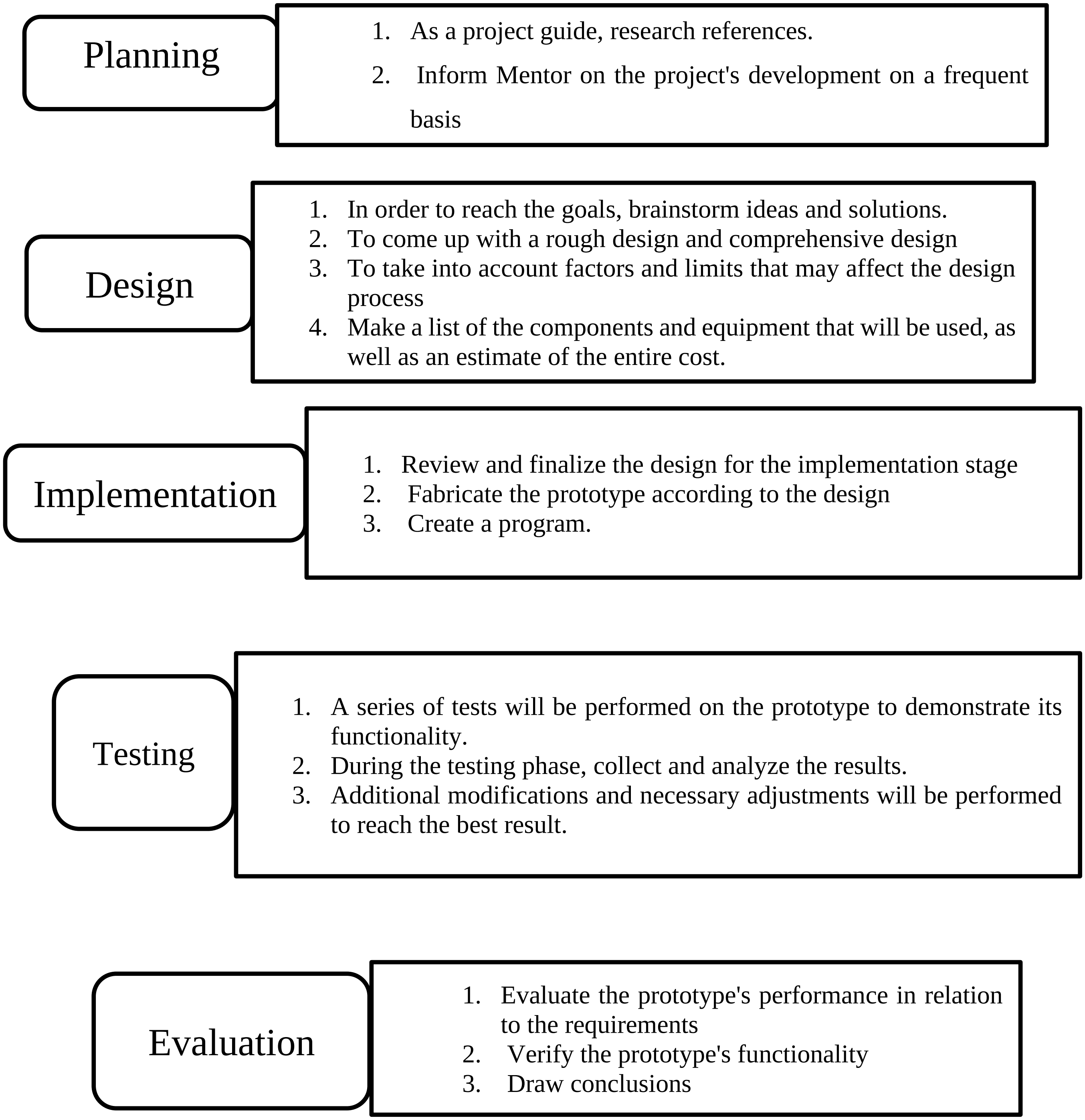

Figure-4.2: Principles & Procedures

CHAPTER 5

CONCLUSION & FUTURE SCOPE

5.1 Conclusion

The use of Arduino for IoT-based Person Fall Detection from a Wheelchair and Show Body Temperature has been proposed. The device can detect falls and provide much-needed assistance to the individual. We created an IoT-based wearable fall detection system since fall detection is a serious concern in the health care arena, especially for the elderly. The technology monitors the temperature of the human body, and the detection mechanism detects a fall from the wheelchair by using a threshold value. The fall is detected when the acceleration surpasses the critical threshold, and an alert is triggered, as well as a message sent to the patient's contact person's cellphone. This item can be stored in a person's pocket or worn on their hand. Because both the hardware and software designs are adequate for this purpose, this system performs effectively for both indoor and outdoor fall detection.

5.1.1 Advantages of this project

- Easy to reach
- Light weight
- Low cost
- Easy to wear & remove

5.1.2 Disadvantages of this project

- Due to frequent hand movement, there is a high rate of false alarms.

5.2 Future scope

If the proposed algorithms are incorporated into an embedded system in the future, their performance will be evaluated in real time. We'll also try to incorporate a GPS tracke

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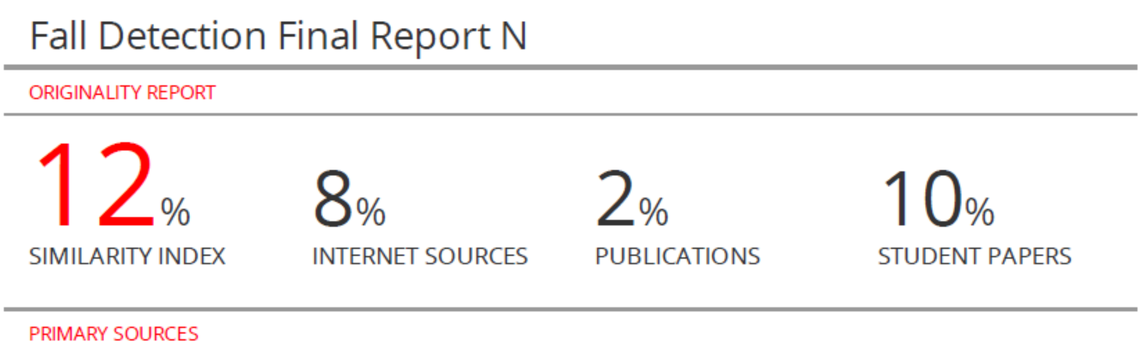
Plagiarism checking:


Fall Detection Final Report N

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