

Implementation of the Internet of Things on a Wheelchair using the MPU6050 Sensor

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ABSTRACT

The large number of family activities carried out outside the home makes them always feel worried and anxious about the activities carried out by the elderly at home. This will be a problem when the elderly carer has important activities outside the home and has to leave the elderly person alone. If an elderly person falls, the sensor will detect the pressure of the fall and reduced balance in the elderly wheelchair. Then the MPU6050 sensor will send input to the nodemcu which controls the entire circuit for processing by sending a signal to the Blynk application as an output processor with a notification in the form of a short message that the elderly person has fallen, from the wheelchair which is displayed on the user's cellphone which has the blynk application installed. With this tool, it is easier for elderly caretakers to know the condition of elderly people when they are in a wheelchair, and it is also quicker to help elderly people if they fall from a wheelchair by notifying them via message notifications in the Blynk application.

INTRODUCTION

The Elderly (Senior Age) is a phase of life that cannot do many activities due to physical limitations and age. One way families always look after elderly people in wheelchairs is by giving cellphones to elderly people. This is done when the family or elderly carers are outside because it is urgent and requires leaving elderly people alone at home.

However, this method still has many shortcomings when the elderly are carrying out activities and forget to bring their cell phone. Perhaps when it is inactive they don't even have credit. The large number of families who carry out activities outside the home makes them always feel worried and anxious about the activities carried out by the elderly at home, this can be a problem until the elderly carer has important activities outside the home and leaves the elderly alone (Wahyuningsih, 2018).

To overcome this, a device is needed that can control the movement of the elderly when they fall from a wheelchair due to limited movement of their limbs, using the MPU6050 sensor which can be utilized by output values from the sensor in the form of acceleration and angular velocity which will detect every pressure and shift of the wheelchair. , if an elderly person falls, the sensor will detect the pressure of the fall and reduced balance in the elderly wheelchair, and then the MPU6050 sensor will send input to the nodemcu which controls the entire circuit for processing by sending a signal to the Blynk application as a processor of the output received from the nodemcu which has been registered with a token that will be used to send notifications in the form of alarms to the account that has been created.

LITERATURE REVIEW

Many other studies have conducted similar research, including one entitled Evaluation of an intelligent wheelchair system for older adults with cognitive impairments (Tuck-Voon How, Rosalie H Wang, 2013). Implementation of the MPU 6050 Sensor to Measure the Equilibrium of a Self-Balancing Robot Using PID Control (Kharisma et al., 2018). Besides that, there are also many studies in other articles that use nodemcu as a controller, such as the implementation of the nodemcu esp8266 wifi module for smart home (Deris, 2019). A Home Mobile Healthcare System for Wheelchair Users (Yang et al., 2014). Semiautonomous Low Cost Wheelchair for Elderly and Disabled People (Kuruparan et al., 2006). Prototype of IoT-Based Fruit Alcohol Level Measurement Tool (Nursila et al., 2021). Design of Smoke Detector for Smart Room Based on Arduino Uno (Ilham, Candra, et al., 2021). The Infusion of Notification Design With an Application of Social Media Based on the Internet of Things (Candra et al., 2020). Rain monitoring system for nutmeg drying based on the Internet of Things (Ilham, Satria, et al., 2021). Design of an Automatic Water Pump on a Traditional Boat (Ihsan et al., 2020). Heart Rate Monitoring and Stimulation with the Internet of Things-Based Al-Quran Recitation (Ilham et al., 2019). Light Control Design by Using Social Media



Telegram Applications Based on the Internet Of Things (Candra et al., 2019). Designing an Arduino-based Automatic Cocoa Fermentation Tool (Balkhaya et al., 2020).

METHOD

Tool Specifications

In designing this tool, we will discuss the needs that must be met, so that this tool can work according to what was planned, namely:

1. The nodemcu can be turned on with a supply voltage of 3.3 Volts, using either a battery or an adapter.
2. Using the MPU6050 sensor as a pressure detection sensor for elderly wheelchairs falling.
3. Blynk as an application for processing message notifications from nodemcu with registered telephone numbers and accounts.

The tools that will be used in building an IoT-based step counter design include:

Hardware

The hardware used in this research method is as follows:

Table 1. Hardware and Specifications

No.	Hardware	Specification
1	Nodemcu	Amica Version 3
2	MPU6050 sensor	3-5 Volts
3	Jumper Cables	Male to Female

Software

The software used in this research method is as follows:

Table 2. Software and Specifications

No.	Software	Version
1	Blynk app	2.27.15
2	Arduino IDE	1.8.5
3	Fritzing application	0.9.2b

Schematic Design / Block diagram

This block diagram was created to simplify the tool design process. This tool system consists of 4 circuits, namely the input section, control section, process section, and output section.

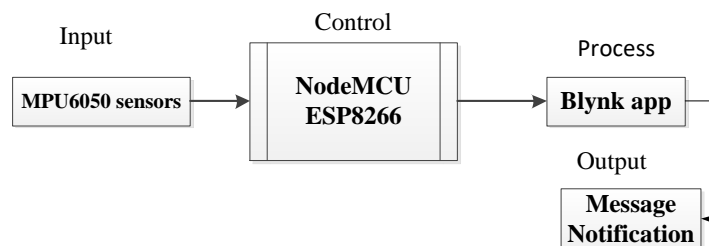


Figure 1. Block Diagram

Information:

1. Input Section
The input section consists of the MPU6050 sensor which works to detect pressure from the balance of a wheelchair falling in the elderly.
2. Control Section
The control section consists of a node that functions as a controller for the entire circuit so that the circuit can work optimally.
3. Process Section
The output section consists of the Blynk application which functions to process the output sent by the nodemcu via a token that is registered as the destination address which will display all input from the sensor.
4. Output Section

The output section consists of the Blynk application which will process all output from the nodemcu and will display the results on the user's cellphone.

Tool Design

Design of a Wheelchair Monitoring Tool for the Elderly Using the MPU6050 Sensor Based on the Internet of Things:

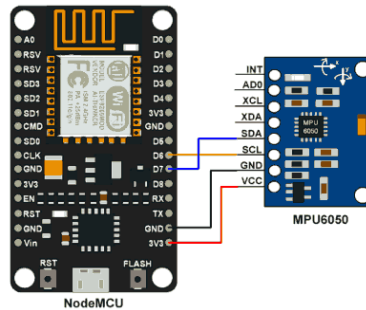


Figure 2. Tool Design

Tool Sketch



Figure 3. Tool Sketch

- A. Place of placement of the tool
- B. Front view of the wheelchair
- C. Back view of the wheelchair
- D. Side view of the wheelchair

Tool Working Principle

The working principle of the Wheelchair Monitoring Tool for the Elderly Using the MPU6050 Sensor Based on the Internet of Things is that if the sensor detects falling pressure or reduced balance in an elderly wheelchair, the sensor will provide input to the nodemcu via a digital pin which will be processed and then sent to the blank application. uses the internet network to be compressed into message notifications that are sent to the user's or elderly carer's cellphone.

System flowchart

A flowchart is a chart or image that shows the process flow and relationships of a program. Flowcharts are needed to explain the program flow or are made in graphical form so that other people can understand the flow that has been created. The following is a flowchart of a Wheelchair Monitoring Tool for the Elderly Using the MPU6050 Sensor Based on the Internet of Things.

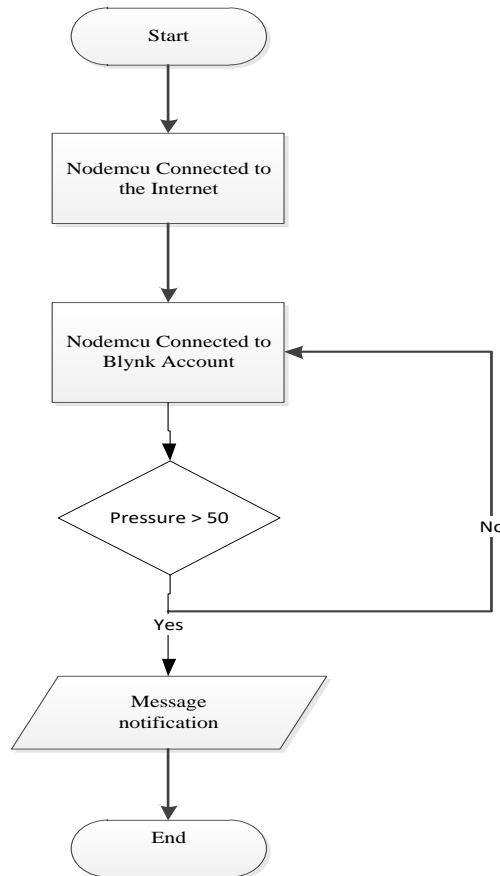


Figure 4. Nodemcu Program Flowchart

The flowchart above explains the flow of how the program on Nodemcu has 4 processes, namely:

1. The node must be connected to the internet so it can be monitored remotely.
2. Nodemcu is connected to the account that has been registered on blink.
3. The MPU6050 sensor detects the falling pressure of an elderly wheelchair.
4. The application will send a message notification to the user's or elderly carer's cellphone with the text that the elderly person has fallen from a wheelchair.

RESULT AND DISCUSSION

Results of a series of tools

MPU6050 Vcc pin to Vin pin on nodemcu, Gnd pin to GND pin on nodemcu, Sda pin to D1 nodemcu pin, SCL pin to D2 nodemcu pin. Like Figure 5.

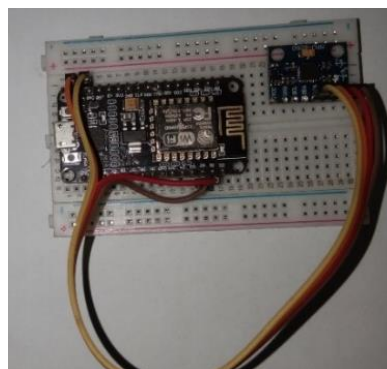


Figure 5. Series of results

Testing Procedure

After the system has been created, it is necessary to test the Wheelchair Monitoring System for the Elderly Using the MPU6050 Sensor Based on the Internet of Things where the sensor will send notifications to the smartphone when the pressure falling from the wheelchair is above 50. Here the author conducted research 10 times.

Table 1. Tool testing

Test	Wheel chair		Sensor Reading	Information
	Danger	Safe		
I	√		70	Incoming Notification/ Danger
II		√	8	No notifications/ Safe
III	√		80	Incoming Notification/ Danger
IV	√		300	Incoming Notification/ Danger
V	√		100	Incoming Notification/ Danger
VI	√		335	Incoming Notification/ Danger
VII	√		180	Incoming Notification/ Danger
VIII		√	32	No notifications/ Safe
IX	√		335	Incoming Notification/ Danger
XI		√	22	No notifications/ Safe
XI		√	22	No notifications/ Safe

This research was conducted to detect the pressure of falling from a wheelchair. When the mpu6050 sensor detects a falling pressure on a wheelchair with pressure above 50, the nodemcu will process the input from the sensor and will send a message notification to the elderly caretaker's smartphone which has the Blynk application installed so that the elderly caretaker can help the elderly person who has fallen from the wheelchair more quickly.

Tool Test Results

Based on testing of wheelchair monitoring systems for the elderly using the mpu6050 sensor based on the internet of things. Where the sensor will detect the pressure of a fall on a wheelchair, a notification will be sent to the elderly caretaker's smartphone in real time.

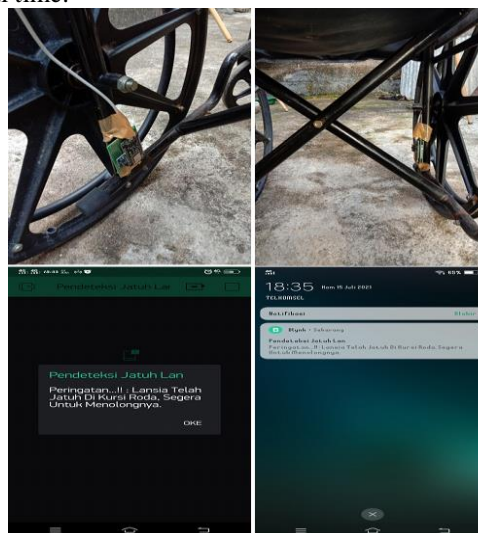


Figure 6. Overall results of the tool

From the tool testing that has been carried out, the pressure detected by the sensor is by the program that has been created where the pressure can be seen on the serial monitor in the Arduino software by the conditions that have been created in the program, namely with conditions greater than 50 and smaller than 50 and do not use units, only displays numbers according to the results detected by the sensor, each pressure is calibrated according to the sensor reading which will then be sent a message to the blynk application if the pressure condition is above 50, and what

appears in the blink application is only a notification in the form of a message notification short according to the message that has been created in the Arduino program.

CONCLUSION

After designing and realizing the Wheelchair Monitoring System for the Elderly Using the MPU6050 Sensor Based on the Internet of Things and then testing the tool, both in the form of each series and as a whole. So it can be concluded:

1. To make it easier for guards to know when an elderly person has fallen from a wheelchair.
2. Nodemcu sends a notification to the elderly caretaker's smartphone that the elderly person has fallen so that the elderly caretaker will know more quickly and immediately help him

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