

Create a Device for Identifying the Location of Alzheimer's Patients

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Abstract

The elderly are unavoidably at a higher risk of disease. Alzheimer's disease is one of the most common conditions that affect the elderly. Alzheimer's disease is a brain disease caused by cell damage that results in memory and thinking ability loss as well as behavioral changes. Three satellites are used in this process, with two forming an imaginary line from the user and the third determining the user's position. This module can be integrated by a variety of antennas connected to the U.FL connector to capture satellite signals. The response from the module is sent from the coordinate data from Latitude from the test site based on the tests that have been completed. Due to the limited ability to capture the 800 L SIM module signal in comparison to smartphones commonly used today, network connection problems in closed rooms or places far from signal transmitting towers are the most frequently encountered during testing.

Keywords: *Alzheimer's Disease, Elderly Disease, Connector, SIM Module.*

A. INTRODUCTION

The elderly are at an increased risk of disease, which cannot be avoided. Many factors contribute to this, including a poor lifestyle, a lack of body fitness, and a lack of health-monitoring habits (Nivvoli & Partidge, 2012; Saleh et al., 2017; Bangali & Shaligram, 2013). According to government regulation number 43 of 2004, a person is considered elderly if he or she is over the age of 60. Alzheimer's disease is one of the most common diseases among the elderly.

Alzheimer's disease is a brain disease caused by cell damage that results in memory and thinking ability loss as well as behavioral changes. This disease will progressively worsen. In the early stages of Alzheimer's, a person can still perform daily tasks but will begin to experience symptoms such as difficulty remembering the location of his belongings and the names of people he has just met (Khan et al., 2012; Rana et al., 2013). Then, in the middle stage, the symptoms worsen to the point where the patient requires assistance with daily activities, and the patient begins to have difficulties remembering about himself, such as identity and home address; at this stage, people with Alzheimer's experience changes in their emotional state, such as being irritable and anxious. In the final stage, the patient will have significant memory

loss and will be unable to socialize, so he will always require assistance with daily activities (Alzheimer Association, 2015).

According to the World Health Organization, Alzheimer's is a disease that primarily affects the elderly, with sufferers experiencing a decline in their ability to think, remember to speak, and change behavior that worsens over time (Duthey, 2013). People with Alzheimer's disease exhibit the following behaviors: they are easily angry and aggressive, easily anxious, forgetful, frequently repeat work and words, are suspicious, frequently get lost when traveling, and have difficulty sleeping. Later on, the patient will find it increasingly difficult to speak normally and may experience depression or irritability. Finally, the patient's behavior will change significantly; he or she will find it difficult to interact with the environment, speak, think, or remember.

This technology determines location, navigation, and the time required to arrive at a specific location (Milner, 2016; Kumar & Mittal, 2019; Mahzan et al., 2019). In this process, two satellites form an imaginary line from the user, and the other satellites function to determine the user's position (Bajaj et al., 2002; Singh et al., 2014). This module can be integrated by various antennas connected to the U.FL connector to capture satellite signals. Furthermore, this module can be combined with multiple microcontrollers such as the Arduino Uno, Arduino Nano, Arduino Mega, or Raspberry.

A gyroscope is frequently used in human motion sensors. According to Ching Yee Yong et al. research's on the use of a gyroscope sensor to determine human movement patterns, the gyroscope sensor can be used to determine human movement patterns. Furthermore, this sensor can detect human movement patterns more accurately than the compass sensor (Passaro et al., 2017; Shawki et al., 2015; Tyagi et al., 2013).

GSM is currently being used as a communication medium in many studies. GSM is used in Nur Aira Abd Rahman et al., research's to monitor radiation. In the survey, the system designed has an output in the form of SMS to a predetermined number (Yong et al., 2013; Parab et al., 2015; Shaheen et al., 2011). Furthermore, Halgurd Nawaz and Bakhtiar Ali used GSM to monitor three parameters at the same time in their study. It consists of monitoring gas, smoke, and motion sensors used in smart homes (Abd Rahman et al., 2018; Zandamela, 2017).

Based on these findings, a tool will be designed and built in this study to determine the location and position of people living with Alzheimer's so that when an emergency occurs, prevention can be taken to avoid undesirable outcomes.

B. METHOD

The GPS module determines the tool's user location, while the gyroscope sensor determines the user's position. The microprocessor will process the data from the sensing results after the gyroscope and GPS sensors have completed their tasks in order to send SMS messages to caregivers or families of Alzheimer's patients. Figure 1 depicts the block diagram of the tool to be designed.

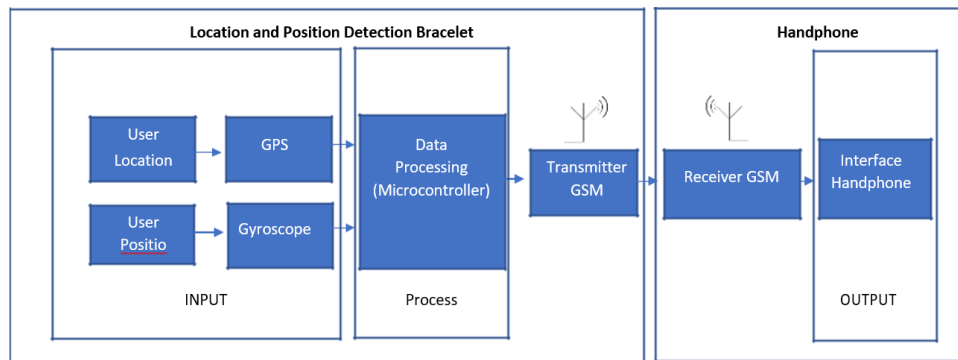


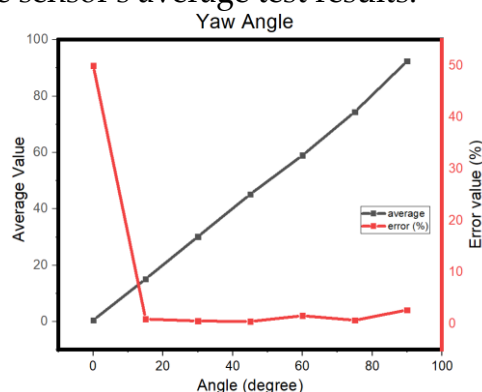
Figure 1. Block Diagram of the Bracelet Location and Position

Three scenarios will be simulated: the state when the system starts up, the shape when the system receives a command message, and the form when the user does not experience a position change. This will ensure that the system that has been created can operate in accordance with the design that has been designed. When the system is turned on, the first stage begins. The system will send an SMS message to the specified number with the message "The bracelet is activated."

A command will be sent to the system via SMS in the second scenario. In this case, the system should receive an SMS message with the word "Location." The system will send the user's coordinate point data to the specified number after receiving the message. Finally, if the gyroscope sensor does not move within the specified time, the system will send location data. The time set to trigger the state in this state is 20 seconds. When the timer runs out, the system will send a warning message to the specified number along with the coordinates.

C. RESULTS AND DISCUSSION

A protractor is used as a reference for testing gyroscope sensors. During testing, the sensor will be placed in the center of the protractor and compared to the protractor's reference value. Attached are the results of the overall gyroscope sensor test. Figure 2 displays the sensor's average test results.



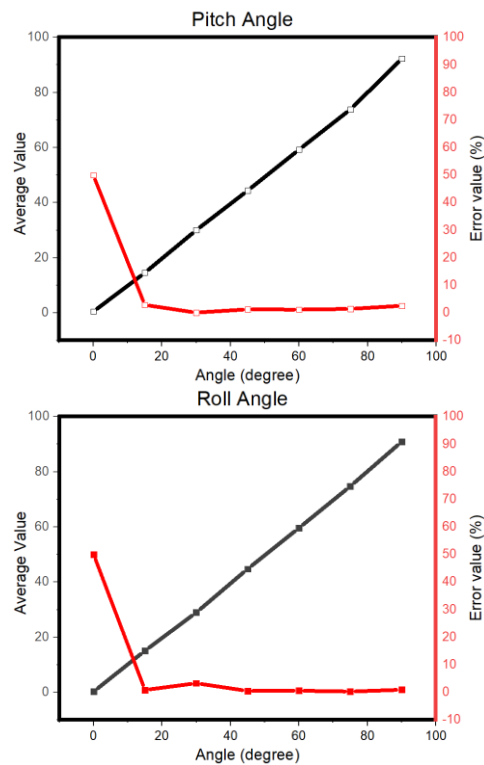


Figure 2. The MPU 6050 Sensor's Average Test Results

Figure 2 shows the test results, which show that the angle value read on the gyroscope sensor changes despite being located at the same point. This is due to the fact that during testing, the sensor is manually moved, which causes the sensor reading to be in a condition that is different from the initial position and results in the reading of different values. Furthermore, the test site's non-flat surface factor causes variations in the values read by the sensor.

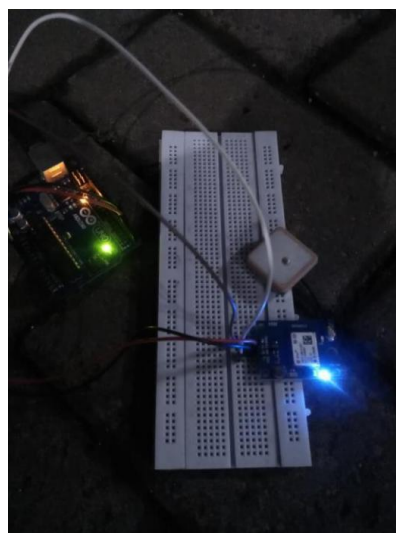


Figure 3. Testing Setup for Neo Ublox 6M Module

The Neo Ublox 6M Module is tested by comparing the coordinate points it produces with a reference, in this case, the position of the laptop when it is in use. The Neo Ublox 6M module was tested in two locations: Umi Tasya Wedding Art, located on Jalan Masjid Al-Latif No. F2 Kedemangan, Setu City of South Tangerang, and STO

Serpong, located on Jl Raya Puspitek, Kedemangan, Setu City of South Tangerang. The two locations were chosen for testing because they have open space, which allows the GPS signal to be received faster than if the module was tested in a closed room. Figure 3 depicts the test setup. Five data points for the longitude and latitude coordinates were collected during the test at the initial location, as shown in Table 1:

Table 1. Coordinate Points at the Location of UMI Tasya Wedding Art

No	Latitude	Longitude	Deviation (m)
1	-6.334671	106.668998	3
2	-6.334708	106.669052	5
3	-6.334701	106.669052	5
4	-6.334735	106.669052	6
5	-6.334735	106.669052	6
Average			5

Source: data proceed

There is an average distance difference of 5 meters between the coordinates of the reference point, indicating a deviation of 2.5 meters when compared to the accuracy of the technical specifications of the Neo Ublox 6M module. The distance comparison data was obtained by using the Google Maps website, as shown in Figure 3's example coordinate number 1.

In Figure 4, the module's test results are displayed. According to the figure in this test, the 800 L SIM module is connected and can communicate with Arduino; this is demonstrated by sending the command string "AT" to the module, which response with the series "OK." The module is then given a command string in the form "AT + CPIN?" and responds with the sequence "+CPIN: Ready" and "OK." This string indicates that the SIM card provider has successfully connected to the module and is ready to use.

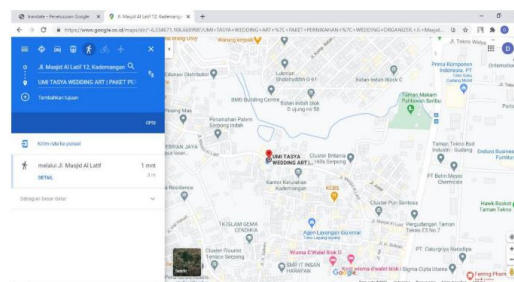


Figure 4. Comparison of the distance between the GPS module and the reference at the Umi Tasya location

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COM3
|
14:05:10.999 -> Testing GSM SIMS00L
14:05:16.505 -> AT
14:05:16.505 -> OK
14:05:16.505 ->
14:05:29.786 -> AT+CPIN?
14:05:29.786 -> +CPIN: READY
14:05:29.833 ->
14:05:29.833 -> OK
14:05:29.833 ->
14:05:46.742 -> AT+COPS=?
14:05:53.151 ->
14:05:53.228 -> +COPS: (2,"TELKOMSEL","T-SEL","51010"),(0-4),(0-2)
14:05:53.275 ->
14:05:53.275 -> OK
14:05:53.275 ->
14:06:08.293 -> AT+CREG?
14:06:08.293 -> +CREG: 0,1
14:06:08.293 ->
14:06:08.340 -> OK
14:06:08.340 ->
14:06:21.185 -> AT+CSQ
14:06:21.232 -> +CSQ: 26,0
14:06:21.232 ->
14:06:21.232 -> OK
14:06:21.232 ->
14:06:30.191 -> AT+CBAND?
14:06:30.191 -> +CBAND: DCS_MODE
14:06:30.238 ->
14:06:30.238 -> OK
14:06:30.238 ->

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Figure 5. Results of AT Command Testing on the 800 L SIM Module

The module is then given a command string in the form of "AT+COPS=?" and responds with "+COPS: (2, "Telkomsel," T-SEL," 51010"), (0-4), (0-2)," indicating that Telkomsel is the sim provider being used during testing. The module is then given a command string in the form "AT + CREG?" which checks network registration and returns the series "+CREG: 0.1," indicating that the SIM card has been registered and can now access the provider network. The command string "AT+CSQ" is then given. This string ensures that the signal received by the module is of high quality. And "+CSQ: 26.0" indicates that the signal obtained during testing is -61 dBm, indicating that the received signal is in excellent condition. Finally, given the command string "AT + CBAND?" and responding with "+CBAND: DCS MODE," the module in use is operating at 1800 MHz.

This experiment was repeated three times, with the first two experiments sending a message to the number that had been determined with a string that reads "Latitude." In the third experiment, coordinate data from the testing site will be sent to Latitude. The software that has been created will include a number of AT commands in the form of "AT+CMGF=1" to put the module in text mode and "AT+CMGS=" + phone number + " "message content" to send SMS messages to the specified number.

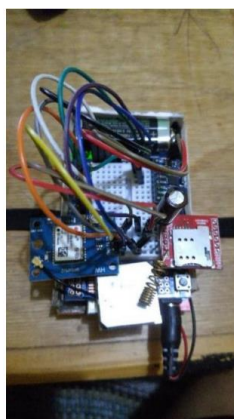


Figure 6. Prototype of an Alzheimer's disease location and position detection bracelet.

The most frequent network connection issues during testing occur in enclosed spaces or locations far from signal transmitting towers; this is because the 800 L SIM module signal cannot be as easily captured as a smartphone signal today. Furthermore, the issue of sim card registration in order to access the network must be addressed. The problem in this study occurred because the sim card used had an active period, and when using a new sim card, the sim could not be registered into the network.

A prototype of a location and position detection bracelet that has been integrated with all modules and sensors that have been designed is used in this test. This test aims to ensure that the tool functions as intended. The created prototype can be characterized as depicted in Figure 6.

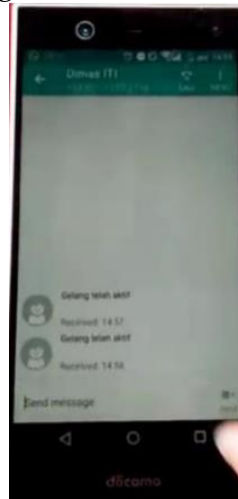


Figure 7. Notification that the prototype has been active

There are three parameters to be tested in this overall test: sending a message indicating that the system has worked, sending a command to send the bracelet user's coordinates, and sending the coordinates automatically if the user does not move at all.

In the first test, it was discovered that the designed prototype can send SMS messages in the form of system notifications. However, the notification message is occasionally hampered because the 800 L SIM module has not received a signal from the network to be used when the system is turned on, resulting in a delay time until the message can be sent. Figure 7 depicts the outcomes of the notification delivery.

The second test revealed that when given a command in the form of an SMS containing the string "Location," the prototype can send messages to a predetermined number. The data from these locations have been integrated with the Google Maps domain, which displays the user's location. Figure 8 shows the results of this test. The image shows that the specified number has received a message with the text "User's current location: maps.google.com/q=-6.342309,106.672380," which is the user's location while testing is taking place. Additionally, a difference of 10 meters is discovered when the coordinates of the STO Serpong are compared to the reference coordinate points.

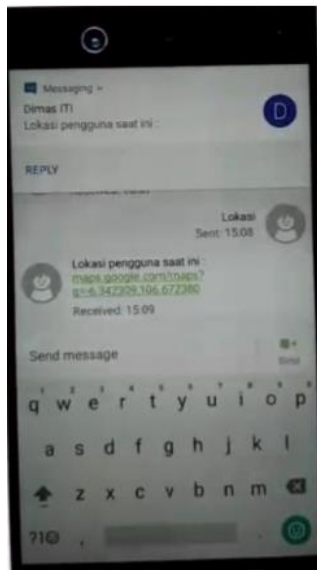


Figure 8. An SMS message containing the user's location when a command is received.

In the third test, it was discovered that the designed prototype can send messages to a predetermined number if the user does not move within 20 seconds. The user's location when not moving during the test is specified in the message as "User is not moving, Current location: maps.google.com/q=-6.342220,106.672240". There is a difference of 10 meters between this point and the reference point.

D. CONCLUSION

According to the research, it can be concluded that the bracelet can function to send location data from the user when an SMS command containing the word "Location" is received. Once the user has been motionless for 20 seconds, the bracelet will keep sending location information. And the distance from the reference point is 10 meters.

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