"I-DEVICE" Islamic Device for Blind as Prayer Time Reminder and Qibla Direction Indicator with Voice Output

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Abstract—*Blind is a disability that occurs in the eyes that show total dysfunction also partly (low vision), with that the learning process which emphasizes the other senses, the sense of touch and hearing. Persons with problems of difficulty in doing activities, none other than when praying. System praying in accordance with the time in the area and borne to face the Qibla, is no exception for sufferers visually impaired, therefore we need sufficient attention great for this problem in order to help blind sufferers. Therefore, portable devices that can be made easily carried by blind. This tool consists sound output so easy to understand its use. Based on the considerations outlined, a tool will be made aids for the visually impaired with GPS, compass sensors, and RTC module (Real Time Clock). The goal is agreement to get aids for the visually impaired to know the Qibla direction and time prayer reminder. This tool uses GPS and compass sensors as Directions the qibla Once the user is in a different place, RTC module as a prayer time marker. With a tool design portable, this tool is expected to be easy to carry everywhere and comfortable when used.*

I. INTRODUCTION

Blind is a disability that occurs in eyes that show a decrease in function in the eye total or partial (low vision), blind people have difficulty seeing the environment including performing prayers. On research previously there were several tools used for assist the blind in recognizing the Qibla direction. Example The first is "Prototype Robot to Determine Direction Qibla with the Signs of Prayers "[1]. The second example is "IbM Qidir (Qiblah Direction) Finder" that is a tool used to minimize errors in determine the direction of Qibla that is practical and useful in all area [2]. The third example is "Device Design Loud Electronic Prayer Time Reminder System" [3]. In background back by that problem, then in the task journal this end is carried out a study to design an a tool that is able to help visually impaired people in carry out prayer.

II. METHODOLOGY

A. Tool Specifications

Tool specifications for prayer times reminder and Qibla direction for the blind are as follows:

1. Arduino Mega 2560

Arduino Mega 2560 is a development board Arduino based microcontroller by using the ATMega 2560 chip. Used as processing data from sensors [4].

2. CMPS12 Compass Sensor

The CMPS12 Compass Sensor is a special sensor function as a compass, like befitting a ordinary compass that can show the direction, we can Use the CMPS12 Compass Sensor for application others such as visual aids.

3. RTC DS1307

The Real Time Clock component is an IC component counters that can be used as data sources time in the form of hourly, day, month and year data. RTC DS1307 is used to input time data, this tool is used as an alarm activity [5].

4. UBLOX NEO-6M GPS

GPS (global positioning system) is a system which is able to provide the exact location on earth in any condition and anywhere. This GPS can used indoors though not so good and get a signal longer than outside room [6].

5. DF Player

DFPlayer is a compact and able MP3 module directly connected to the speaker, DF Player can working alone in a standalone or working together with a microcontroller via Serial connection [7].

6. Speaker

Speaker as the output (output) in the form of sound for listened to by users.

7. Arduino IDE Software

Arduino software used is the driver and IDE, although there are still a few other softwares very useful during the development of Arduino. Integrated Development Environment (IDE), a special program for a computer to be able to make a program design or sketch for the Arduino board. IDEA Arduino is very sophisticated software written by using Java [8].

B. Input-Output Diagram

Input-Output diagram of the prayer time reminder and Qibla direction with sound output for blind is shown in Fig. 1.
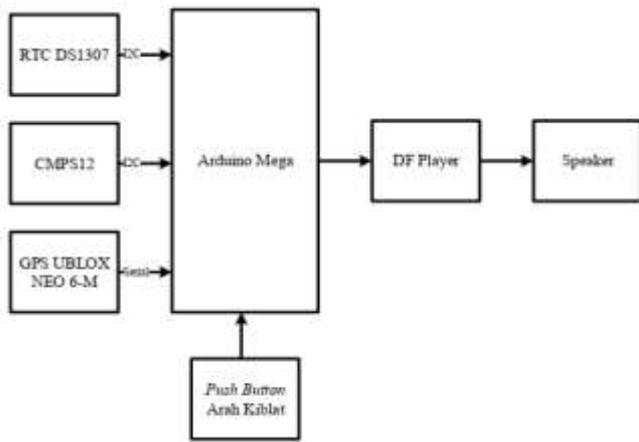
Fig. 1. Input-Output Diagram.

C. *Theory of Determination of Qibla Direction*

In the calculation of the Qibla direction, there are 3 points which are must be made as shown in Fig. 2, which is:
1. Point A, placed at the Kaaba (Mecca).
2. Point B, placed at the location of the place to be Qibla direction is determined.
3. Point C, placed at the north pole point.

Point A and point C are two fixed points, because of the point A remains at the Kaaba and point C is right at the North Pole, where as point B as a variable that changes depending on which location which will be calculated in the Qibla direction. If all three of these points connected by the curved lines of the earth's surface, then a triangle of ABC occurs, as in third Fig.2. The sides of the triangle are named with lowercase letters by name the angles in front of each side a, side b, and side c [9].
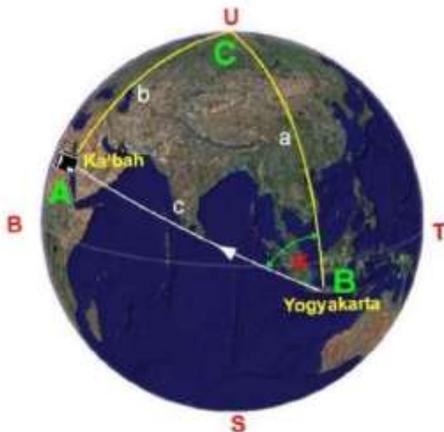

Fig. 2. Taking 3 points as direction calculation

From Fig. 2 it will be known that what is meant the calculation of Qibla Direction is a calculation to find out how much the K angle value is at point B, i.e. the angle enclosed by side a and side c.

Making triangular ball images is very useful for help determine the value of the Qibla direction angle for a place on the surface of the earth that is counted / measured from a the point of the direction of the compass point in the direction of the other compass point, for example measured from the North to West point (U-B), or measured clockwise from the North

point (UTSB). For the calculation of Qibla direction, only two data are required [10]:
1. Kaaba Coordinates $\varphi = 21°\ 25\ ’LU$ and $\lambda = 39°\ 50’\ BT$.
2. The coordinates of the location where the Qibla direction will be calculated.

While the latitude and longitude data places are city locations Qibla direction will be calculated from the measurement directly using the GPS module, with the equation:

$$tgK = \frac{\sin(\lambda t - \lambda K)}{\cos\varphi t\,.\,\tan\varphi K - \sin\varphi t\,.\,\cos(\lambda t - \lambda K)} \quad (1)$$

With,
K   : Qibla direction angle from north to west
φK : Latitude of the Kaaba (21° 25 ’LU)
λK : Longitude Ka'bah (39° 50 'BT)
φt : Latitude of origin
λt : Longitude origin

III. RESULT AND ANALYSIS

At this section, a series of testing and testing of all equipment will be tested. Results this test will be used as data to obtain desired results. As for several goals testing is carried out to find out the results designing and manufacturing tools, analyzing errors and Weaknesses of the tool, then compared so that if any damage can be repaired immediately. Some parts are necessary for testing include the following:
A. Arduino Mega 2560 Testing
B. RTC DS1307 testing
C. Testing CMPS12
D. Testing UBLOX NEO-6M GPS

A. *Arduino Mega 2560 Testing*

Arduino Mega 2560 board testing aims to know the system can work well and know Arduino Mega 2560 microcontroller board is in a state well.

Fig. 3. The Result of Arduino Mega 2560 Testing

From the test results in Fig. 3 it is known that Arduino Mega 2560 has filled the program that has been made and can work properly.

B. RTC DS1307 testing

RTC DS1307 testing aims to determine the results Data displayed by RTC DS1307 is in the form of date, time and minutes.

TABLE I. RTC DS1307 testing.

Date	Prayer Time's Schedule	Time		Correction
		Input	Output	
1	dawn	04.25	04.25	Right
2	duhur	11.40	11.40	Right
3	Asr	14.59	14.59	Right
4	maghrib	17.29	17.29	Right

The test results above, it is known that RTC DS1307 can display the hours according to the program entered on Arduino Mega 2560 microcontroller board and still can save data after the system shuts down or doesn't get power supply.

C. CMPS12 testing

Testing the CMPS12 sensor aims to find out the accuracy of the resulting angle. The results of tests that have been carried out, there are several angular data generated by the CMPS12 sensor and from testing CMPS12 sensor has a success value of 100%.

TABLE II. Qibla Angle Reading Results.

Testing	Time	
	CMPS12 Sensor	Smartphone
1	294.7	294
2	294.2	294
3	293.7	294
4	293.8	294
5	294.1	294
6	293.9	294
7	293.8	294
Avarage	294.02	294

D. Testing UBLOX NEO-6M GPS

Testing UBLOX NEO-6M-00 GPS aims to know the extent of the accuracy of the coordinate point data provided by the GPS module. This test is done by determining a known point coordinates, then the writer goes to that point and read the results of reading the coordinates issued by the GPS module then compares with google maps.
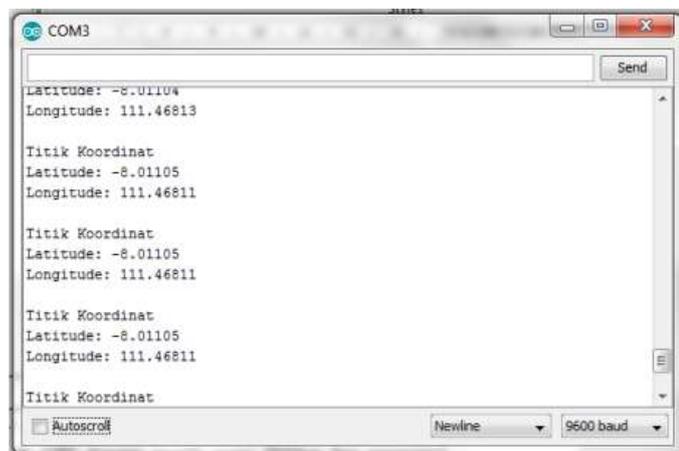

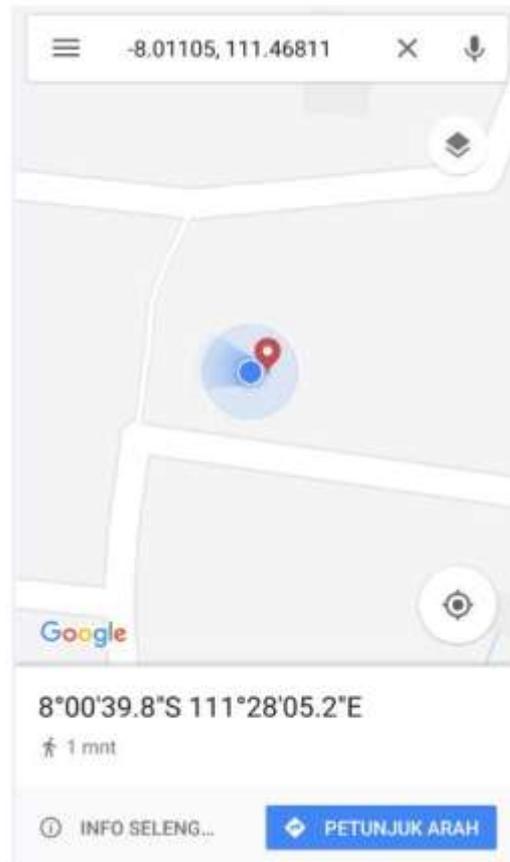Fig. 4. UBLOX NEO-6M GPS Test Results

Fig. 5. Display of Google Maps GPS Testing

The test results in Fig. 4 are the points taken UBLOX NEO-6M GPS opens on Google Maps, get results that match points on Google Maps in Fig. 5.

IV. CONCLUSION

After going through the process of designing, manufacturing, testing, and analysis, based on the results of design and the results of the analysis that has been done regarding the design "IDevice" prayer time marker and Qibla direction with sound output for the visually impaired, the authors get data that can be used as a conclusion. The conclusion from making this tool are:

1. UBLOX NEO-6M GPS Sensor Module can take the coordinates of the Arduino program.
2. The CMPS12 compass sensor can read the direction angle Qibla and become a comparison point processing results coordinates of the UBLOX NEO-6M GPS Sensor Module to find out the Qibla direction.
3. RTC DS1307 can determine the prayer schedule programmed in Arduino Software.
4. RTC DS1307 has an internal battery for save time and date data, so even though the microcontroller system is off time and date in RTC DS1307 memory remains up to date.
5. The electronic circuit in this research is already done running well and this tool can work properly.

REFERENCES

[1] J Hakim, L., Raharjo, R., dan Waluyo, D. 2013. Prototype Robot Untuk Menentukan Arah Kiblat dengan Tanda Shaf Sholat. Tugas Akhir : PSD3 Teknik Elektronika - Dep. Teknik Elektro - Politeknik Elektronika Negeri Surabaya.,

[2] Setiopranoto, M J., Maulana, E., dan Abidin Z. 2013. IbM Qidir (Qiblah Direction) Finder. Tugas Akhir: Fakultas Teknik – Universitas Brawijaya.G. O. Young, "Synthetic structure of industrial plastics," in *Plastics,* 2nd ed., vol. 3, J. Peters, Ed. New York: McGraw-Hill, pp. 15–64, 1964.

[3] Siregar, M R., Jabbar, A., dan Usman, A. 2013. Perancangan Perangkat Keras Sistem Pengingat Waktu Sholat Elektronik. Tugas Akhir : Jurusan Teknik Informatika – Sekola Tinggi Teknik Harapan Medan..

[4] Fauzan, A., Zuraiyah, T., dan Ismangil, A. 2016. Rancang Bangun Alat Bantu untuk Tunanetra menggunakan Sensor Ultrasonik dan Sistem Penentuan Lokasi Berbasis Mobile.Tugas Akhir : Program Studi Ilmu KomputerFakultas MIPA – Universitas Pakuan.J. U. Duncombe, "Infrared navigation—Part I: An assessment of feasibility," *IEEE Transactions Electron Devices*, vol. ED-11, no. 1, pp. 34–39, 1959.

[5] Singgih, H. 2013. Rancang-Bangun Alat Penunjuk Arah Kiblat Berbasis GPS. Tugas akhir : Program Studi Teknik Elektronika, Jurusan Teknik Elektro – Politeknik Negeri Malang.

[6] Arkanuddin, M. 2010. Teknik Penentuan Arah Kiblat. Yogyakarta : Rukyatul Hilal Indonesia (RHI).

[7] Nur, M. 2017. Rancang Bangun Handheld Wand Pendeteksi Halangan dan Alarm Jarak dengan Output Suara untuk Tunanetra. Tugas Akhir : Program Studi Teknik Komputer Kontrol – Politeknik Negeri Madiun..