

Accuracy of Qibla Direction Calculation by Determining the Earth's True North Point

Imamul Muttaqin

MAN 2 Model Medan, Indonesia

Corresponding Author: Imamul Muttaqin

ABSTRACT: *True North is any point on the earth to the North Pole, it is because the North Pole and the South Pole are pointing to the precise axis of the rotation of the earth. Therefore true north is the North based on an axis of non-northern Earth based on earth magnets. So the difference is the true north pointing out the true north direction of the Earth while the North Magnet is the north direction of the magnetic compass needle. North magnets do not coincide with the true north of the Earth. To know the true north of the Earth by using a compass need to know first magnetic declination. To perform magnetic declination can be done through a magnetic declination calculator such as WMM (World magnetic model) that can be downloaded via the Crowdmag app's Playstore. In determining the direction the Qibla is required is determining the Earth's true North Point.*

KEYWORDS: *Qibla direction, True North Earth, North Compass, Declination Compass*

Date of Submission: 18-01-2020

Date of Acceptance: 06-02-2020

I. INTRODUCTION

During this tool used to determine the direction of the mosque Qibla and Musalla is a compass, besides determination of Qibla direction using a very practical compass, this tool is also very easy to obtain. But the use of the compass in total in determining the direction of Qibla can lead to an improper direction of Qibla leading to the Kaaba, this is because the North point indicated by the compass is the point North Magnetic. While in determining the direction the Qibla is required is determining the Earth's true North Point. The use of the compass should also be very cautious because objects containing metals such as knives, watches, coins and others greatly affect the compass needle so as not to show the Earth's true north.

The most important thing and should be avoided the use of compass in determining the direction of Qibla is the compass undergoes magnetic declination i.e. deviation of North Pole magnetic needle compass against the true north of Earth. The value of this magnet variation is always different and varies at any time and place (SlametHambali, 2011).

Revision of the revision of the Book of Almanac HisabRukyat explained for Indonesia's westernmost area until the easternmost area of the magnet declination lies between the price of approximately-1 degree to + 6 degrees. The amount of magnetic declination in a place can also be seen and determined from a magnet declination map; Generally this map is created or updated every 5 years, for example the map Epoch 1990.0 applies for a period of 1990-1995 onwards. The creation and renewal of these maps is in accordance with the international provisions (Revised Team of the Revision of the Book of Almanac HisabRukyat, 2010).

By ignoring the Earth's true North Point in the direction of Qibla then the direction of Qibla mosque tends to be diverged and far from the Kaaba. True North is true north is any point on the earth to the North Pole, it is because the North Pole and the South Pole pointed appropriately to the Earth's rotation axis. Therefore true north is the North based on an axis of non-northern Earth based on earth magnets. So the difference is the true north pointing out the true north direction of the Earth while the North Magnet is the north direction of the magnetic compass needle. North magnets do not coincide with the true north of the Earth. To know the true north of the Earth by using a compass need to know first magnetic declination. To perform magnetic declination can be done through a magnetic declination calculator such as WMM (World Magnetic Model) that can be downloaded via the Crowdmag app's Playstore. Before that should be determined first latitude and longitude mosque using GPS (Global Position System) or map coordinates, or can also be downloading the application Variation.

II. DISCUSSION

A. Qibla Direction According to FiqhJurisprudence

Qibla etymologically according to Muhammad RawasQal'aji in Mu'jamLughah al-Fuqaha, that the Qibla is MaidaruHaiatin from sentence "يُقَابِلُ — مُقَابِلَةً" which means:

الْكَعْبَةُ الْمَشْرِفَةُ وَهِيَ الْجِهَةُ الَّتِي يَجِبُ اسْتِقْبَالُهَا فِي الصَّلَاةِ.

"The Kaaba is a noble (direction) that is addressed when Salat".

According to Imam Nawawi in Majmoo ' (Abu ZakariaMuhyiddinNawawi, 2010)

الْمُرَادُ بِالْمَسْجِدِ الْحَرَامِ هُنَا : الْكَعْبَةُ نَفْسُهَا

"The Meaning of Haram is: Building Kaaba".

Based on the understanding of the qibla above there is still the error in defining the Holy Haram, Imam Nawawi mentioned there are four definitions of Masjid Al Haram: (Abu Zakaria Muhyiddin Nawawi, 2010)

وَاعْلَمَ أَنَّ الْمَسْجِدَ الْحَرَامَ قَدْ يُطَلَّقُ وَيُرَادُ بِهِ الْكَعْبَةُ فَقَطُّ, وَقَدْ يُرَادُ بِهِ الْمَسْجِدُ حَوْلَهَا مَعَهَا, وَقَدْ يُرَادُ بِهِ مَكَّةُ كُلُّهَا, وَقَدْ يُرَادُ بِهِ مَكَّةُ مَعَ الْحَرَمِ حَوْلَيْهَا بِكَمَالِهِ

"That what is meant by the Haram is:

1. Ka'bah only.
2. Haram and surrounding areas.
3. The whole city of Mecca
4. The whole city of Mecca and all the land of Haram. "

From the four definitions of Masjid al-Haram above Imam Nawawi, the first opinion is that what is meant by the Haram is the Kaaba, the following statement: (Abu ZakariaMuhyiddinNawawi, 2010)

أَنَّ مَعْنَاهُ هَذِهِ الْكَعْبَةُ هِيَ الْمَسْجِدُ الْحَرَامُ الَّذِي أُمِرْتُمْ بِاسْتِقْبَالِهِ لَا كُلَّ الْحَرَمِ وَلَا مَكَّةَ وَلَا الْمَسْجِدَ الَّذِي حَوْلَ الْكَعْبَةِ بَلْ هِيَ الْكَعْبَةُ نَفْسُهَا فَقَطُّ

"That this meaning is the Kaaba that is the Haram mosque where you are instructed to confront it is not a haram, Mecca is not also the mosque around the Kaaba but what is meant is the Kaaba itself".

The scholars agreed that for the people who directly witnessed the Ka'bah must face the Kaaba is a cube-shaped Kaaba building. Among the scholars who said this was Ibn Rusyd in the Bidyah al-Mujtahid:

أَمَّا إِذَا أَبْصَرْتَ الْبَيْتَ فَالْعَرَضُ عِنْدَهُمْ هُوَ التَّوَجُّهُ إِلَى عَيْنِ الْكَعْبَةِ وَ لَا خِلَافَ فِي ذَلِكَ

"If you can watch the mosque (Kaaba) directly according to them (the scholars) The purpose is facing the Kaaba there is no difference in this problem".

B. The Urgency Of Determining The True North Of The Earth In Qibla Direction Accuracy Calculation

To know the true north of the Earth by using a compass need to know first magnetic declination. To perform magnetic declination can be done through a magnetic declination calculator such as WMM (World magnetic model) that can be downloaded via the Crowdmag app's Playstore. Before that should be determined first latitude and longitude mosque using GPS (Global Position System) or map coordinates, or can also by downloading the application Variation.

As an example of the qibla direction of Muslim Mosque exemplary Jl. H. Bahrum Jamil Kec. Medan City unknown latitude 3.601898, longitude 98.708031. After that activate the Crowdmag program by entering the latitude of the place in the latitude and longitude columns in the Longitude column, after that make sure the North (N) and East (E) positions, then change the kilometer column to the meter and the fill altitude (altitude) to 50 meters. Please be aware if Crowmag is used online then the date, month and year will automatically adjust but if used offline then adjust date, month and year with the day of Qibla direction measurement.

Once the data is complete, then press calculate, it will automatically appear the Compass declination value is-0.33. The next step is to determine the Earth's true North Point by using the formula developed Tan declination Compass x 100 which is Tan 0.33 x 100 = 0.628326799. To obtain accurate calculation of Qibla direction then the next step is to manually calculate the qibla direction of the example Muslim mosque.

The next triangular formula of the ball through the Azimut northern point is used to calculate manually i.e.:

$$AQ = \tan^{-1} \left(\frac{1}{\left(\frac{1}{\tan B} \right) \times \sin A / \sin C - \cos A \times \left(\frac{1}{\tan C} \right)} \right)$$

Where:

Value A = 90-PE Muslim Mosque example (LU) namely $90 - 3.601898 = 86.398102$.

Value B = 90-PE Kaaba (LU) IE $90 - 210' 25'' 21.17'' = 68.58333334$

Value C = largest and smallest longitude = LE Muslim Mosque Example (BT)-LE Kaaba (BT) i.e. = $98.708031 - 390' 49'' 34.56'' = 58.8746977$

Thus each value can be entered with the formula "AQ = Tan-1 (1/((1/Tan 68.58333334) x Sin 86.398102/Sin 58.8746977 - Cos 86.398102 x (1/ton 58.8746977))) The result is AQ = 67.27491237 = 67° 14' 57" from North Point to Western Point. Whereas from the western point to the North Point $90 - 67.27491237 = 22.72508763 = 22° 43' 30''$. To specify the direction of Qibla using Compass is $360 - 67.27491237 = 292.7250876 = 292° 43' 30''$. While using a centimeter unit is determined by the way "Tan (90-AQ) x 100" IE $\tan (90 - 67.27491237) \times 100 = 41.9$ cm

Description:

Tan = Tangent

AQ = Qibla Direction

To apply these calculations in the field, there are several tools: Compass navigation to know four direction of the Wind (east, west, north, south), one metre long bracket roller along with markers, elbow-elbow, Water Pass to find out the flat area of the place to be determined by the direction. The first step determines the flat place with the water pass then put the compass to know the 4 direction of the wind, once known to create a long line of 1 meter between the south and North Compass, then pull upwards from the compass's North point of 0.6 as The Earth's true North Point, drag a slash from the southern point to the true north of the Earth, then pull the line from the true western point of the Earth down towards the middle of the true North Point of the Earth continuing to the point of the east. Lastly drag the line to the right of the Earth's true west by 41.9 Cm and then pull it down to form the elbow to the point of the true north of the Earth.

But in practice in the field, can also utilize the North Compass by adding 0628 the Earth's true North Point with Qibla direction 41.9 cm to $0628 + 41.9 = 42.5$ cm. Thus using the North Compass drag the line from the West Compass to the right of 42.5 cm, without relining the Earth's true North Point.

III. CONCLUSION

From the exposure and description The author has described above can be known that true north is the true north is any point on the earth to the North Pole, this is because the North Pole and the South Pole point to the precise axis of the Earth's rotation. Therefore true north is the North based on an axis of non-northern Earth based on earth magnets. So the difference is the true north pointing out the true north direction of the Earth while the North Magnet is the north direction of the magnetic compass needle. North magnets do not coincide with the true north of the Earth. To know the true north of the earth can be done by using the formula: $AQ = \tan^{-1} \left(\frac{1}{\left(\frac{1}{\tan B} \right) \times \sin A / \sin C - \cos A \times \left(\frac{1}{\tan C} \right)} \right)$, it is known that magnetic declination can then use the formula \tan declination Compass x 100.

REFERENCES

- [1] Slamet Hambali, Penentuan Arah Kiblat dengan Segitiga Siku-Siku dari Bayangan Matahari Setiap Saat, Semarang : Pascasarjana IAIN Wali Songo, 2011, p. 234
- [2] Tim Penyusun Revisi Buku Revisi Almanak Hisab Rukyat, *Buku Almanak Hisab Rukyat*, Jakarta: Direktorat Jenderal Bimbingan Masyarakat Islam Kementerian Agama Republik Indonesia, 2010, p. 239
- [3] Muhammad RawasQal'aji, *Mu'jamLughah al-Fuqaha*, Beirut: Darul-Nafais, 1988, p. 356.
- [4] Abu ZakariaMuhayiddinNawawi, *al-Majmu' SyarahMuhaab* (Beirut: DarulKutubIlmiah, 2007, vol 4, p. 209

Imamul Muttaqin. "Accuracy of Qibla Direction Calculation by Determining the Earth's True North Point". *International Journal of Humanities and Social Science Invention (IJHSSI)*, vol. 09(2), 2020, pp 01-03.