Qibla Direction of the Great Mosque of Baiturrahim Using the Easy Qiblah Method: A Historical Perspective on King Botutihe

Zulfiah[1] F. Ramadhani[2]

[1]Faculty of Sharia Institut Agama Islam Negeri Sultan Amai Gorontalo, Indonesia
[2]University of Malaya, Radio Cosmology Research Laboratory, Department of Physics, Kuala Lumpur, Malaysia

Article Info

Article history:

Received: 03-01-2026
Revised: 15-02-2026
Accepted: 30-03-2026

***Keywords*:**

Easy Qiblah;
Baiturrahim;
Islamic astronomy;
King Botutihe;
Qibla direction.

ABSTRACT

The direction of the qibla of the Great Mosque of Baiturrahim during the time of King Botutihe was determined using a traditional approach based on natural phenomena. Along with the development of technology, smartphone applications such as Easy Qiblah offer convenience in verifying the direction of the Qibla practically and quickly. This study aims to analyze the accuracy of determining the direction of the qibla of the Great Mosque of Baiturrahim using the Easy Qiblah application based on satellite maps in a historical perspective. The research method used is descriptive-analytical with a comparative approach between measurement results using application and calculation of qibla direction based on astronomical hisab. The results of the study show that the Easy Qiblah application based on satellite maps has a fairly high level of accuracy with a relatively small deviation compared to the results of astronomical calculations. However, this accuracy is still affected by technical factors, such as sensor calibration and magnetic field interference in the surrounding environment. This research confirms that the use of modern technology can function as an effective tool in verifying the direction of the Qibla, as well as complementing the traditional methods that have been used since the time of King Botutihe. The integration between historical approaches and modern technology is important in an effort to improve the accuracy of the direction of the qibla without ignoring the historical values.

ABSTRAK

Arah kiblat Masjid Agung Baiturrahim pada masa Raja Botutihe ditentukan menggunakan pendekatan tradisional berbasis pada fenomena alam. Seiring perkembangan teknologi, aplikasi *smartphone* seperti *Easy Qiblah* menawarkan kemudahan dalam verifikasi arah kiblat secara praktis dan cepat. Penelitian ini bertujuan untuk menganalisis akurasi penentuan arah kiblat Masjid Agung Baiturrahim menggunakan aplikasi *Easy Qiblah* berbasis peta satelit dalam perspektif historis. Metode penelitian yang digunakan adalah deskriptif-analitis dengan pendekatan komparatif antara hasil pengukuran menggunakan aplikasi dan perhitungan arah kiblat berbasis hisab astronomis. Hasil penelitian menunjukkan bahwa aplikasi Easy Qiblah berbasis peta satelit memiliki tingkat akurasi yang cukup tinggi dengan deviasi yang relatif kecil dibandingkan dengan hasil perhitungan astronomis. Meskipun demikian, akurasi tersebut tetap dipengaruhi oleh faktor teknis, seperti kalibrasi sensor dan gangguan medan magnet di lingkungan sekitar. Penelitian ini menegaskan bahwa pemanfaatan teknologi modern dapat berfungsi sebagai alat bantu yang efektif dalam verifikasi arah kiblat, sekaligus melengkapi metode tradisional yang telah digunakan sejak masa Raja Botutihe. Integrasi antara pendekatan historis dan teknologi modern menjadi penting dalam upaya meningkatkan ketepatan arah kiblat tanpa mengabaikan nilai-nilai historis.

Corresponding Author:

Zulfiah
Faculty of Sharia Institut Agama Islam Negeri Sultan Amai Gorontalo, Indonesia
Jl. Sultan Amai Kel. Pone Kec. Limboto Kab. Gorontalo, Indonesia.
Email: zulfia@iaingorontalo.ac.id

INTRODUCTION

Determining the direction of the qibla is a fundamental need for Muslims in carrying out prayers, both individually and in congregation in mosques. In social practice in Indonesia, as well as the determination of the beginning of the Hijri month in Indonesia (Hudi & Shikhovtsev, 2026; Putra & Staines, 2026), the direction of the qibla of mosques in Indonesia is also still found in various mosques that have deviations in the direction of the qibla due to the limitations of measurement methods during their construction (Abd. Haji Amahoru & Sri Rahmadani Pulu, 2023). This phenomenon can also be found in historical mosques, including the great mosque of Baiturrahim, which is the mosque of the Gorontalo which was established during the time of King Botutihe (*Gorontalo Provincial Tourism Office*, n.d.). In this period, the determination of the direction of the qibla was generally carried out traditionally by relying on natural phenomena, such as the direction of sunset or the orientation of the west, without being supported by precise astronomical calculations. This condition causes the possibility of deviation in the direction of the qibla if measured using a modern approach.

Along with the development of digital technology, it is now increasingly easier for people to determine the direction of the Qibla through various smartphone-based applications. One of the widely used applications is Easy Qiblah, which utilizes Global Positioning System (GPS) technology and magnetometer sensors to determine the direction of the Qibla in real-time (Ali & Ansori, 2021). The presence of this application provides a practical solution, especially for people who do not have access to professional measuring instruments such as theodolite (Hikmawati Pathuddin et al., 2023). However, the use of digital applications is not completely free of constraints, as their accuracy is still affected by technical factors such as device calibration (Bunyamin et al., 2024), magnetic field interference (Reno, 2025), and sensor quality on each device (Patmin et al., 2022). This raises questions about the extent of the reliability of the application, especially when used to verify the direction of the qibla on permanent mosque buildings.

In the literature review, the determination of the direction of the qibla has long been a concern in the discipline of astronomy with an accurate mathematical and astronomical approach. The hisab method that uses azimuth calculations based on geographical coordinates has been proven to be able to produce a high level of precision qibla direction (Irfina et al., 2023). Various studies have also shown that the deviation of the qibla direction in old mosques in Indonesia can reach several degrees due to the use of traditional methods that are not accurate (Thoyfur, 2021). On the other hand, technological developments have encouraged the emergence of various digital applications that offer convenience in determining the direction of the qibla (Sakirman, 2018). Although a number of studies have stated that the application is quite accurate, most of the research still focuses on the technical aspects and has not been much associated with the historical context of mosque construction, particularly with regard to specific figures and periods.

Based on this background, this study aims to analyze the determination of the direction of the qibla in the Great Mosque of Baiturrahim using the Easy Qiblah application in a historical perspective. This study not only compares the results of the application measurements with astronomical hisab calculations, but also examines these differences in the context of the traditional methods used during the time of King Botutihe. Thus, this study is expected to provide a comprehensive overview of the development of Qibla direction methods from time to time, as well as evaluate the role of modern technology in improving the accuracy of Qibla direction.

The novelty of this research lies in the integration between historical approaches and digital technology in the study of the direction of the Qibla. In contrast to previous research which generally only focused on technical or mathematical aspects, this study connects the results of modern measurements using the Easy Qiblah application with the historical context of the construction of mosques during the time of King Botutihe. In addition, this study specifically examines the Great Mosque of Baiturrahim, namely the mosque of the Gorontalo which was established during the time of King Botutihe as an object of study that has high historical value but has not been widely analyzed in the context of the accuracy of the qibla direction based on digital applications. This multidisciplinary approach is expected to make a new contribution to the development of astronomy and enrich the study of local Islamic history associated with the use of modern technology in religious practice.

METHOD

This study uses a descriptive-analytical approach with a comparative method, namely comparing the results of determining the direction of the qibla using the Easy Qiblah application with the calculation of the direction of the qibla based on astronomical hisab. This approach was chosen to obtain a comprehensive picture of the accuracy of the application in an empirical context while relating it to the historical perspective of the time of King Botutihe.

This type of research is included in the category of field research (Codina-Vila et al., 2020) which is supported by literature studies (Hamzah, 2020). Field research was carried out by directly measuring the direction of the qibla at the Baiturrahim Grand Mosque using the Easy Qiblah application on smartphone devices (Hayat & Utama, 2018). Meanwhile, a literature study was conducted to examine theories of determining the direction of the qibla in astronomy, the hisab method, and historical literature related to the construction of mosques during the Gorontalo kingdom.

The data collection technique is carried out through several stages. First, direct observation at the research site by measuring the direction of the qibla using the Easy Qiblah application. Measurements are made several times to obtain consistent results, taking into account environmental conditions such as minimal magnetic field interference and device position stability. Second, documentation, which records the results of measurements and the physical condition of the qibla

direction in the mosque, especially the orientation of the mihrab. Third, literature study, which is collecting data related to the geographical coordinates of the research location and astronomy-based theory of Qibla direction calculations.

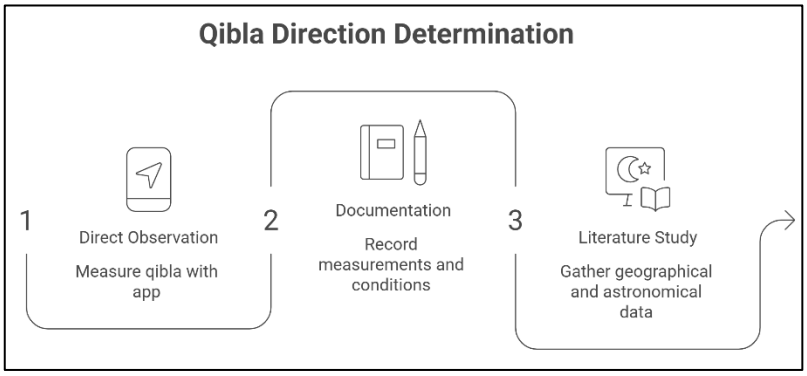

Figure 1. Data collection techniques

The data obtained is then analyzed through several steps. First, calculate the direction of the Qibla using the astronomical hisab method with the qibla azimuth approach based on the latitude and longitude coordinates of the location and the coordinates of the Kaaba in Makkah. Second, compare the results of the calculation with the measurement results using the Easy Qiblah application to find out the level of deviation that occurs. Third, analyze the factors that affect the difference in results, such as device calibration, magnetic field interference, and sensor characteristics on the smartphone used.

In addition to technical analysis, this study also uses a historical approach to understand the method of determining the direction of the qibla during the time of King Botutihe. This approach is carried out by examining relevant historical and literary sources to explain the context of determining the direction of the Qibla at that time and the level of accuracy that can be achieved (Yusuf, 2014). This research method integrates empirical, mathematical, and historical approaches to produce a comprehensive analysis of the determination of qibla direction based on the Easy Qiblah application and its relevance in the context of historic mosques.

RESULTS AND DISCUSSION

History and Uniqueness

The Baiturrahim Grand Mosque, also known as the Gorontalo Mosque, is one of the most important Islamic historical sites in Gorontalo Province. This mosque was founded in 1728 AD (1140 AH) by King Botutihe, coinciding with the relocation of the Gorontalo Kingdom's administrative center from Dungingi to the Batato area (*Dinas Pariwisata Provinsi Gorontalo*, n.d.). The construction of this mosque marked the confirmation of Islam as the main foundation of the Gorontalo government and customs, as reflected in the traditional philosophy of "*Adati hula-hulaa to syaraa, syaraa hula-hulaa to Qur'ani*." Since its inception, the Baiturrahim Grand Mosque has

functioned not only as a place of worship but also as a center for the propagation of Islam and a symbol of the legitimacy of royal power integrated with local religious and customary values. Located in the center of Gorontalo City. The mosque is easily accessible on foot or by public and private transportation from major government and cultural landmarks.

Baiturrahim Mosque (Arabic: مسجد بيت إبراهيم غورونتالو), better known as the Great Mosque of Baiturrahim (Arabic: مسجد الجامع بيت ابراهيم), is one of the historic mosques located in Gorontalo City, Gorontalo Province, Indonesia. This mosque was founded in 1728 by the ruler of the Gorontalo at that time, namely King Botutihe. The existence of this mosque not only functions as a center of worship, but also becomes an important symbol of the development of Islam in the Gorontalo region.

In terms of capacity, this mosque is one of the largest mosques in Indonesia that can accommodate around 4,000 worshippers. In terms of architecture, the mosque building has characteristics in the form of two main structures that look like twin buildings that are fused. This uniqueness reflects the development of mosque architecture which has undergone adjustments in line with the need for space and the number of worshippers that continue to increase.

In the course of its history, the mosque building has undergone several renovations and restorations. The changes were made not only to expand capacity, but also in response to damage caused by natural disasters, in particular the major earthquake that occurred in 1938 and caused significant damage to the building's structure. The last restoration was carried out in 1999 with the support of B. J. Habibie, who at that time served as the President of the Republic of Indonesia. This renovation is an important part of maintaining the sustainability of the mosque's function as a center of worship as well as an Islamic historical heritage in Gorontalo.

Figure 1. Great Mosque of Baiturrahim, Gorontalo

In the context of royal spatial planning, the Baiturrahim Grand Mosque occupies a strategic position as a central part of the traditional Gorontalo government landscape, alongside the Bantayo Poboide (traditional council hall) and the king's

residence. Its location at the heart of the government structure demonstrates the central role of religion in social and political decision-making during the Gorontalo Sultanate. Throughout its history, the mosque has undergone several renovations due to age and natural disasters, including an earthquake in 1938 that caused significant damage. Renovations and structural reinforcements were later carried out without compromising the historical and symbolic value of the building.

In the present time, the Baiturrahim Grand Mosque serves as a religious and cultural landmark of Gorontalo City and as a religious tourism destination with high historical value. The mosque frequently hosts large-scale religious activities, such as Eid al-Fitr and Eid al-Adha prayers attended by government officials and the wider community. With a history spanning more than three centuries, the Baiturrahim Grand Mosque represents the continuity of Islamic traditions in Gorontalo and stands as a historical witness to the development of civilization (Sakirman et al., 2023b), traditional governance, and the cultural identity of the Gorontalo people.

Qibla Direction Measurement Results

The measurement of the qibla direction at the Baiturrahim Grand Mosque is carried out using the Easy Qiblah application by considering several observation points within the mosque area, including around the mihrab and the main prayer room. Measurements are repeated to ensure data consistency and minimize errors due to device sensor fluctuations. Each measurement is taken in the condition that the device has been calibrated and placed on a flat surface to obtain stable results. In addition, the measurement also pays attention to the surrounding environmental conditions, such as the presence of metal objects and electronic devices that have the potential to interfere with the magnetometer reading. The observation results showed that the Qibla direction displayed by the application was relatively stable and did not experience significant differences between measurement points. This shows that the application has a fairly good consistency in determining the direction of the qibla at the research site.

Figure 2. Qibla direction of the Great Mosque of Baiturrahim, Gorontalo

Satellite image visualization shows the results of measuring the direction of the qibla at the Great Mosque of Baiturrahim using the ruler measurement feature on the digital map. The yellow line shown on the map represents the direction from the location of the mosque to the Kaaba in Makkah as the destination point of the Qibla. The line runs diagonally to the northwest, which visually confirms that the direction of the Qibla is not aligned with the pure westward direction, but rather has a certain slope towards the north.

Based on the measurement data seen in the image, the length of the track reaches about 9,239 km with a heading angle of about 291.5°. This value shows that the direction of the qibla from Gorontalo is at an azimuth of ±291°, which is consistent with the results of previous astronomical calculations. Thus, the direction of the Qibla shifts about 21° north from the west (270°), so it practically points to the northwest.

If observed further, the orientation of buildings around mosques, including road and settlement patterns, tends to follow local geographical directions that do not overlap with the direction of the qibla. This reinforces the finding that the direction of the qibla is a specific direction determined based on global calculations (great circle), rather than following the layout of a city or a simple cardinal direction. Therefore, the use of satellite imagery and digital measuring instruments is very important in obtaining accurate Qibla direction.

In historical perspective, it is likely that the initial direction of the Great Mosque of Baiturrahim built during the time of King Botutihe was not based on azimuth calculations like this. The determination of the direction of the qibla at that time relied more on an empirical approach, such as the direction of the west or observation of the position of the sun. Therefore, the existence of an angular difference with the results of modern measurements is natural and reflects the development of science from time to time.

These satellite images provide strong quantitative and visual evidence of the true direction of the Qibla. The azimuth value obtained reinforces the results of previous measurements and shows consistency between digital application methods, local maps, and satellite image-based measurements (Hikmawati Pathuddin et al., 2023). This confirms that the use of modern technology, such as Google Earth, can be an effective verification tool in ensuring the accuracy of the direction of the qibla, especially in historic mosques that have important value in the development of Islam in the area.

The measurement results obtained from the application are then compared with the results of calculating the direction of the qibla using the astronomical hisab method based on the geographical coordinates of the mosque location. This calculation uses latitude and longitude data of the location and coordinates of the Kaaba as the main reference point. From the results of the comparison, it was found that the Qibla direction produced by the application had a small difference from the results of astronomical calculations. The difference is generally in the range of ±1° to

±3°, which is practically still acceptable in the context of worship. This shows that the Easy Qiblah application is able to provide results that are close to the ideal value obtained through scientific methods.

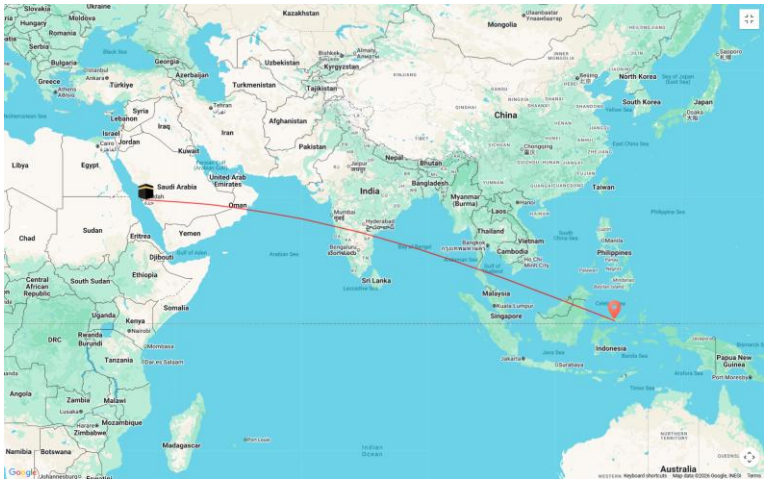

Figure 3. Qibla direction of the Great Mosque of Baiturrahim, Gorontalo

The results of the measurement of the qibla direction at the Great Mosque of Baiturrahim as shown in the map in figure 3 show a straight line (great circle) that connects the location of the mosque with the Kaaba in Makkah. The line shows that the direction of the Qibla is not right to the west, but is inclined to the northwest. Astronomically, this direction is the shortest path on the earth's surface (great circle) from Gorontalo to the Kaaba, so it becomes a scientific reference in determining the qibla.

Based on the results of the calculation of the qibla azimuth for the Gorontalo region, the direction of the qibla is in the range of ±291° from the geographical north. This means that from the north position (0°), the direction of the Qibla is reached by rotating clockwise to about 291°, which visually appears on the map as a slash to the northwest towards the Arabian Peninsula. The red line on the image confirms that the direction crosses the Indian Ocean before reaching Saudi Arabia's territory, indicating the global nature of the spherical trigonometry-based calculation of the Qibla direction.

If it is associated with field conditions, the direction of the qibla in the mosque is not always identical to the direction of the west in general, as is often understood simply by the community. Instead, the direction of the qibla must follow a specific azimuth angle according to the geographical coordinates of the location. Therefore, the results of the visualization on this map confirm that the direction of the qibla in Gorontalo has a deviation of about 20° to the north from the pure west direction (270°), so it is important to pay attention to it in determining the orientation of the mosque mihrab.

In the historical context, the determination of the direction of the qibla during the time of King Botutihe most likely did not use this mathematical approach, but was

based on the estimation of the western direction. However, the results of modern measurements show that the direction of the Qibla actually has a more northwestern tendency. This shows the potential difference between the traditional orientation and the results of modern astronomical calculations, although from the perspective of fiqh it can still be tolerated as long as it leads to jihat al-ka'bah.

The visualization of the Qibla direction map not only shows the technical measurement results, but also emphasizes the importance of using scientific methods in ensuring the accuracy of the Qibla direction. The direction shown is evidence that the determination of the Qibla today has evolved from an estimative approach to an approach based on precise and measurable astronomical calculations.

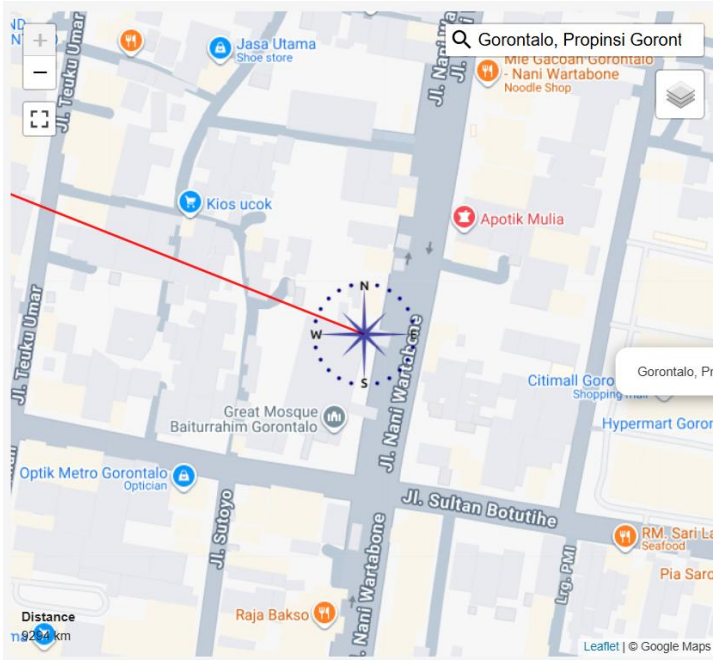

Figure 4. Qibla direction of the Great Mosque of Baiturrahim, Gorontalo

The visualization of the local map shown in figure 4 shows the results of measuring the direction of the qibla around the Great Mosque of Baiturrahim using a digital application-based approach. In the image, the direction of the qibla is indicated by a red line that departs from the location of the mosque and points to the northwest. Meanwhile, the digital compass in the center of the map displays the orientation of the main cardinals (north, south, east, and west) as a reference in reading directions. Based on the position of the Qibla line to the compass, it can be seen that the direction of the Qibla is not parallel to the west direction (W), but shifts slightly to the north.

Geographically, this direction indicates that the qibla is at a certain azimuth angle from the north, which in the context of the Gorontalo region ranges from about 290°–295°. This means that from the pure west (270°), the Qibla shifts about 20° in a northerly direction. This visualization confirms that the general understanding of the people who identify the Qibla with the western direction is not entirely correct,

because the actual direction of the Qibla must follow the shortest path to the Kaaba through the surface of the earth (great circle).

From the map, it can also be observed that the orientation of the buildings around the mosque, including the road network such as Jl. Nani Wartabone and Jl. Sultan Botutihe, is not completely parallel to the direction of the qibla. This shows that the direction of the qibla is a special reference that does not always follow the spatial pattern of the city. Therefore, determining the direction of the Qibla requires special tools or methods, such as the Easy Qiblah application, to obtain more accurate results.

In the historical context, it is likely that the initial orientation of the Great Mosque of Baiturrahim in the time of King Botutihe did not fully follow the precise azimuth angle as shown in this map. The determination of the direction of the Qibla at that time relied more on a simple approach, such as the direction of the west or the orientation of the surrounding environment. However, the results of these modern measurements provide a more accurate picture of the actual direction of the qibla, as well as the basis for evaluating and verifying the direction of the qibla of the mosque.

This local map provides strong visual evidence that the direction of the qibla at the mosque site has a certain deviation from the west and tends to point to the northwest. The use of digital applications in this visualization demonstrates the important role of technology in improving the accuracy of Qibla direction, while strengthening the integration between traditional approaches and scientific methods in religious practice.

Small variations may affect measurement results caused by technical factors, such as the sensitivity of the device's sensors and the environmental conditions when the measurement is taken. This variation indicates that the measurement results are not completely constant, but are still within reasonable tolerance limits. Thus, the results of this study confirm that the Easy Qiblah application can be used as a tool in determining the direction of the qibla, especially for practical and non-permanent purposes. However, for purposes that require high precision, a more accurate measurement method is still needed.

Easy Qiblah Application Accuracy Analysis

The accuracy of the Easy Qiblah application in determining the direction of the Qibla is greatly influenced by the technology used, namely GPS and magnetometer. GPS functions to accurately determine the geographical position of the user, while the magnetometer is used to detect the magnetic north direction as the basis for determining the direction of the Qibla. The combination of these two technologies allows the application to calculate the direction of the Qibla in real-time with a fairly high level of precision. Nevertheless, the accuracy of the application is determined not only by the technology, but also by the way it is used and the conditions of the surrounding environment.

In practice, it is found that the measurement results can be altered if the device is not calibrated correctly or if there is a disturbance of the magnetic field around the measurement site. The interference can come from metal objects, electrical installations, or other electronic devices that are in the vicinity of the user. Therefore, the calibration process is an important step that must be done before using the application. Good calibration can improve the accuracy of measurement results and reduce the likelihood of misdirection.

In addition to technical factors, the quality of the device also affects the measurement results. Smartphones with more sensitive and accurate sensors tend to produce more stable data compared to devices with low specifications. This shows that although the Easy Qiblah application generally has a good level of accuracy, the results obtained are still relative and depend on various supporting factors. As such, users need to have an adequate understanding of how to use the app in order to get optimal results.

Comparison with Traditional Methods

In the historical perspective, the determination of the direction of the qibla during the time of King Botutihe was carried out by a simple method and based on natural observations. This method uses the direction of the sunset as an indicator of the direction of the west, which is then assumed to be the direction of the qibla. This approach was a practical solution at the time, given the limited knowledge and technology available. However, this method does not take into account more complex geographical factors, such as differences in latitude and longitude and the spherical shape of the earth (Sakirman, 2018).

When compared to modern methods that use astronomical calculations, traditional methods have a lower accuracy rate (Ali & Ansori, 2021). This is due to the absence of in-depth mathematical calculations in determining the direction of the qibla. Nevertheless, traditional methods still have important historical value because they reflect the efforts of people in the past in fulfilling their worship obligations with their knowledge (Thoyfur, 2021). In this context, the deviation in the direction of the Qibla that occurred was not an error, but part of the methodological limitations of the time (Amalia et al., 2023).

Comparisons between traditional and modern methods show significant developments in science and technology used in determining the direction of the Qibla. Modern methods offer a higher level of precision and are reliable for a variety of purposes, including the construction of mosques and the determination of the direction of the qibla permanently (Bunyamin et al., 2024). Nevertheless, traditional methods remain relevant in historical studies and as a basis for understanding the development of astronomy over time.

Implications for the Direction of the Qibla of the Mosque

The results of this study show that the direction of the qibla of the Great Mosque of Baiturrahim in general is still within the acceptable range based on fiqh

standards (Ash-syaukani, 2008). Although there is a small deviation when compared to the results of astronomical calculations, the direction of the mosque's qibla still points to the Kaaba area (jihat al-ka'bah), so it is still valid to be used for the implementation of prayer (Anwar Singosari, 2024). This shows that the determination of the direction of the qibla during the time of King Botutihe had been done quite well in accordance with the conditions and knowledge available at that time.

These findings also show the importance of re-verifying the direction of the qibla, especially in historic mosques built using traditional methods. This verification is not intended to correct drastically, but rather as an effort to improve accuracy and provide certainty to pilgrims (Sakirman et al., 2023a). The use of the Easy Qiblah application can be the first step in the verification process, although it still needs to be equipped with more precise methods for more accurate results.

Another implication of this study is the need to educate the public about the importance of the direction of the Qibla and how to determine it. With increasing public understanding, it is hoped that the use of technology in determining the direction of the qibla can be carried out more optimally and responsibly. In addition, mosque managers can also use the results of this research as a basis for evaluating and improving the direction of the qibla if necessary.

Integration of Historical Perspectives and Modern Technology

This research shows that the integration between historical approaches and modern technology is an important step in the development of the qibla direction study. The historical approach provides an understanding of how the people in the past, especially during the time of King Botutihe, determined the direction of the qibla with the existing limitations. Meanwhile, modern technology such as the Easy Qiblah application offers a more practical and accurate solution in determining the direction of the Qibla today.

The integration of these two approaches allows for a more comprehensive understanding of the determination of the direction of the qibla as part of the dynamics of scientific development. Modern technology serves not only as a tool, but also as a means to evaluate and verify practices that have been carried out in the past. Thus, the use of technology does not eliminate historical value, but rather strengthens it through a more systematic scientific approach (Jamil et al., 2022).

This integration also has far-reaching implications in the development of astronomy and religious practice. By utilizing modern technology, people can gain ease in determining the direction of the qibla without having to master complex astronomical calculations (Nabila, 2021). However, an understanding of historical aspects is still necessary so that the use of technology is not separated from the cultural and historical context behind it. Therefore, a multidisciplinary approach that combines history, astronomy, and technology is very important in the study of the direction of the Qibla in the modern era.

Comprehensive Analysis of Qibla Direction Determination

The analysis of the determination of the direction of the qibla in this study was carried out by integrating the results of field measurements using the Easy Qiblah application, astronomical hisab calculations, and historical approaches related to the time of King Botutihe. In general, the measurement results show that the direction of the qibla at the Great Mosque of Baiturrahim is in a relatively close range to the results of astronomical calculations, although there are small deviations that can still be tolerated. These findings indicate that the traditional methods used in the early days of mosque construction have produced a fairly representative orientation towards the direction of the Kaaba, although it has not yet reached the level of precision of modern methods.

From the technical side, the deviations found in measurements using the Easy Qiblah application are influenced by several factors, such as the quality of the magnetometer sensor, GPS accuracy, and the conditions of the surrounding environment. Interference of the magnetic field from metal objects or electronic devices can cause the magnetic northbound readings to become less stable, thus impacting the final result of the direction of the qibla. In addition, an imoptimal device calibration process also has the potential to result in measurement errors. Therefore, although the Easy Qiblah application offers convenience and practicality, its use still requires a technical understanding so that the results obtained can be close to the real value.

From a methodological perspective, the comparison between traditional and modern methods shows a paradigm shift in determining the direction of the Qibla. Traditional methods based on natural observations tend to be estimated, while modern methods rely on more systematic and accurate mathematical and astronomical approaches. However, the results of this study show that the two methods do not have to be contradicted, but can complement each other. Traditional methods have important historical and cultural value, while modern methods provide a higher level of precision in determining the direction of the Qibla.

From the point of view of fiqh, the small deviation found in the direction of the qibla does not necessarily invalidate the validity of the prayer, as long as the direction is still within the territory of the qibla (jihat al-ka'bah). This gives legitimacy to the practice of determining the direction of the qibla during the time of King Botutihe, which was carried out with limited knowledge and technology. Thus, this analysis shows that the use of the Easy Qiblah application not only serves as a technical verification tool, but also as a means to understand the continuity between past religious practices and the development of modern science.

Overall, this analysis confirms that the determination of the direction of the qibla is a multidimensional process that involves technical, historical, and normative aspects. The integration between modern measurement results and historical understanding allows for a more comprehensive approach to the study of the direction of the qibla. Therefore, the use of technology such as the Easy Qiblah

application needs to be placed as part of efforts to improve worship practices, not as a complete replacement for methods that have developed in the Islamic scientific tradition.

CONCLUSION

This study found that the determination of the direction of the qibla at the Great Mosque of Baiturrahim shows that there is a complex dynamic between the traditional methods used during the time of King Botutihe and the modern approach based on digital technology. The use of the Easy Qiblah application as a tool to determine the direction of the Qibla shows a fairly high level of accuracy with a relatively small deviation compared to the calculation of astronomical hisab. However, the results of the study show that this accuracy is not completely absolute because it is influenced by several main factors, namely the quality of the device's sensors, the calibration process, and the interference of the magnetic field in the surrounding environment. In addition, the difference between traditional and modern methods is also influenced by the limitations of astronomical knowledge in the past as well as the empirical approach used in determining the direction of the Qibla. These findings confirm that Qibla direction is a multidimensional phenomenon that does not only depend on technical and scientific aspects, but also involves historical and normative dimensions in religious practice. Thus, the use of the Easy Qiblah application not only serves as a technical tool, but also as a means to bridge the understanding between traditional and modern methods in determining the direction of the Qibla.

This research makes an important contribution to the development of astronomical studies, especially in understanding the integration between historical approaches and digital technology in determining the direction of the qibla. The added value of this research lies in its multidisciplinary approach that combines aspects of astronomy, history, and religious practices in one comprehensive analytical framework. In contrast to previous research that tended to focus on the technical aspects of measuring the direction of the Qibla, this study places the application of Easy Qiblah as part of the dialogue process between traditional and modern methods. In addition, the use of case studies on the Great Mosque of Baiturrahim provides a contextual empirical contribution in understanding the practice of determining the direction of the qibla in historic mosques. This research also reinforces the importance of integration between astronomical data and the use of digital technology in improving the accuracy of the direction of the Qibla. Thus, this research not only makes a theoretical contribution, but also has practical implications in efforts to verify and refine the direction of the qibla in society. In addition, this study offers a new perspective in seeing the determination of the direction of the Qibla as a process that is not only technical, but also as part of the development of epistemology in the Islamic scientific tradition.

However, this study has some limitations that need to be considered. This study uses more descriptive and comparative approaches with measurement data limited to one location, so it does not fully describe the variation in conditions in various other regions. In addition, the use of the Easy Qiblah application is highly dependent on the device used, so the results of this study cannot be generalized to all types of smartphone devices. This study also did not involve measurements using high-precision instruments such as theodolite as the main comparator, so the level of accuracy produced is still relative. Therefore, further research is recommended to use a more empirical approach involving a variety of measurement methods, including direct observation and the use of professional tools. Follow-up research can also expand the scope of the study by comparing several historic mosques in different regions to obtain a more comprehensive picture. In addition, the development of an integrative model that combines astronomical approaches, digital technology, and fiqh studies is an important research direction to be conducted. Thus, it is hoped that further research can make a broader contribution in an effort to improve the accuracy of determining the direction of the qibla and strengthen the integration between science and religious practices in society.

REFERENCES

Abd. Haji Amahoru & Sri Rahmadani Pulu. (2023). Pemetaan Data Astronomi untuk Mengidentifikasi Pergeseran Arah Kiblat Masjid di Pulau Ambon. *Jurnal Pendidikan MIPA*, *13*(1). https://doi.org/10.37630/jpm.v13i1.848

Ali, S., & Ansori, M. (2021). Penentuan Arah Kiblat Menggunakan Rubu'Mujayyab dan Kompas Easy Qiblat 3 in 1 pada Handphone Android (Study Penelitian di Masjid An Nur Pare Kediri). *Salimiya: Jurnal Studi Ilmu Keagamaan Islam*, *2*(4).

Amalia, N., Syarif, Muh. R., & Khalik, S. (2023). Toleransi Kemelencengan Arah Kiblat. *HISABUNA: Jurnal Ilmu Falak*, *4*(1). https://doi.org/10.24252/hisabuna.v4i1.35802

Anwar Singosari, K. A. S. (2024). Revitalisasi serta Batasan Toleransi Skewness Arah Kiblat dalam Ibadah Menurut Syafi'iyah. *ELFALAKY*, *8*(1). https://doi.org/10.24252/ifk.v8i1.47259

Asy-syaukani, I. (2008). *Tafsir Fathul Qadir*. Pustaka Azzam.

Bunyamin, M., Jayusman, J., & Putra, A. E. (2024). Tinjauan Galat Kiblat Terhadap Perhitungan Arah Kiblat Yang Presisi dan Efisien Kota Bandar Lampung. *As-Salam: Jurnal Studi Hukum Islam & Pendidikan*, *13*(02). https://doi.org/10.51226/assalam.v13i02.724

Codina-Vila, M., Íñigo, R., Rovira-Fernàndez, A., & Serrat-Brustenga, M. (2020). *Library Research Support Services*. https://doi.org/10.4018/978-1-7998-4546-1.ch004

Dinas Pariwisata Provinsi Gorontalo. (n.d.). Dinas Pariwisata Provinsi Gorontalo. Retrieved March 30, 2026, from https://pariwisata.gorontaloprov.go.id/publik/detail_destinasi/masjid-agung-baiturrahim-masjid-kesultanan-gorontalo

Hamzah, A. (2020). Metode penelitian kepustakaan (library research). *Literasi Nusantara Abadi*, *5*(1).

Hayat, A., & Utama, E. R. H. (2018). Rancangan Aplikasi Kalkulator Ilmu Falak Berbasis Smartphone. *CCIT Journal*, *11*(2). https://doi.org/10.33050/ccit.v11i2.588

Hikmawati Pathuddin, Try Azisah Nurman, & Siti Saleha. (2023). Perbandingan Rumus Trigonometri dan Metode Tongkat Istiwa' untuk Mengakurasikan Arah Kiblat. *Jurnal MSA (Matematika Dan Statistika Serta Aplikasinya)*, *11*(1). https://doi.org/10.24252/msa.v11i1.34870

Hudi, & Shikhovtsev, A. Y. (2026). Review of Crescent Visibility: The Role of Islamic Astronomy in Determining the Hijri Calendar. *ALFALAK: Journal of Islamic Astronomy*, *1*(1), 1–11.

Irfina, Muh. Rasywan Syarif, Muh. R., & Mustafa, Z. (2023). Analisis keakurasian Azimut Bintang Sebagai Acuan Penentu Arah Kiblat Di Pantai Bira Kabupaten Bulukumba. *HISABUNA: Jurnal Ilmu Falak*, *3*(3). https://doi.org/10.24252/hisabuna.v3i3.33552

Jamil, A., Sakirman, S., & Ardliansyah, M. F. (2022). Penentuan Arah Kiblat dengan Posisi Matahari di Pusat Ibu Kota Kabupaten Lampung. *Al-Manahij: Jurnal Kajian Hukum Islam*, *16*(1), 133–152. https://doi.org/10.24090/mnh.v16i1.6169

Nabila, J. (2021). Hadis dan Teknologi: Studi Penentuan Arah Kiblat Menurut Ali Mustafa Yaqub dan Dr. Ing. Khafid. *Journal of Chemical Information and Modeling*, *53*(February).

Patmin, H., Nugroho, A. K., & Muliandhi, P. (2022). Rancang Bangun Alat Bantu Menentukan Arah Kiblat Sholat dan Pengingat Jumlah Rakaat untuk Penyandang Tunanetra Berbasis Arduino dengan Sensor Kompas HMC5883L. *Techné : Jurnal Ilmiah Elektroteknika*, *21*(2). https://doi.org/10.31358/techne.v21i2.325

Putra, S., & Staines, M. (2026). Dynamics of the Isbat Session and Differences in Determination The Beginning of Ramadan 1447 H in Indonesia. *ALFALAK: Journal of Islamic Astronomy*, *1*(1), 11–24.

Reno. (2025). Pengukuran Arah Kiblat Berbasis Trigonometri dan GPS dengan Koreksi Magnetik: Studi Lapangan di Kota Sambas. *Irajagaddhita*, *3*(1). https://doi.org/10.59996/irajagaddhita.v3i1.700

Sakirman, S. (2018). Formulasi Baru Arah Kiblat: Memahami Konsep Rasydul Kiblat Harian Indonesia. *Al-Qisthu*, *16*(1), 559782.

Sakirman, S., Jamil, A., & Ardliansyah, M. F. (2023a). PkM Penguatan Kapasitas Mengukur dan Verifikasi Arah Kiblat bagi Pengurus Masjid. *GUYUB: Journal of Community Engagement*, *4*(2), 106–128. https://doi.org/10.33650/guyub.v4i2.6524

Sakirman, S., Jamil, A. J. A., & Ardliansyah, M. F. (2023b). Dynamics of Qibla Direction of the Great Mosque: (Study of Accuration and Verification of Geographic Coordinate Points). *KULMINASI: Journal of Falak and Sharia*, *1*(1), 1–21. https://doi.org/10.22373/kulminasi.v1i1.4082

Thoyfur, M. (2021). Perkembangan Metode Dan Instrumen Arah Kiblat Abad Pertengahan: Studi Kajian Historis Perspektif David a King. *AL-AFAQ : Jurnal Ilmu Falak Dan Astronomi*, *3*(1 SE-Articles).

Yusuf, M. (2014). *Metode Penelitian Kuantitatif, Kualitatif & Penelitian Gabungan*. Penerbit Kencana.