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ALKHUSRA: An Innovative Instrument for Determining Lunar Eclipse Prayer Times

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ABSTRACT

This study examines the construction and operation of ALKHUSRA media for determining lunar eclipse prayer times. Using the Research and Development (R&D) method, data were obtained from a*d-Durrul Aniq*, books, journals, and references related to hisab, lunar eclipses, and eclipse prayers. The results show that ALKHUSRA is designed with a classical astronomical visual concept and contains essential eclipse data, including year, month, date, peak time, and eclipse type. The media consists of a main disc as the data center, a front cover with information windows as the user interface, and a back cover as the reference panel. It is operated by rotating the disc until the selected year aligns with the central arrow, after which the information window automatically displays the eclipse data, including two events when they occur in the same year. ALKHUSRA therefore functions as an effective, accurate, and user-friendly tool for determining the starting time of lunar eclipse prayers, while also serving as an educational medium for understanding Islamic astronomical phenomena.

ABSTRAK

Penelitian ini mengkaji pembuatan dan penggunaan media ALKHUSRA dalam menentukan waktu salat gerhana bulan. Dengan metode *Research and Development* (R&D), data diperoleh dari kitab a*d-Durrul Aniq*, buku, jurnal, dan referensi terkait hisab, gerhana bulan, serta salat gerhana. Hasil penelitian menunjukkan bahwa ALKHUSRA dirancang dengan konsep visual astronomi klasik dan memuat data penting gerhana, seperti tahun, bulan, tanggal, waktu puncak, dan tipe gerhana. Media ini terdiri atas piringan utama sebagai pusat data, penutup depan dengan jendela informasi sebagai antarmuka pengguna, serta penutup belakang sebagai panel referensi. Penggunaannya dilakukan dengan memutar piringan hingga tahun yang dipilih sejajar dengan tanda panah pusat, lalu jendela informasi secara otomatis menampilkan data gerhana, termasuk dua peristiwa apabila terjadi dalam satu tahun. Dengan demikian, ALKHUSRA berfungsi sebagai alat bantu yang efektif, akurat, dan mudah digunakan dalam menentukan awal waktu salat gerhana bulan, sekaligus menjadi media edukasi untuk memahami fenomena astronomi Islam.

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INTRODUCTION

The phenomenon of a lunar eclipse is a sign of Allah's power that has both scientific and spiritual dimensions thru the worship of the khusuf prayer (Mufidah et al., 2022). A lunar eclipse, or khusūf al-qamar, is a phenomenon when the entire or part of the moon's disk enters the Earth's core shadow (umbra) (Rahmayani, 2021). The occurrence of a lunar eclipse is closely related to the movement of the three main celestial bodies, namely the sun, earth, and moon, especially the moon's revolution around the earth. The chance of a lunar eclipse occurring arises when the moon's position is within 12 degrees or less from the node of its orbit (Azmi, 2019).

Eclipse prayer is part of Islamic law, the implementation of which is based on authentic evidence from the Qur'an, Hadith, and the consensus of scholars (Alimuddin & Mustafa, 2022). This prayer is performed as an act of worship to Allah SWT when a natural phenomenon occurs in the form of a solar eclipse (*kusūf*) or a lunar eclipse (*khusūf*) (Hamdani et al., 2019).

The integration of science and religious law in this phenomenon demands the existence of educational media that can connect astronomical calculations with practical religious practices. Without communicative media, there will be a gap in public understanding of the exact timing of eclipses, which will result in inaccuracies in the timing of worship practices. The absence of communicative and applicative media can lead to the public's limited ability to recognize the exact timing of lunar eclipses and the precise timing of eclipse prayers (Abdillah et al., 2019).

The determination of the time of a lunar eclipse in Islam can be studied thru a branch of knowledge called astronomy, which is the study of the movement of celestial bodies such as the sun and moon for the purposes of worship (Hajar, 2014). The term "ilmu falak" is composed of two word components, namely "ilmu" and "falak." (Alimuddin, 2014) The word "ilmu" is understood as knowledge, skill, or expertise, (Departemen Pendidikan dan Kebudayaan, 2006) while the term "falak" refers to the curvature of the sky, the celestial sphere, and is related to the science of stars or astronomy (Alimuddin, 2014).

The existence of astronomy helps Muslims to perform their worship on time and in accordance with religious law. This science has developed since classical times and has become part of the rich tradition of Islamic scholarship (Marpaung, 2015). Astronomy plays an important role in building the cosmological awareness of the community so that they can understand the signs of Allah's power thru the regularity of celestial movements. This perspective reinforces the importance of this research as a concrete effort to integrate scientific and religious dimensions thru the development of learning media based on lunar eclipse calculations (Syarif, 2017).

The main issue in current falak literacy is the lack of learning media that combines classical theory with modern needs. Most of the calculation tools still focus on complex mathematical aspects, making them difficult to access for the general public and students. Meanwhile, classical treasures such as the book Ad-Durrul Aniq by Ahmad Ghozali Muhammad Fathullah present a systematic yet complex eclipse

calculation system that is difficult to understand without adequate scientific background. Based on these conditions, there is a need for innovative learning media that can bridge the understanding between the theoretical aspects of astronomy and religious practices in the context of lunar eclipse prayer times. Amid the increasingly rapid wave of digital transformation, the world of education is demanded to continuously innovate in creating relevant, effective, and motivating learning experiences (Syafar, 2025).

This research aims to carry out a methodological transformation by converting the calculation method from the book Ad-Durrul Aniq into a digital format using Microsoft Excel, which is then visualized in the form of the media "ALKHUSRA". The name ALKHUSRA itself is a combination of the word al-khusuf (الْخُسُوفُ) which means "lunar eclipse" (Munawwir, 1997) and busrah (بُسْرَةٌ) which means "brightness/good news," (Munawwir, 1997) which philosophically signifies the opening of insight thru the phenomenon of an eclipse. This rotating calendar-shaped media is designed to facilitate the determination of the time of the lunar eclipse as a practical guide for the eclipse prayer. Thus, the development of ALKHUSRA is expected not only to enrich the treasury of astronomical knowledge but also to enhance the independence and literacy of Islamic astronomy within the community.

METHOD

This research is a type of research and development or *Research and Development* (R&D), which is a research method aimed at producing a specific product while simultaneously testing the effectiveness of that product (Sugiyono, 2020). The research procedure focuses on the design and creation of the ALKHUSRA media as an instrument for determining the time of the lunar eclipse prayer. The data used in this research is sourced from primary and secondary data. Primary sources refer to the calculation method in the book Ad-Durrul Aniq by Ahmad Ghozali Muhammad Fathullah, while secondary sources include books, scientific journals, and other astronomical references relevant to the concepts of lunar eclipses and the prayer of khusuf.

The entire research and data analysis process is systematically formulated thru the ALKHUSRA analysis flow, which begins with the analysis stage to identify the need for determining the eclipse prayer times based on the principles of astronomy, followed by establishing the calculation foundation using the rules from the Book of ad-Durrul Aniq as the main calculation basis. After the data is collected, a data conversion process is carried out from classical formulas into a visual medium in the form of a rotating calendar to make the information easier to understand. The next stage is to produce the determination results in the form of the output time for the eclipse prayer, which then undergoes an accuracy testing process to ensure its precision thru comparison with other astronomical references. Next, the results are reviewed from a Sharia perspective based on the provisions of the Khusuf prayer fiqh to ensure the relevance between astronomical data and the practical needs of the

community. This series of processes concludes with the realization of an applicative medium, which can function as a practical and efficient tool to support the worship activities of Muslims.

RESULTS AND DISCUSSION

Design and Development of ALKHUSRA Media for Determining Lunar Eclipse Prayer Times

Media ALKHUSRA is designed as a visual instrument in the form of a rotating calendar that integrates astronomical data into an applicable physical form. The process of creating this media begins with the processing of lunar eclipse calculation data sourced from the Book of Ad-Durrul Aniq. These classical formulas are converted into Microsoft Excel to achieve precise time data accuracy, covering elements such as year, date, peak time, and type of eclipse. As for the components of the ALKHUSRA media, among them:

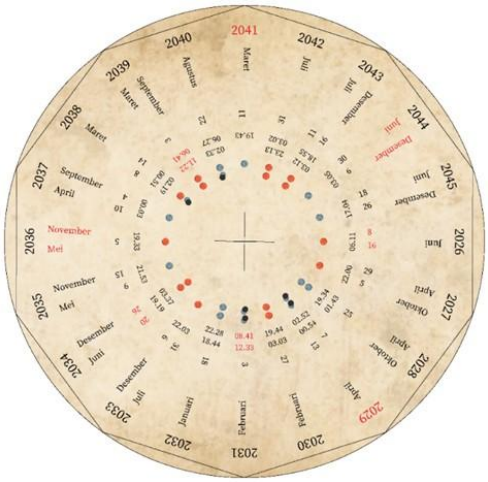


Figure 1. Main Disk

The Main Disk is a core component that functions as an integrated astronomical data storage. This disk contains the following variables that will be displayed thru the information window on the front cover:

The disk is designed with several interrelated components that support the identification and interpretation of lunar eclipse events. The outermost part of the disk displays the year scale from 2026 to 2045, which functions as the primary reference for determining the eclipse period. Inside this scale, chronological data in the form of months and dates provides more specific information about when each eclipse occurs according to the Gregorian calendar.

The disk also includes a time indicator that presents the peak or contact time of the eclipse in hourly format, allowing observers to determine the timing of the phenomenon more precisely. In addition, the types of lunar eclipses are classified using colored dot symbols, such as red, gray, or black, so that each eclipse category can be visually distinguished with ease. Meanwhile, any text written in red indicates

that the lunar eclipse cannot be observed directly by the naked eye from the observer's location.

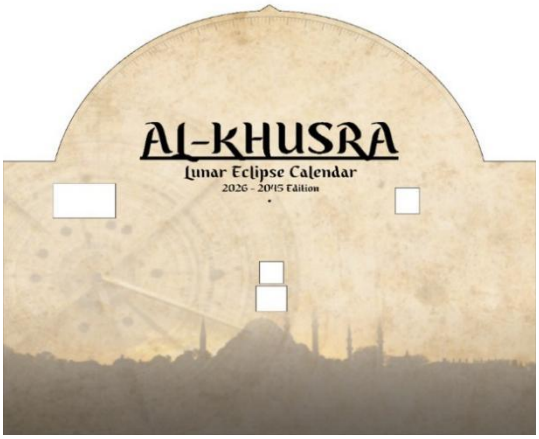


Figure 2. Front Cover

The Front Cover is a static panel that serves as a user interface for reading data in a focused and structured manner. This component is equipped with four Information Windows designed to isolate specific data on the main disk:

The disk also contains several display windows that help users read the eclipse information more clearly. The Month Window, located on the left side, displays the name of the month in which the eclipse occurs according to the selected year. On the right side, the Date Window presents the exact date of the eclipse in the Gregorian calendar.

In the upper middle section, the Type Window shows a visual indicator in the form of a colored dot symbol, which classifies the eclipse as total, partial, or penumbral. Meanwhile, the Time Window, located in the lower middle section, provides information about the peak time or contact time of the eclipse in hourly format.

In addition to the information window, this front cover features a Central Indicator Line and a classic astronomy-themed visual design that helps users accurately align the disk position.



Figur 3. Rear Cover

The Back Cover serves as a reference panel containing theoretical information, instrument specifications, and production identity. This component consists of three main parts:

The instrument also includes an informational section that explains its scientific and technical identity. This section presents a brief description of the relationship between the instrument's mechanical system and the regularity of celestial body movements, emphasizing its role as a medium for astronomical education.

In addition, the instrument is equipped with a specification table that systematically presents its technical details. This data field includes the instrument name, AL-KHUSRA, its type as a Lunar Eclipse Calendar 2026–2045, model 1.0, and the designer, Ahmad Tahsisul Arfah.

A digital information gateway is also provided through a QR code, which gives users direct access to the digital guidebook. By scanning this code, users can obtain complete operating instructions as well as additional educational materials related to lunar eclipse phenomena.

The Use of ALKHUSRA Media for Determining the Time of Lunar Eclipse Prayer Guidelines for Using ALKHUSRA Media

To obtain accurate lunar eclipse data, ALKHUSRA media should be used through several systematic steps. First, the user needs to prepare the instrument by holding the ALKHUSRA media in a stable position and ensuring that the front cover panel is facing the user. After that, the target year to be observed must be identified on the main disk, within the available year range of 2026 to 2045.

Once the target year has been determined, the user should perform precision alignment or calibration by slowly rotating the main disk until the selected year aligns perfectly with the arrow or pointer located at the top center of the medium. When the year position is properly aligned, the information related to the lunar eclipse phenomenon will automatically appear in the available information windows.

The left window displays the month in which the eclipse occurs, known as the month window. The right window presents the date of the eclipse occurrence, known as the date window. The top middle window shows a visual symbol indicating the type of eclipse that will occur, known as the type window. Meanwhile, the bottom middle window displays the peak time of the eclipse occurrence in hour format, known as the time window.

Further verification is needed when two eclipses occur in one year. In this condition, the information window will automatically display two rows of data at the same time. Therefore, users must read the data horizontally. The position of the data shown in the month window will always align with the corresponding data in the date, type, and time windows. If the user reads the top row in the month window, then the top row in the other windows must also be used. Likewise, if the lower row is read in one window, the corresponding lower row in the other windows should also be followed.

Advantages and Limitations of ALKHUSRA Media

ALKHUSRA media has several advantages in supporting the determination of lunar eclipse prayer times. This media presents the determination process visually and systematically, making it easier to understand without requiring manual calculations. In addition, ALKHUSRA integrates astronomical principles with Islamic sharia in determining the timing of lunar eclipse prayers.

This media is also practical and easy to use by various groups, including academics and the general public. Furthermore, ALKHUSRA can be utilized as an educational tool in the study of astronomy, particularly in learning materials related to lunar eclipses.

However, ALKHUSRA media also has several limitations. This media functions as an auxiliary tool, so it does not replace in-depth astronomical calculations. In addition, ALKHUSRA is not applicable for a long period of time, as it is only valid from 2026 to 2045. Although this media can be widely implemented, users still need to consider that the available database uses the Makassar latitude reference point.

CONCLUSION

Based on the research results, it can be concluded that the ALKHUSRA media is an innovative astronomical instrument that successfully integrates the classical calculation method from the Book of ad-Durrul Aniq into a practical visual media format. The development process of this media involved stages of data digitization using Microsoft Excel, which was then implemented into a rotating calendar design, including data disks, user interface, and reference panels.

The ALKHUSRA media has proven to be effective and applicable in helping the community and students independently determine the time for performing the lunar eclipse prayer thru a simple operational mechanism without compromising the accuracy of astronomical data. Substantively, the presence of this media not only serves as a worship aid but also becomes an educational tool to enhance the community's astronomical literacy regarding celestial phenomena. As a further development effort, the researchers suggest that the next ALKHUSRA media be produced with more durable materials and a broader range of data years. In addition, massive socialization is needed regarding the use of similar educational media in Islamic educational institutions to strengthen the community's independence in determining prayer times related to astronomical phenomena accurately and in accordance with Islamic law.

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