The Magic of Stonehenge or How to Predict Solar and Lunar Eclipses

Jana Wiegert, Stefanie Rohrer, Simon Landmann, Philipp Rother, Lukas Wittmann, Dan Curticapean
Offenburg University, Badstr. 24, 77652 Offenburg, Germany
dan.curticapean@hs-offenburg.de

Abstract: In this paper, the authors present a self-developed app that features the Stonehenge algorithm for predicting lunar and solar eclipses. Furthermore, the app presents useful guidelines for astronomy photography and enhances optics and photonics training. © 2021 The Author(s)
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1. Solar and Lunar Eclipses

Astronomical events like solar and lunar eclipses have impressed mankind since time immemorial. The total solar eclipses were very frightening events in ancient times, a sickle covers the sun more and more, it becomes cold and dark and finally during totality it becomes dark like in the night. Then the solar corona can be seen in an impressive way for less than four minutes. After that the sun becomes more and more visible again. Total lunar eclipses Fig. 1 are also very impressive natural events and have already found their way into ancient mythologies, as they are quite rare. The moon appears unnaturally red and a lunar eclipse is very long compared to the total solar eclipse with up to 1 hour and 40 minutes.

Fig. 1: Total Lunar Eclipse 2018 over the Black Forest / Feldberg, Germany. Photography by Dan Curticapean

Total solar eclipses always occur when the Sun, Moon and Earth (in this order) are aligned in a straight line. Solar eclipses always occur at new moon since the moon must cross the node position exactly at new moon. Total lunar eclipses always occur when the Sun, Earth and Moon (in this order) are aligned in a straight line. Lunar eclipses always occur at full moon since the moon must cross the node position exactly at full moon [1] - [2].

A megalithic arrangement near the city of Stonehenge England has always captivated people. Until the beginning of the 20th century, they were considered cult places of the Druids. Only at the beginning of the last century it was recognized that Stonehenge is an observatory about 5000 years old.

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If all our technology, mathematics and physics were taken away today, we would still be able to predict the moon and solar eclipses using Stonehenge. To do this, we just need to apply Stonehenge's algorithm [3]. It is to be noted that the Stonehenge algorithm does not distinguish between partial and total eclipse.

2. Development of the Astronomy App

The authors have simulated and visualized the operating principles of the Stonehenge algorithm in an app. Also the deviations of the 5000 year old algorithm were determined. It should be mentioned that the application was developed by students as part of an interdisciplinary project work. This project work is part of the curricula of our study program and the topic is free to choose. Figure 2 shows the main areas of the application.

In addition, the app offers a chapter on astrophotography with an integrated location-dependent sunrise and sunset compass and calculator. Furthermore, the app offers an overview of the upcoming rocket starts and a quiz on the presented content. With the app, the authors want to inspire enthusiasm for astronomy and to encourage users to get involved in science and technology. The app is developed for iOS and Android devices.

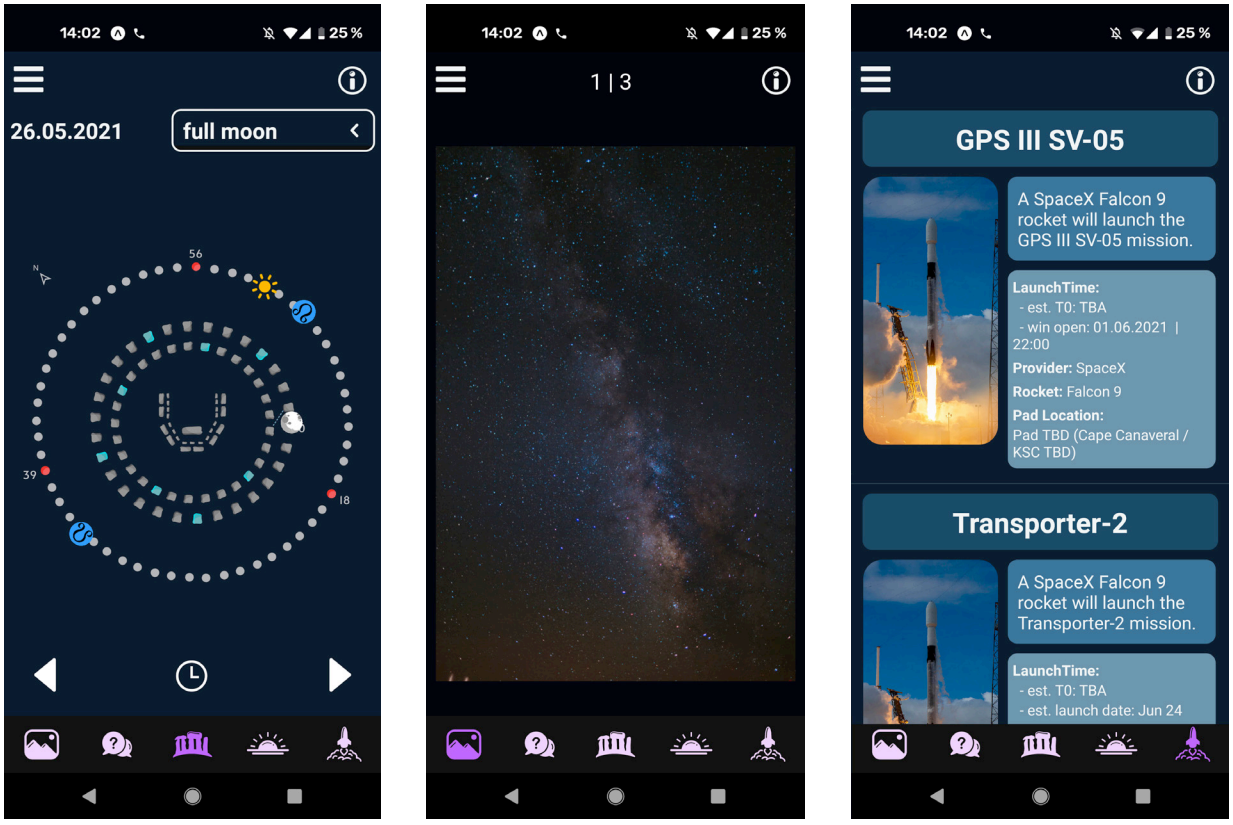

Fig. 2. Astronomy App:

a) Stonehenge algorithm predicting full moon; b) guidelines for astronomy shooting with practical tips; c) upcoming rocket launches

3. References

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