AstroCal Software Users Manual

Revision Sheet

Revision	Date	Brief Summary of Changes
Version 1.0	1. 10/09/2022	Baseline document with current functionality

2. INTRODUCTION

2.1 Document Use

The intended audience for this document is for anyone using the AstroCal software as system console operators, python application operators, or contributing to the open source project.

2.2 Definitions and Acronyms

2.2.1   Key Definitions

Crescent Moon: When only a small arc-shaped section of the visible portion is illuminated, from the perspective of Earth
Day Length: the time elapsed between beginning and end of the daytime period
Elevation:
Gibbous Moon: When the Moon is more than half full, but not quite fully illuminated, from the perspective of Earth.
Illumination: The Moon is fully illuminated at the full moon (visible fraction = 1.00). During the crescent phases the visible fraction ranges from 0.00 to 0.50; in the gibbous phases, it is between 0.50 and 1.00.
Julian Day: The number of days that have passed since the initial epoch defined as noon Universal Time (UT) Monday, 1 January 4713 BC in the Julian calendar.
Lunar Eclipse: A lunar eclipse occurs when the Moon moves into the Earth's shadow, from the perspective of Earth
Solar Eclipse: A solar eclipse occurs when the Moon passes between Earth and the Sun, from the perspective of Earth
Waning Moon: When the moon is in the phase in which its amount of illumination is decreasing, from the perspective of Earth.
Waxing Moon: When the amount of illumination on the Moon is increasing, from the presentive of Earth.

2.3 References

2.3.1 AstroCal is licensed under the MIT License.

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2.3.2 Security or privacy protection consideration

AstroCal is an offline application run locally without the storage of user settings and user input selections.

3. Concept of Operations

The goal of AstroCal is to be an application that displays highly-accurate solar and lunar calendar information. The application will be available as a binary file for command line use, or as a graphical application for those who have less technical proficiency.

AstroCal utilizes the mathematical library [Swiss Ephemeris](#) for its calculations. The Swiss Ephemeris library is a toolset that allows planetary and lunar computations. It's available under GNU Affero General Public License version 3.

4. General Use

4.1.1 Installation

4.1.1.1 *Instructions from source*
Not availbe in current functionality, coming in the next version.

4.1.1.2 *Instruction from Visual Studio Code*
1. Install VSCode
   1.1. Go through the installer process https://code.visualstudio.com/
2. Install Python Package from VS Code Marketplace
   https://marketplace.visualstudio.com/items?itemName=ms-python.python
3. Install a Python interpreter https://www.python.org/downloads/
4. Clone the Git Repo
   4.1. Create a folder named "AstroCal" somewhere on your computer.
   4.2. Open the folder location in terminal
   4.3. Clone the project locally with the following command:

   ```
   Git clone https://github.com/COSC-470-Okanagan-
   College/AstroCal.git
   ```

   4.3.1. Download and install Visual Studio Build Tools 2022.
   https://visualstudio.microsoft.com/visual-cpp-build-tools/

4.1.1.3 *Instructions for Setting up Libraries*
1. Navigate to AstroCal folder
2. To install all libraries at once, a requirements.txt can be used with pip. The install will proceed recursively line-by-line installing libraries as specified in the document. See an example of a requirements.txt file and its install method below.

   ```
   pip install -r requirements.txt
   ```

4.1.1.4 Instructions for Starting AstroCal
1. Open Visual Studio Code
2. Open AstroCal project
3. Navigate to the Run and Debug Tab
4. Select the AstroCal configuration from the drop down
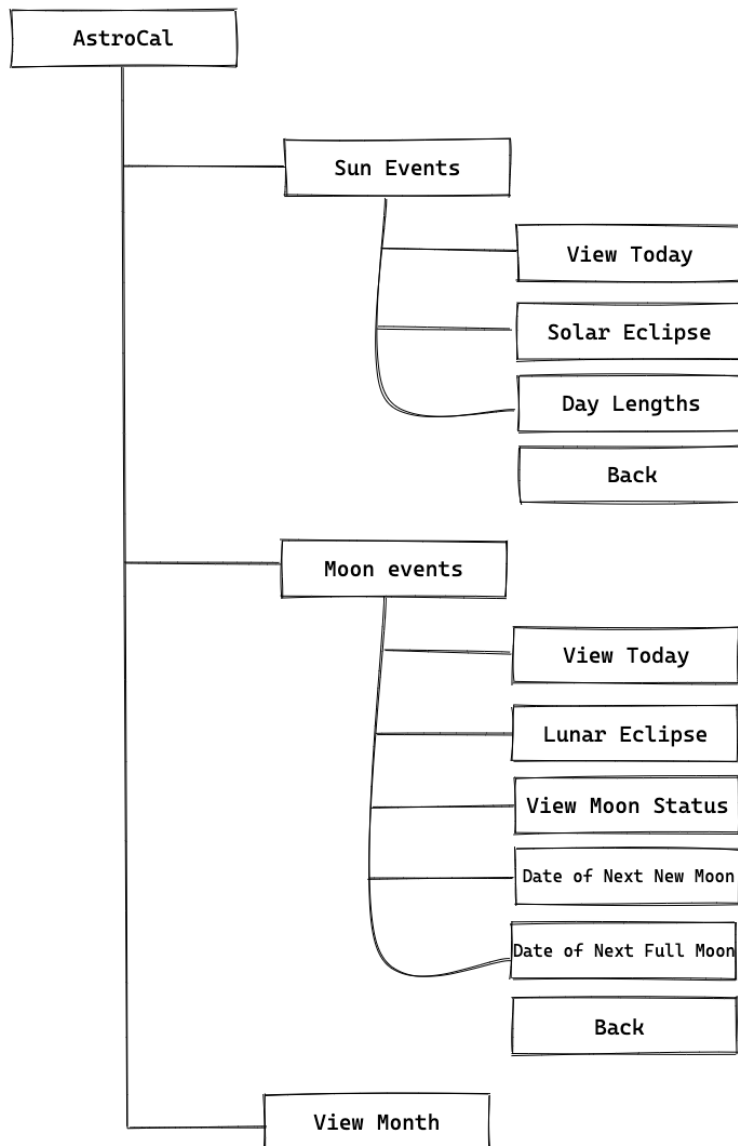
Hit the Run icon.
5. The application will now be interactable in the terminal of Visual Studio Code.

5. Procedures and Tutorials

5.1.1 AstroCal Software Overview

AstroCal allows you to calculate the sun events, moon events and creates a monthly calendar of information. *Figure 1* outlines the structure of the available functionality.

Figure 1 – AstroCal Organization

5.1.2 AstroCal Command Line Sun Events

1. Start the program in the terminal in Visual Studio Code. See section *4.1.1.4 Instructions for Starting AstroCal*
2. Select **Sun Events** by entering the selection 1 and hitting enter **1** ⏎
   - 2.1. **View Today**: Will output the date, the sunrise and the sunset
      - 2.1.1. Press enter to continue to the main menu
   - 2.2. **Solar Eclipse**: Will output information of the next solar eclipse including start time, totality, end time, and the overall duration
      - 2.2.1. Press enter to continue to the main menu
   - 2.3. **Day Lengths**: Will allow you to input the number of days, and output the day lengths for that interval.
      - 2.3.1. Press enter to continue to the main menu
   - 2.4. **Back:** Will return you to the main menu

5.1.3 AstroCal Command Line Moon Events

1. Start the program in the terminal in Visual Studio Code. See section *4.1.1.4 Instructions for Starting AstroCal*
2. Select **Moon Events** by entering the selection 2 and hitting enter **2** ⏎
   - 2.1. **View Today**: Will output the date, the moonrise and the moonset
      - 2.1.1. Press enter to continue to the main menu
   - 2.2. **Lunar Eclipse**: Will output information of the next lunar eclipse including start time, totality, end time, and the overall duration
      - 2.2.1. Press enter to continue to the main menu
   - 2.3. **View Moon Status**: Will output todays moon phase and visibility.
      - 2.3.1. Press enter to continue to the main menu
   - 2.4. **Date of Next New Moon**: Will output the next date for a new moon.
      - 2.4.1. Press enter to continue to the main menu
   - 2.5. **Date of Next Full Moon**: Will output the next date for a full moon.
      - 2.5.1. Press enter to continue to the main menu
   - 2.6. **Back:** Will return you to the main menu

5.1.4 AstroCal Command Line View Month

1. Start the program in the terminal in Visual Studio Code. See section *4.1.1.4 Instructions for Starting AstroCal*
2. Select **View Month** by entering the selection 3 and hitting enter **3** ⏎**.** This will automatically output the month's solar and lunar information and automatically return you to the main menu.

6. Software Commands

Currently AstroCal runs from source code, there are no binaries that are general available, this will be coming in a future release.

7. Navigational Features

GUI is not currently available in this version and will be enabled in a future release.

8. Error Messages and Problem Resolution

Error messaging is not currently available in this version. In a future release error messages will inform users if their input was invalid.

Currently invalid input causes the error "*Exception has occurred: ValueError*". To resume the program the user will be to stop and restart the running the program in Visual Studio Code.