The MegaMovie Project: Optimization of an Affordable, Automatic Photo Documentation System

Siuling Pau[1], Akira DeMoss[2] Juan Carlos Martínez-Oliveros[3], Laura Peticolas[3]
[1]College of San Mateo, [2]Iowa State University, [3]Space Sciences Laboratory, UC Berkeley

The Solar Eclipse MegaMovie

On August 21st of 2017, a total solar eclipse will cross the US from coast to coast. Here, the Moon will cover the Sun, offering an extraordinary scenery not seen in these lands since 1918.

More than incredible views, total solar eclipses offer unique opportunities to study the solar Corona, a gaseous layer invisible to the eyes when the brightest part of the Sun is exposed. This layer hosts some of the most interesting activities of a star, many of which are still a mystery to scientists.

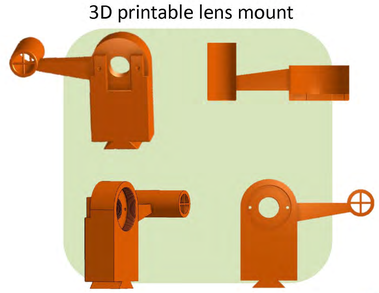
The Space Sciences Laboratory of UC Berkeley developed the Solar Eclipse MegaMovie Project: the first citizen scientific experiment intended to obtain crowdsourced photographic data of a solar eclipse.

Sign up to be part of the project at eclipsemega.movie

Mobile App | Web site | YouTube

Camera Setup

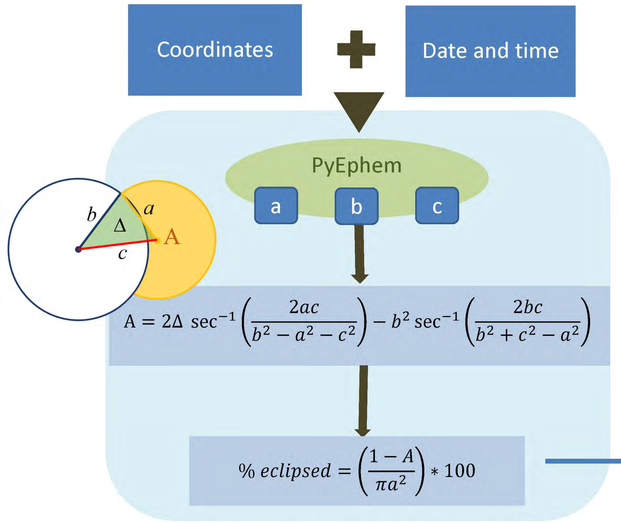
3D printable lens mount

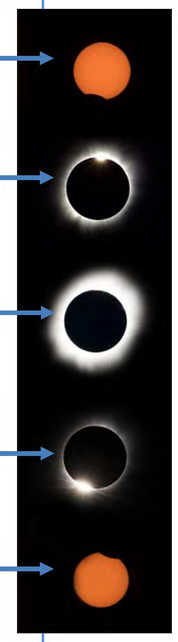


- **Telephoto Lens**
- **Lens adaptor EOS-C**
- **Lens mount with finder**
- **RPi Camera Module**
- **Raspberry Pi board**
- **GPS antenna**
- **GPS HAT**
- **Sensor HAT**
- **Tripod**

Astrometry

The contact times mark the beginning and end of a solar eclipse, as well as the moments to observe the Bailey's beads, the Diamond Ring Effect, and of course, the totality.





In order to photograph these events with the right configurations, the times can be calculated by knowing how much of the Sun will be covered at an specific time and location on the day of the eclipse.

Automatic Photo System

One of the options for the participating volunteers is to build Raspberry Pi Camera setup, with software and designs developed by the MegaMovie team.

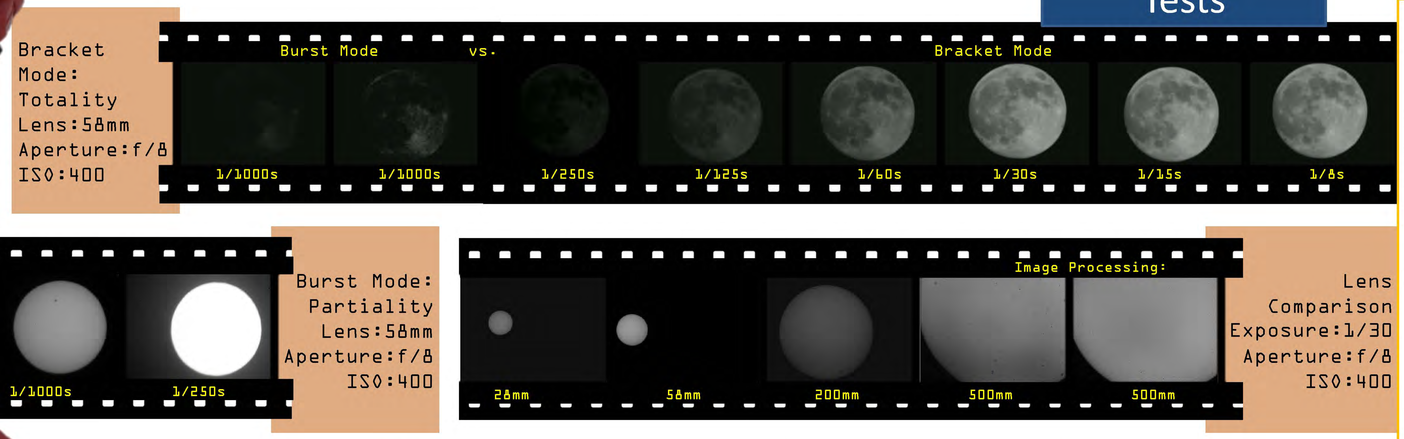
Benefits:

- ✓ Affordable
- ✓ User friendly
- ✓ Automatic
- ✓ Eclipse enjoyment guaranteed
- ✓ Future educational potential

Development:

- Python script for automatic performance of the camera: contact times and bracketing mode.
- Adaptors for DSLR telephoto lenses
- RPi ensemble box
- Image processing system

Tests



Future Applications

After the solar eclipse, the data collected from these and other camera systems will be processed and collected into an open source database available for future investigations.

Beyond, the Raspberry Pi setups can also be used for:

- Future Solar eclipses:
  - Argentina-Chile 2019
  - Argentina-Chile 2020
  - Antarctica 2021
  - South East Asia 2023
  - Mexico-USA-Canada 2024
  - Europe-Middle East 2027
- Educational coding
- Pi camera module reuse (photography, video recording…)

References

Hermenau, Rene. "Free QR Code Generator." *Free-QR-Code.net*. N.p., n.d. Web. Aug. 4, 2017.
Coates, Graeme. "Eclipse Calculations Using Python." 25 Dec. 2015. *Chromosphere*. Web. Jun. 12, 2017.
Adler, Kyle. *Total Solar Eclipse*. 2015. Svalbard. *Linkedin*. Web. Jul. 8, 2017.
Weisstein, Eric W. "Lune." From *MathWorld*--A Wolfram Web. Jul 8, 2017.

Acknowledgements

In collaboration with Google: Making & Science™.
Special recognition to Juan Camilo "Milo" Casas-Buitrago for his essential support during the development of this project and this informative poster. Also to Dr. Darcy Barron, Darlene Yan and fellow interns of ASSURE 2017.
The ASSURE Program is funded by the National Science Foundation (Grant # NSF AGS1461277).

Contact: siulingpau@gmail.com