

Allsky Camera Network for Detecting Bolides Requirements

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Functional Requirements:

1. Classification and Events

- The system must be able to distinguish an interesting event (bolide) from an uninteresting event (airplane).
- If the system is unsure about certain events it must tag them such that the user knows they must manually review the event.
- The user must be able to save events and trash unwanted events in the case of manual review

2. Deliverables

- For an event the system must be able to deliver a video file of the event, a composite image of that video, and light curve data from the event.
- The deliverables should be easily accessible to the user (packaged together)

3. Hardware and Node Interaction

- The user must be able to remotely perform the following operations:
 - Set noise threshold
 - Set sum threshold
 - Set max events per hour
 - Set dev name
 - Set archive path
 - Toggle Start/Stop
 - Make Composite:
Pressing the Make Composite command will cause a composite image to be produced from the most recently selected event video.

- **Analyze:**
Pressing the **Analyze** command will instruct the software to produce a CSV file (comma separated variable) that contains a time history of the event, including the time of each video frame, the number of pixels that are above the noise threshold, the sum of the pixel values above the noise threshold, the X and Y coordinates of the centroid of the pixels above the noise threshold, and the calculated azimuth and elevation of this centroid. Azimuth and elevation calculations depend on accurate calibration parameters so make sure a full calibration is done beforehand.
- **Make Star Map:**
Pressing the **Make Star Map** command will instruct the software to produce an image, from the most recently selected event video, that attempts to enhance the background in order to make faint stars visible. It works by summing all frames from the first half of the video, subtracting an equal number of frames from the second half of the video, and then producing a suitably scaled image from the result. In theory, all static features and noise accumulated during the first half are canceled out by subtracting the frames from the second half. However, if the video is long enough, the stars accumulated during the first half will have moved sufficiently, and so will not be canceled out when the frames from the second half are subtracted.
- **Get Video:**
The **Get Video** command is used to fetch the most recently viewed video to local storage. On my Mac I use this to bring the video file from the Raspberry Pi to the Mac.
- **Get Image:**
The **Get Image** command is used to fetch the most recently viewed composite image to local storage. Of course, this works only if a composite image has already been produced by the **Make Composite** selection or the **Make Star Map** as described above.
- **Get CSV File:**

The **Get CSV File** command is used to fetch the CSV file of the most recently viewed event to local storage. Of course, this works only if a CSV file has already been produced by the **Analyze** command.

- Self Test:

The **Self Test** command initiates a sequence of actions designed to fully test the Pi Sentinel system. At the beginning of this sequence, processing of camera data is started, then after a period of time, a Force Trigger is initiated, and then, after a period of time, processing of camera data is stopped. This sequence lasts for about three minutes and is repeated 10 times. This command is not available if Pi Sentinel is already processing camera data.

- Calibrate:

The user should enter the Latitude, Longitude, and Altitude of the camera and adjust a few of the parameters by hand to get a rough calibration. A final calibration will depend on locating and identifying stars at known times as described later.

- Force trigger an event

- Update stars

- The user must be able to playback portions of video from the nightly recording.
- The user must be able to access a list of stars that were visible during the nightly recording with the appropriate time stamp

Interface Requirements:

Rest API (for Nodes)

verb	endpoint	description
POST	/config	Update local config values
GET	/config	Gets local config values
GET	/status	Returns status of node

Rest API (Central Server)

verb	endpoint	description
GET	/node/videos?timespan=09292024-10062024	Returns all video_id's within parameter
GET	/node/videos/{video_id}	Return 200 or 404
POST	/node/videos/{video_id}	Sends video to server
POST	/node/online	Will inform server that node is online
POST	/node/notify	Will tell the server to send email/sms notifications because something is wrong