Comparison of ASGARD and UFOCapture

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Introduction

Set out to compare detection efficiencies between UFOCapture and ASGARD

Outline
1) Overview of equipment
2) Overview of each software
3) Comparison of user-friendliness
4) Comparison of software output
5) Comparison of results

Results Compared:
• Sensitivity of the two systems
• False alarm rates
• Astrometry
• Photometry
Video Input

17 mm Schneider lens (25 degree field of view) on a Watec CCD camera was split and input into the two computer systems, running UFOCapture or ASGARD

Cost: Less than $1,000 for Watec CCD + lens + encasing

Detects size range smaller (more faint) than All Sky Cameras. Therefore sees considerably more (up to 30 on a clear night).
ASGARD Overview

• All Sky and Guided Automatic Real-time Detection
  • University of Western Ontario
  • Originally created to run on All-Sky cameras
  • Not publically available

• Runs on Debian GNU/Linux

• Compatible with several video sources (analog video camera interfaces, digital camera interfaces)

• Detects meteors in real-time, but can also run on pre-recorded video.

• Detection: Compares video frame-by-frame, pixel-by-pixel. Several plugins can be used for detection process. User can specify settings in the plugins, such as how many pixels above background for an event to be triggered.
  • A set of rejection algorithms throw out non-meteor events
UFOCapture Overview

Multipurpose motion-capture software (including security purposes)

$225-$250 depending on exchange rate

Compatible with many different video inputs

Need PC: Windows XP, Windows 2000, or Windows 7

Fairly well documented on website

Preset files to initialize the settings

Good user-interface to tweak settings
**User-Labor Comparison - Setup**

**Installation**
- UFOCapture has an setup.exe file
- ASGARD requires Linux knowledge. Installation is non-trivial and non-intuitive.

**Plates**
- ASGARD requires an extra program – METAL – or an IDL script
- Need to match up many stars (25+) all around FOV
  - User interface is good, but not intuitive
  - Less than 0.02 degree residuals
- UFOCapture has it built into program
  - User interface = very intuitive
  - Fairly automated
  - Less than 0.03 degree residuals
User-Labor Comparison

• Daily data reduction
  – UFOCapture requires an additional program:
    • UFOAnalyzer takes all the events UFOCapture has detected, and identifies whether it is a meteor
      – Many events are misidentified – requires manual filtering through each event
      – Therefore more user-intervention for UFOCapture
  – ASGARD has real-time processing
    • Identifies whether the event is a meteor
    • Put in a reject folder if it is identified to be a non-meteor event
    • Still misidentification of events: requires manual filtering
UFOAnalyzer

- `.csv` (time, angular velocity, shower code, start/end RA/DEC, and more)
- `.xml` (azimuth, elevation, and more)
- Trail map (radiants)
- `.avi`
- `.jpg`
ASGARD

- .tar (.png of each frame)
- .txt (time, site, plate, the coordinates of the meteor in each frame and its magnitude at that point)
- .avi
- .png
## Initial Software Pros/Cons

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<tr>
<th><strong>UFOCapture/Analyzer</strong></th>
<th><strong>ASGARD</strong></th>
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**Pros**
- Easy setup
- Available online
- Nice interface
- Well documented

**Cons**
- Manually run Capture’s output into Analyzer
  - During lightning storm it takes a while to process
  - Program occasionally crashes & system needs restarting (windows 7)
- Manual intervention

**Pros**
- Video buffer (to go back and look at raw videos later)
- Capture + Analyzing is together.
  - Already identifies whether it is a meteor event or not

**Cons**
- Not well documented
- Need METAL to make plates
- Azimuth + elevations in slightly different format
Initial Results

UFOCapture = 207 Meteors
ASGARD = 80 Meteors
Initial Results

3 nights of lightning storm – not included
– Hundreds of false alarms for UFOCapture
False Alarms
Initial Results – Astrometry
Magnitudes not as reliable.
More work needs to be done in this area.
Changes to ASGARD

• Lowering the threshold at which ASGARD flags an event

• Changing detection plugin – affects how an event is triggered. Experimented with other versions.

• Taking out reject filters – inspected which reject filters were flagging real meteors.
Lowered Threshold (from 75 to 50) and removed a rejection filter that flagged a bunch of single frame triggers (meant for blinking planes).

Preliminary Results

False Alarms:

UFOCapture = 153 Meteors
ASGARD = 112 Meteors
Conclusions + Future Work

ASGARD Benefits: Very automated. Results easily accessed in the morning without doing additional work. A preferred software if it can become as sensitive as UFOcapture.

UFOCapture Benefits: Overall rates initially higher than ASGARD. Easy install. Windows compatible.

Additional Work:
• Experiment with a different plugin
• Meteor photometry