Sample Analysis Walkthrough

This walkthrough demonstrates a complete analysis of California poppy time-lapse images using the provided script.

Example Scenario

Imagine you have 72 images taken at 10-minute intervals from 6:00 AM to 6:00 PM, showing poppies opening in the morning and closing in the late afternoon.

Step 1: Prepare Your Images

After exporting from Lightroom using the guide, you'll have a folder structure like:

```
poppy_project/
├── images/
│   ├── Poppy_20250414_0600.jpg
│   ├── Poppy_20250414_0610.jpg
│   ├── ...
│   └── Poppy_20250414_1800.jpg
├── poppy_analyzer.py
└── requirements.txt
```

Step 2: Run the Analysis

```bash
# Activate your virtual environment first
python poppy_analyzer.py --input ./images --output ./results --interval 10 --start-tim
```

Step 3: Review the Process

The script will provide progress updates as it works:

```
Loading images...
Successfully loaded 72 images.
Preprocessing images...
Detecting flowers in each frame...
Processed 10/72 frames
Processed 20/72 frames
...
Tracking flowers across frames...
Found 8 consistent flower tracks.
Analyzing flower opening and closing states...
Generating visualizations...
Visualizations saved to ./results/visualizations
Results saved to ./results/flower_cycle_data.csv
Summary saved to ./results/flower_cycle_summary.csv
Analysis complete!
```

Step 4: Interpret the Results

Example Data

Let's look at a sample of what you might find in the results:

flower_cycle_summary.csv:

flower_id	first_detected	last_detected	open_start	open_complete	close_start	close_complete
1	2025-04-14 06:00	2025-04-14 18:00	2025-04-14 07:30	2025-04-14 09:20	2025-04-14 16:10	2025-04-14 17:40
2	2025-04-14 06:00	2025-04-14 18:00	2025-04-14 07:50	2025-04-14 09:40	2025-04-14 15:50	2025-04-14 17:20
3	2025-04-14 06:00	2025-04-14 18:00	2025-04-14 08:10	2025-04-14 10:00	2025-04-14 15:30	2025-04-14 17:00
4	2025-04-14 06:30	2025-04-14 18:00	2025-04-14 08:00	2025-04-14 09:30	2025-04-14 16:20	2025-04-14 17:50
5	2025-04-14 07:10	2025-04-14 17:30	2025-04-14 08:20	2025-04-14 10:10	2025-04-14 15:40	2025-04-14 16:50

Visual Analysis

The visualizations folder will contain:

1. **Tracking frames** showing flowers with their ID numbers
2. **Individual flower charts** showing:
    - Area over time (blue line)
    - Green dashed line: Beginning to open
    - Green solid line: Fully open
    - Red dashed line: Beginning to close
    - Red solid line: Fully closed

Step 5: Draw Conclusions

From this data, you might observe patterns such as:

1. Most flowers begin opening between 7:30-8:20 AM
2. Full opening occurs approximately 1.5-2 hours after beginning to open
3. Closing typically begins in the mid-afternoon (15:30-16:20)
4. Complete closure takes about 1.5 hours
5. Individual flowers have slightly different timing patterns

Step 6: Additional Analysis

For deeper analysis, you can:

1. Import the CSV into Excel, Google Sheets, or Python (pandas) for further statistical analysis
2. Calculate average opening and closing times across all flowers
3. Compare data across different days if you have multiple time-lapse sequences
4. Correlate with environmental data (temperature, light levels) if available

Notes on Accuracy

The analysis uses changes in the visible area of the flower as the primary indicator of opening/closing states. This works well in most cases, but factors like:

- Changing lighting conditions
- Shadow movement
- Wind-caused orientation changes
- Partial occlusion by other plants

...can all affect the measurements. Review the visual charts to confirm that the automated state detection aligns with what you observe in the actual images.