

# SOLAR TRACKING SYSTEM BASED ON IMAGE PROCESSING ALGORITHM



Objectives

Project Background

Methodology

Result

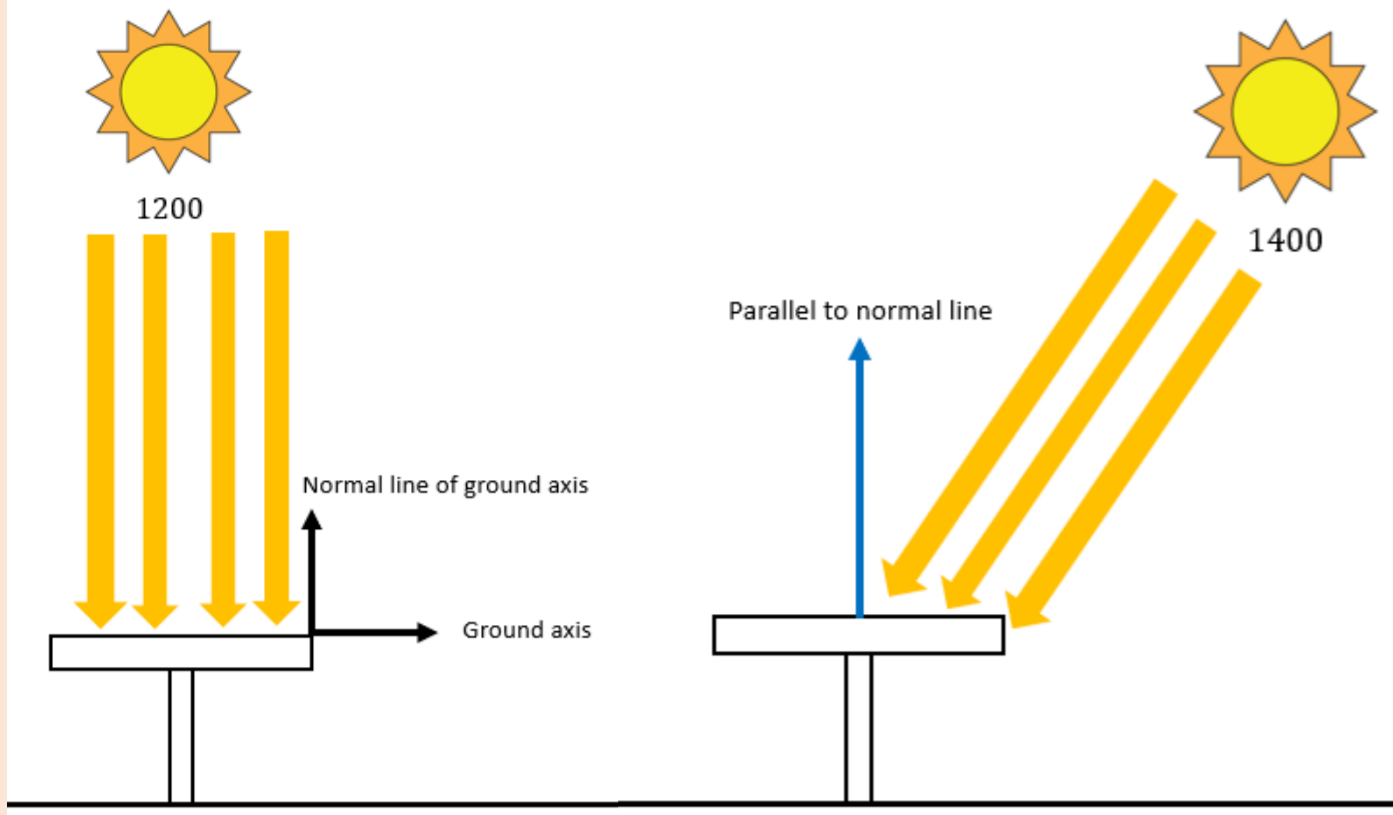


Figure 1: Fixed Solar Panel under different condition.

- ❑ Fixed mount is not perpendicular to the sun, which reduces the solar panel power efficiency.
- ❑ Fixed Mount system only received the highest sun intensity at noon, and the power efficiency of fixed solar PV system is low due to natural behavior of earth.
- ❑ Active based system unable to perpendicular to actual sun position

Problem Statements

1. To design solar tracking system with image processing algorithm
2. To investigate the efficiency of image based solar tracking system
3. To optimize the panel angle that consistent with actual sun angle

- The image processing algorithm has become more useful for different applications over the year besides of object tracking.
- In addition to being a solar tracking system in and of itself, image processing algorithms can also be used to stack other solar tracking systems, such as active based solar tracking systems, with the goal of evaluating other solar tracking systems' efficiency.
- Image processing algorithm primarily using the method of converting an image or frame into HSV format and filtering the noises and unwanted objects to track the sun precisely.
- High resolution, fps and quality cameras are frequently used to enhance image processing efficiency

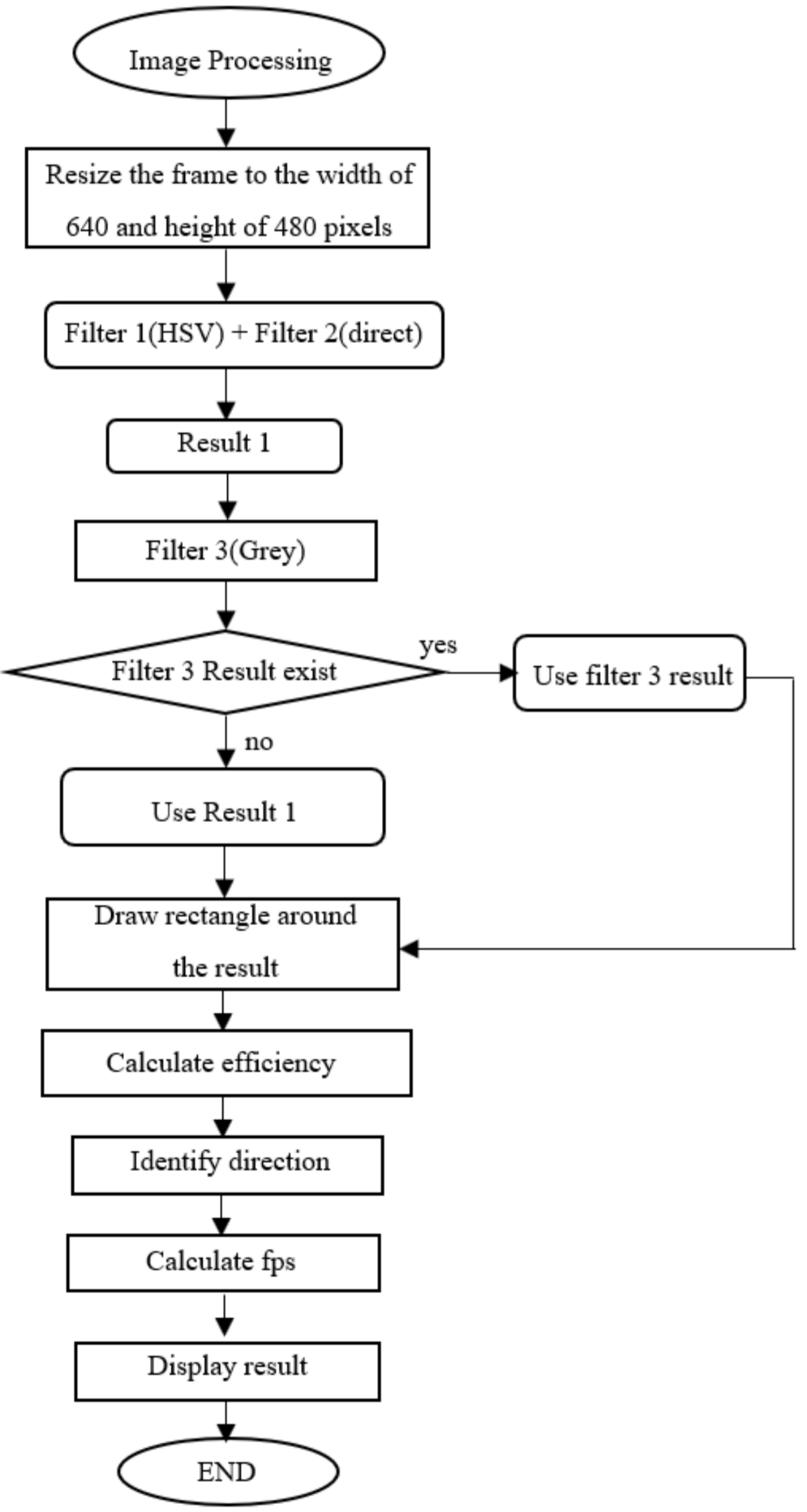


Figure 2: Overall Image Processing algorithm flowchart

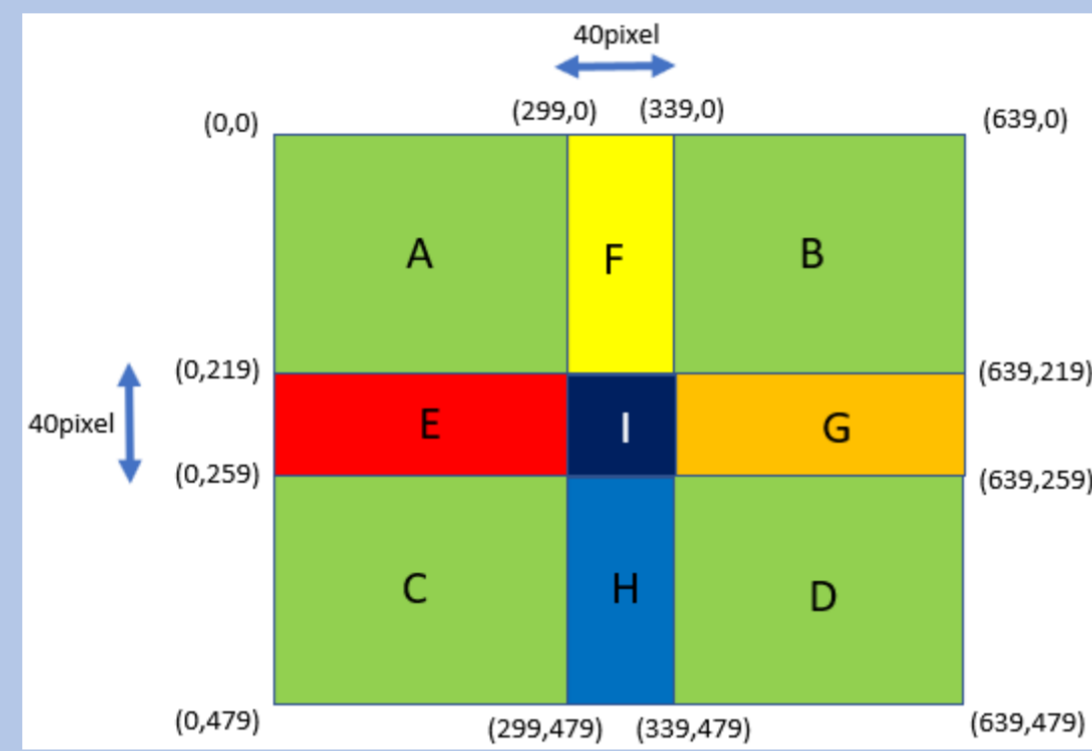


Figure 3: Sun position region

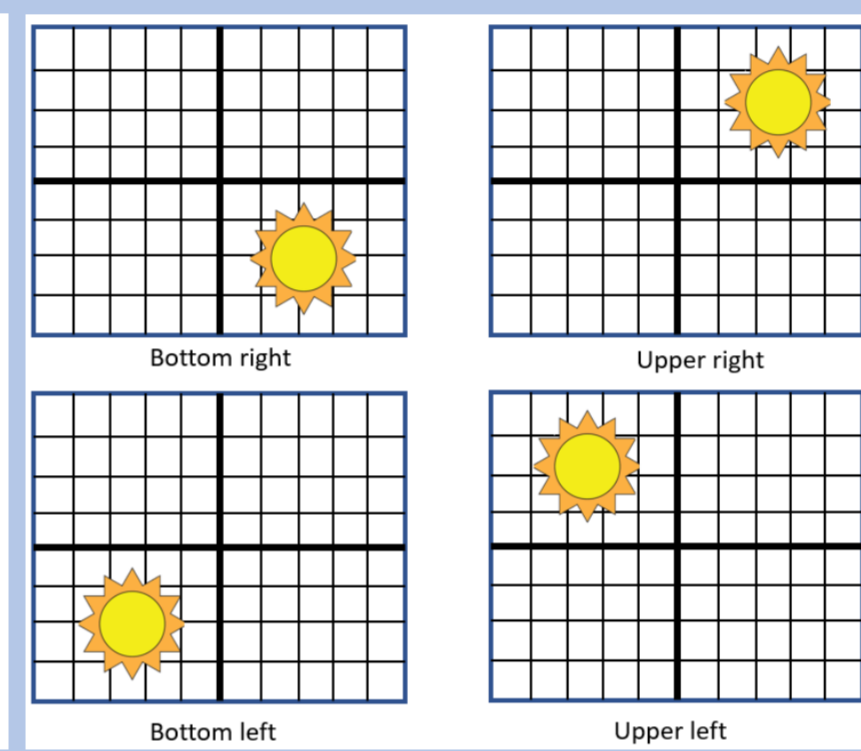


Figure 4: Sun position at Region A, Region B, Region C, Region D

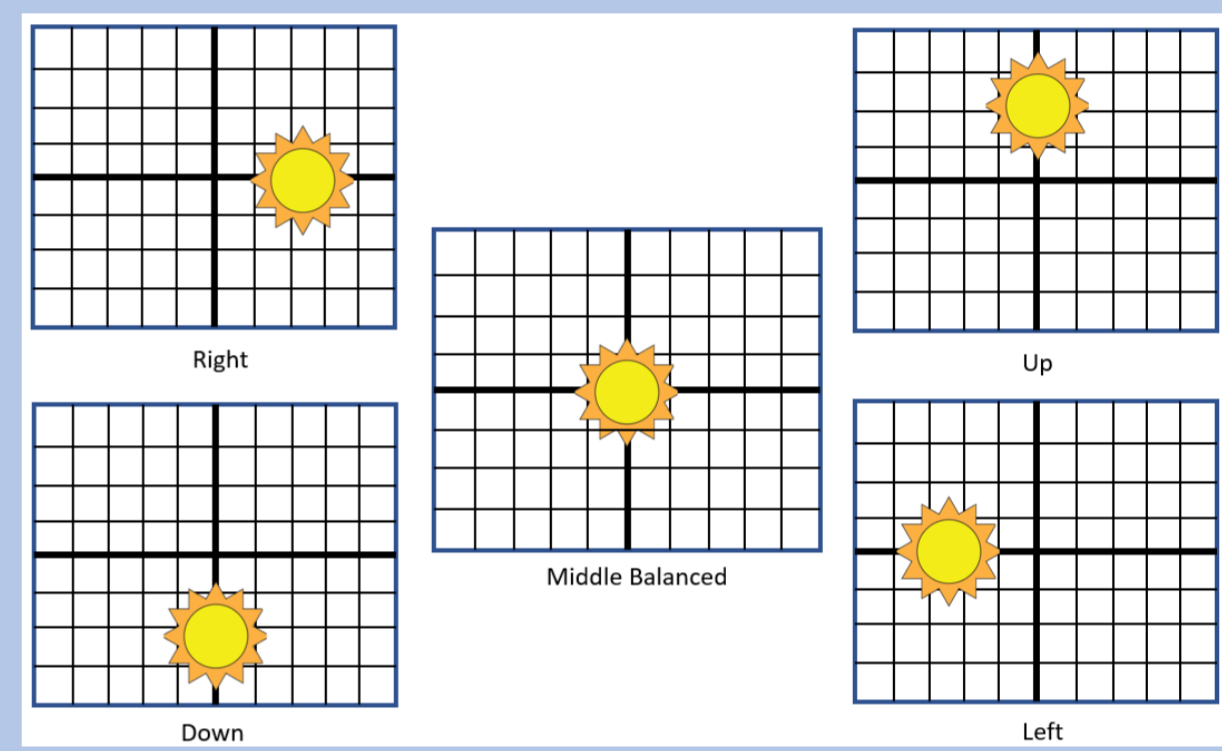


Figure 5: Sun position at Region E, Region F, Region G, Region H, Region I

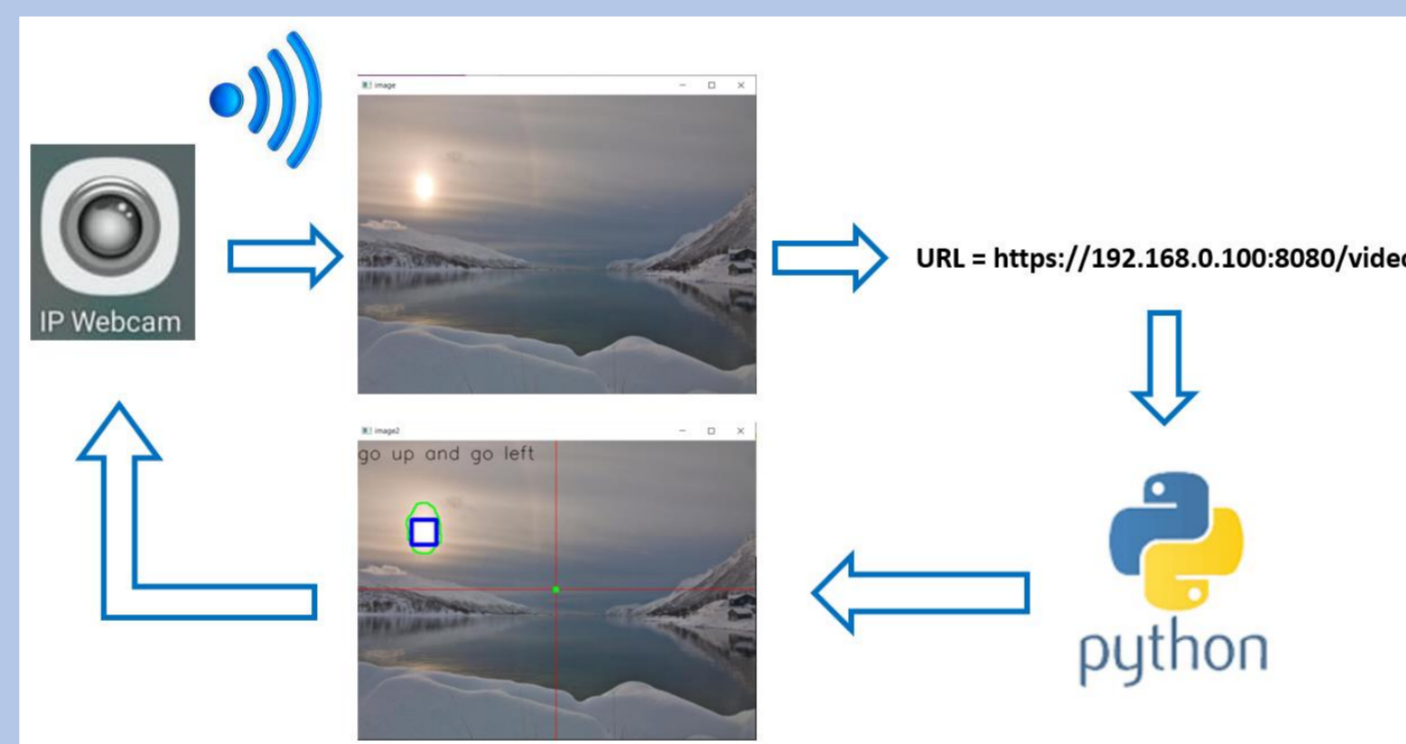


Figure 6: IP camera protocol



Figure 7: Hardware protocol

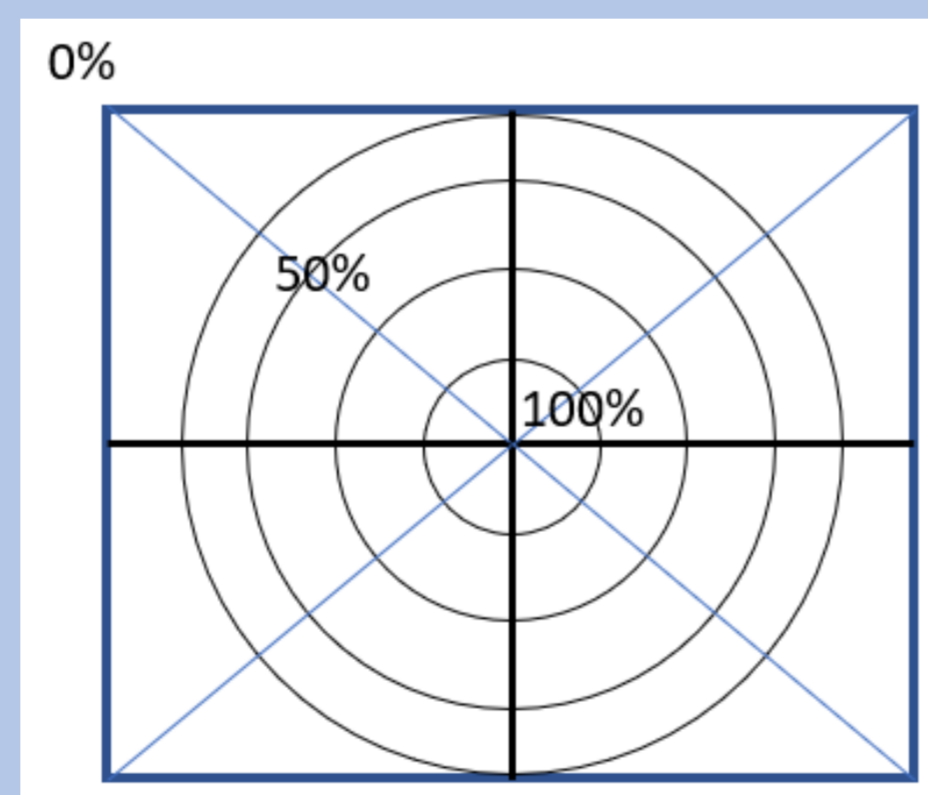


Figure 8: Efficiency of image processing in polar axis

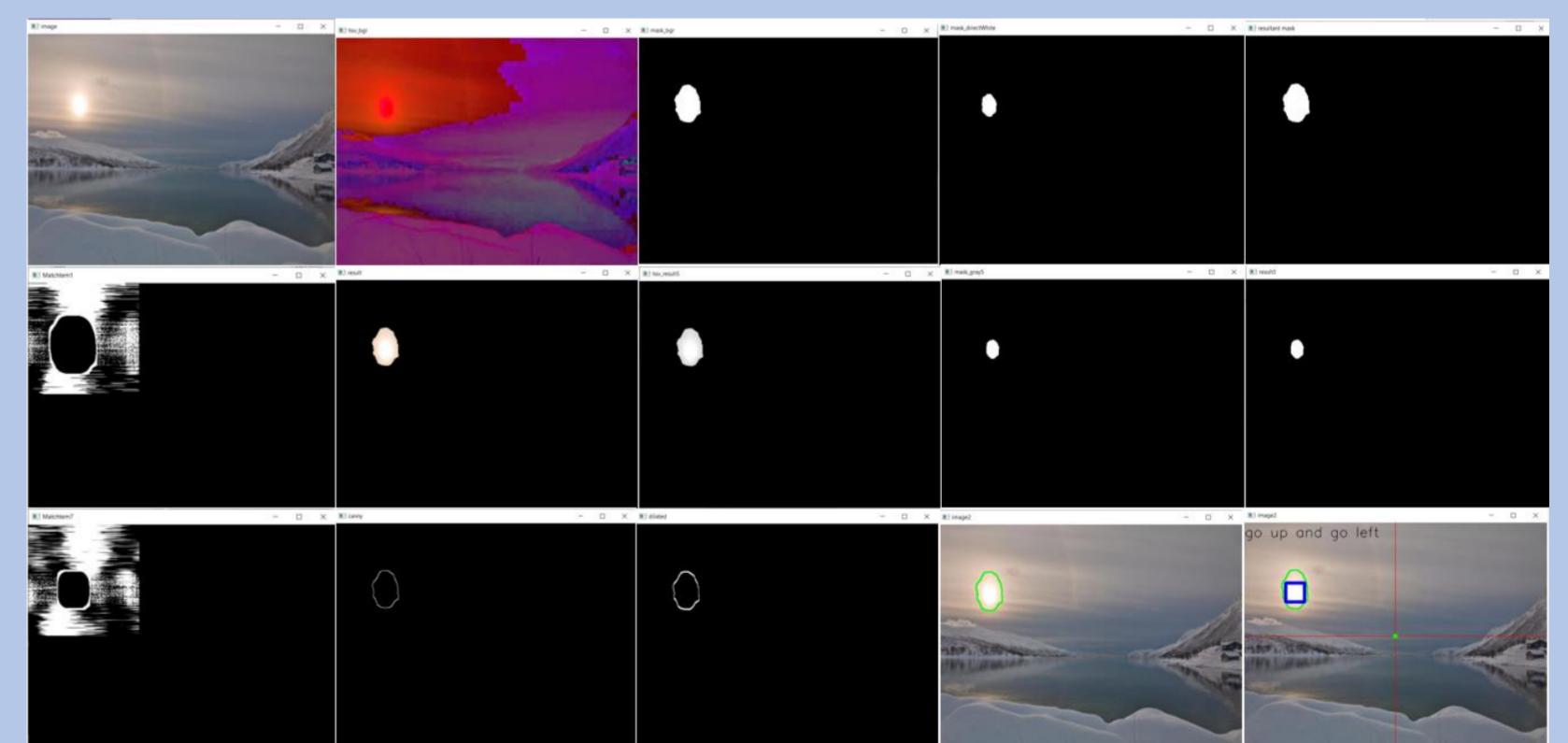


Figure 9: Full Process of Image Processing

- Increase the public motivation to install the solar tracker.
- Alternative way of designing solar tracker to increase solar panel output power efficiency
- Achieve Industrial 4.0
- Fulfil the Nation Goal which is to achieve 31% Renewable Energy share in the national capacity mix by 2025, published by SEDA Malaysia launched the **Malaysia Renewable Energy Roadmap (MyRER)**.
- Provide ideas to potential people, so they can upgrade algorithm from this base

Potential Impact & commercial



Science & Engineering Category

Grant No: SUCRF/C1-2021/FEIT-11

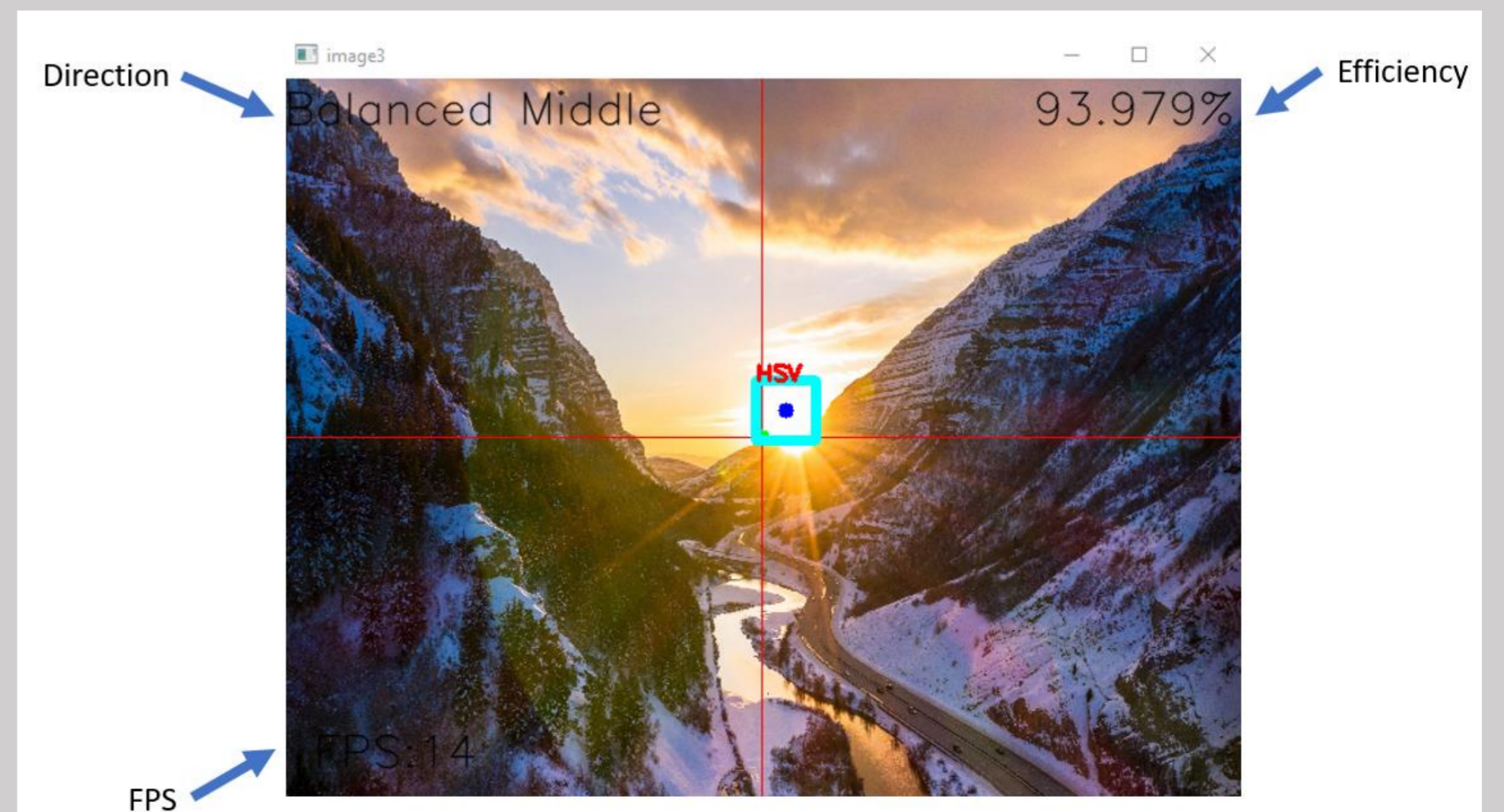


Figure 10: Result of image processing