



SOPI v0.93

User Manual

Smart Oil Palm Intelligence

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OVERVIEW

SOPI stands for Smart Oil Palm Intelligence, a software that uses remote sensing, computer vision, and artificial intelligence to allow oil palm plantation owners and managers optimize their yield performance, reduce their operational cost, and enhance their sustainability by providing accurate inventory mapping immediately from aerial orthophoto.

SOPI was built by practitioners and experts who have more than a decade of experience in remote sensing, oil palm plantations, and software developers in the field of artificial intelligence and visual machines.

1. INSTALLATION

1.1. System Requirements

SOPI is running very efficient, it does not require high-end computer specifications to perform. Low computer specification will not reduce the accuracy of the detection, but high computer specification will speed up processing time. With the following “Recommendation Configuration” the speed of the detection is approximately 1 second per hectare. Please be reminded that other programs which running at the same time when SOPI is running will cause computer resources shared and eventually could affect SOPI detection speed.

1.1.1. Minimum Configuration

- a) Operating System Windows 8
- b) Processor Intel Core 2 Duo Processor or equivalent
- c) RAM 4GB
- d) Hard Disk Drive

1.1.2. Recommendation Configuration

- a) Operating System Windows 10
- b) Processor: Intel® Core™ i7 4 cores @3.6GHz or equivalent
- c) GPU: Discrete NVIDIA or AMD GPU with 4GB VRAM
- d) RAM 16 GB
- e) NVMe Solid State Drive

For optimal performance, ensure your computer has sufficient resources, example to load a 1000-hectare digital orthophoto mosaic at 8cm Ground Sampling Distance (GSD) or a resolution of 40,000 x 40,000 pixels, approximately 6.5 GB of free space on the system drive and 6.5 GB of RAM will be required. To ensure smooth operation, it is advisable to have additional buffer on your computer beyond these requirements.

1.2. Installation and Uninstallation

1.2.1. Installing SOPI on Microsoft Windows

To install SOPI on Microsoft Windows simply run the downloaded executable file, allow it to run if the operating system asks and then follow on-screen instructions.

If another SOPI version is already installed, a new installation setup will require the old version to be removed first before continuing.

1.2.2. Uninstalling SOPI from Microsoft Windows

Open Control Panel from the Start menu, select “Programs” or “Programs and Features” then right click on “Anavision SOPI” from the list and choose “Uninstall”, then follow on-screen instructions to finish the uninstallation process.

1.3. Licensing & Activation

Before using SOPI, a token will be required to activate the software, please email us on info@anavision.com or contact our partners in your country to request it then simply enter the token provided to activate the software.

There are currently 3 types of node-locked license in SOPI software as follows:

1.3.1. Demo license

- a) The license is valid for a limited time.
- b) During the demo period specified in the demo license, there are no restrictions on the size or number of images that can be processed; it is unlimited.
- c) Cannot do export.
- d) Cannot do batch processing.
- e) An active internet connection is required for opening the software but does not require to perform any other processes.

1.3.2. Trial license

- a) The license is valid for 7 days.
- b) The total "Counting" instances is 20, considering each activation of the "Counting" button, regardless of the success or failure of the counting process.
- c) The resolution of the input image is restricted to a maximum of 3000 pixels in either width or length.
- d) Can do export.
- e) Cannot do batch Processing.
- f) An active internet connection is required for both opening the software and initiating the "Counting" process.

1.3.3. Perpetual license

- a) Perpetual license is valid indefinitely.
- b) Unlimited Image size
- c) Full Function including export and batch processing.
- d) Require internet connection to activate the license at the first time after installation.

2. PROJECT MANAGEMENT

2.1. Create a Project

Creating a Project is the first thing to do in SOPI to process an image interactively. It is very simple in SOPI and can be done by only loading an image into SOPI.

- a) Press the Create Project button.
- b) Select an image by browsing to its location from the dialog box that appears.
- c) A project file named "<image name>.tree" will be generated in the same folder as the input image.
- d) If a project file name exists, it will be replaced.

2.2. Save a Project

No need to save the project manually as it will be updated and saved automatically whenever there is a change or process to it in SOPI.

2.3. Load a Project

To open an existing project that has been created, simply click on "Load Project" button then enter or browse the project file location and "Confirm".

2.4. Close a Project

To close the currently open project simply click on the Close button.

3. RUNNING DETECTION

3.1. Counting

Counting will detect tree palm center position based on its appearance in the input image loaded into the SOPI. It will also detect canopy coverage and measure its diameter based on its input image geometry information, then calculate planting distance for each tree to the nearest detected tree next to it to provide the user the density information.

To start the counting simply press the “Counting” button after the project is loaded, the result then will be shown immediately in green circles and orange points on top of the loaded input image.

3.2. Tree Height

Tree Height is calculated by measuring the differences between Digital Surface Model (DSM) and Digital Terrain Model (DTM) provided by the user.

Click on “Height” button and browse DSM and DTM file through the dialog box that appears, then click “Confirm”.

3.3. Blank Spot

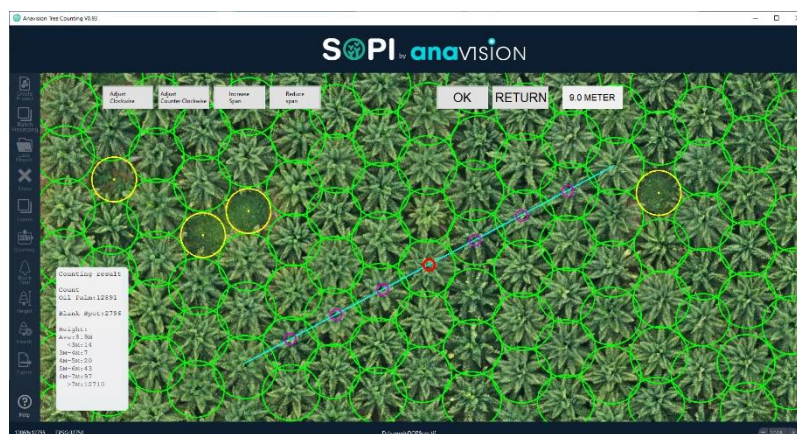
Blank spot function in SOPI automatically identifies areas within the input imagery where oil palm trees are not growing or are absent, indicating potential spots where new oil palm trees may be able to be seeded in the field.

Click on “Blank Spot” button to open the function and bring up an interactive transect line



- The circle on the line represents a location where a tree is planted.
- The spacing between circles represents the planting distance to be used in identifying blank spot locations.
- The line itself represents the direction of planting to be used in identifying blank spot locations.

The bearing direction of the transect line and the spacing between circles can be adjusted interactively by clicking and dragging a purple circle on the transect line, or by clicking on the available button accordingly. This allows for flexibility in analyzing different planting directions and control over the density of trees. After configuring the planting distance, the measured spacing between circles will be displayed in the dialog box at the top of the window, indicated in meters. Click "OK" to initiate the blank spot detection process.



4. LAYER

Click on the “Layers” button and choose which layer to be shown. Multiple layers can be shown at the same time. In the current version, there are two layers available.

- a) Tree counting
To show and hide the counting result from step [3.1 Counting](#) in the loaded project.
- b) Blank spot
To show and hide blank spots result from step [3.3 Blank Spot](#) in the loaded project.

5. EXPORT

To export detection result, click on “Export” button and enter or browse the output folder location, by default a folder named according to the project file under the same folder where the project file is located will be addressed and created to store the exporting result along with the report file.

The exported data file will consist of the following set:

- a) Tree Crown in shapefile format
Tree crown will have the following attributes:
 - i. Canopy diameter
 - ii. Planting Distance (distance from the center canopy to the nearest tree)
 - iii. Tree Height
- b) Tree Point in shapefile format
Tree points will have the same attributes as the tree crown.
- c) Blank Spot in shapefile format
- d) Report in PDF

6. BATCH PROCESS

Batch processing allows the automation of processing of large volumes of data without manual intervention, increasing efficiency and reduced unnecessary labor work.

With this function SOPI can run unlimited size of imagery using minimum computer specifications by splitting them into smaller manageable sizes.

Click on the “Batch Processing” button, browse to the location of the images that need to be processed and select them. Once selected then press “Confirm” and let the SOPI run the detection.

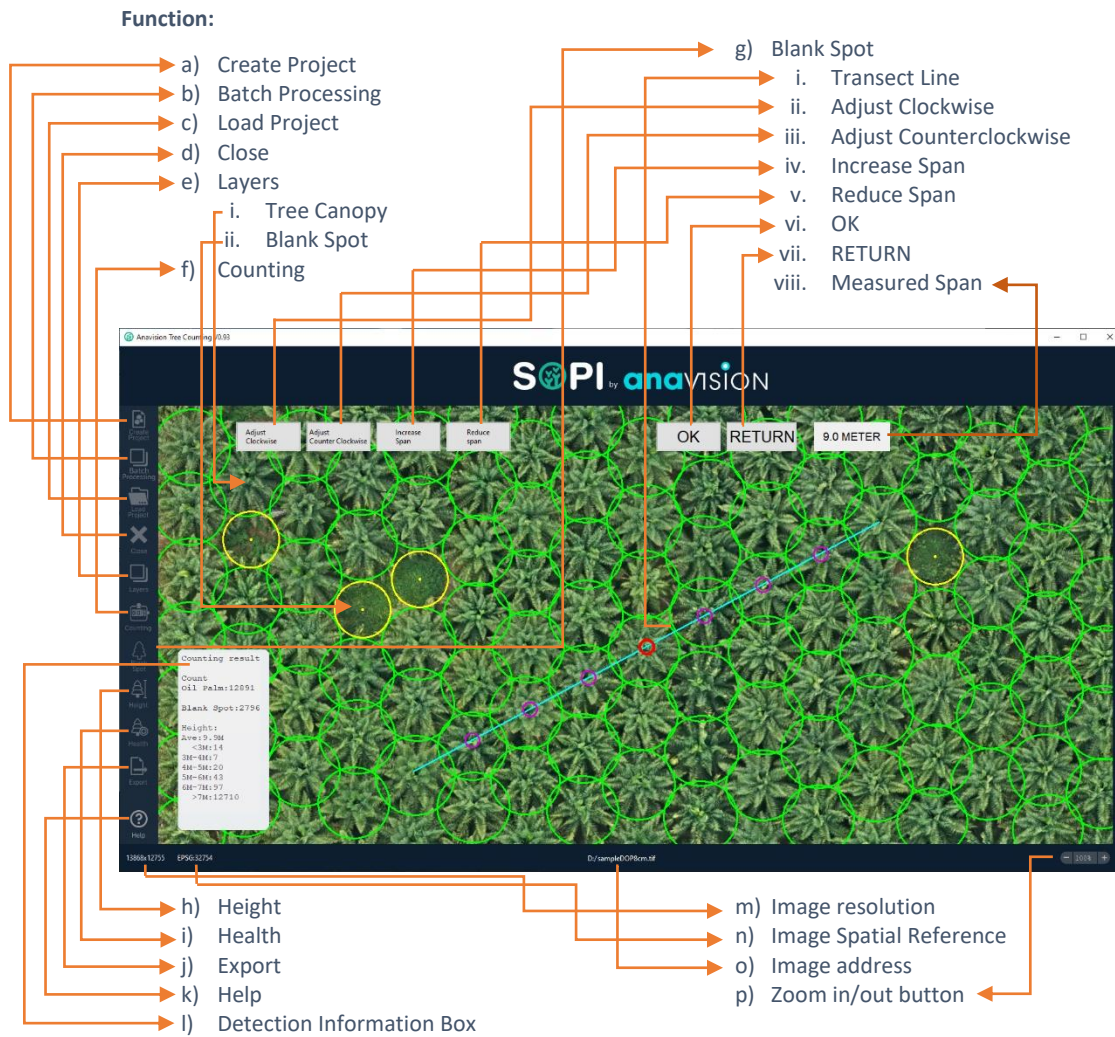
The outcomes will be automatically saved in folders named after each input image. These folders will be generated automatically within the same location as the original imagery.

7. TROUBLESHOOTING

If you need any support, please email to support@anavision.com and provide some details including:

- a) Account information (Company/organization name, licensing)
- b) Problem description
- c) Error messages if any
- d) Steps to Reproduce
- e) Troubleshooting Steps Taken
- f) Related log(s) (C:\Users\- g) Software version
- h) Hardware Information
- i) Input photo information (Size in resolution, pixel size, CRS, Bit, number of bands, etc.)

APPENDIX A GRAPHICAL USER INTERFACE



APPENDIX B SUPPORTED FORMATS

Compressed imagery will reduce object detail from the images, depending on how much the compression applied on the imagery, it will affect the detection results, although at a certain level the results will not be too bad especially on mature oil palm trees, a good quality imagery at its original quality still highly recommended for use rather than imagery that has been compressed.

Input Imagery format:

- I. File format: Geotiff (*.tiff), BIGTiff supported.
- II. RGB 24bit
- III. Coordinate Reference System (CRS): Any CRS with Planar metric in meter
- IV. Ground sampling distance: to get the best result, it is recommended to use 7-9cm GSD.

Input Elevation Model format:

- I. File format: Geotiff (*.tiff), BIGTiff supported.
- II. Floating 32bit
- III. Coordinate Reference System (CRS): Any CRS with Planar metric in meter
- IV. Any Spatial resolution is supported.

Export format:

- I. Shapefile (*.shp)
- II. PDF (*.pdf)