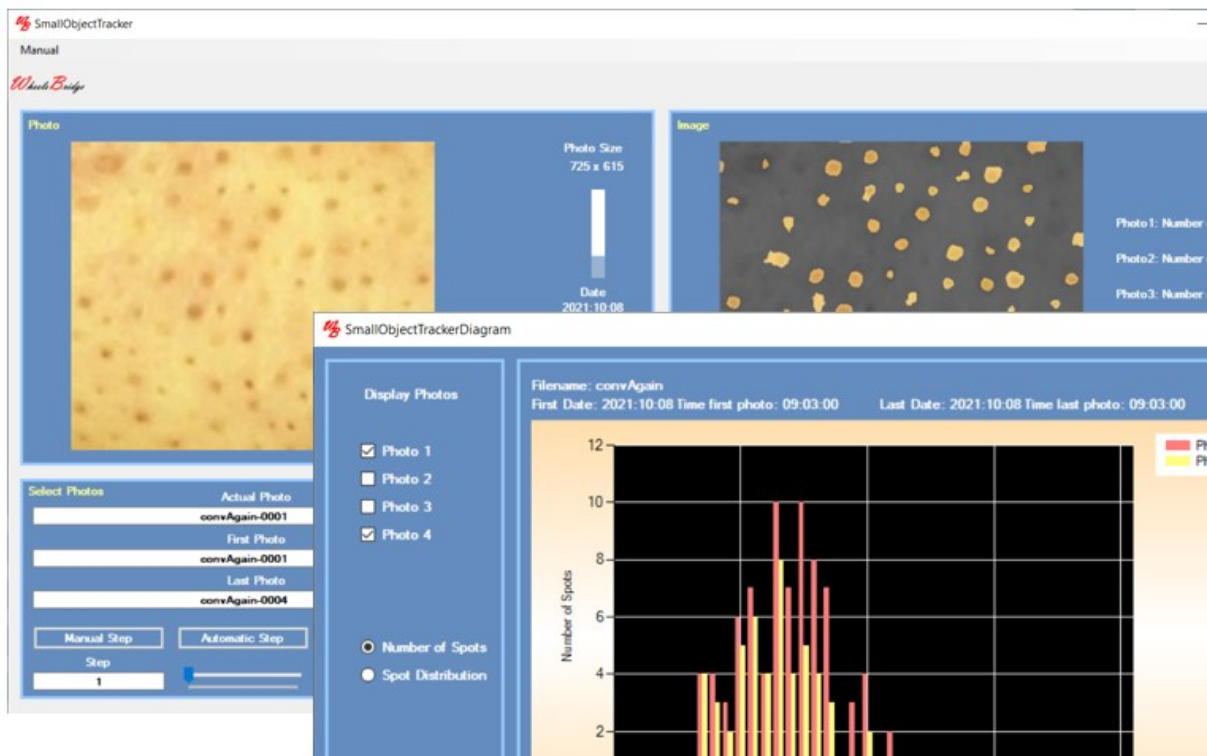




# Wheels Bridge



## Small Objects Tracker TiVi202 User Manual

User Manual 1.0  
Version 1.0  
November 2021

PIONEERS IN TISSUE VIABILITY IMAGING

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*Dear Valued Customer!*

*Welcome to the WheelsBridge TiVi202 Small Objects Tracker extension intended for automatic analysis of small skin spots. The TiVi202 Small Objects Tracker was designed for observer-independent analysis of especially blackhead and whitehead skin spots.*

*The WheelsBridge Small skin spots TiVi202 Small Objects Tracker utilizes a highly sensitive digital camera equipped with polarization filters making it possible to suppress surface reflections from the skin. The versatile system software allows for rapid and easy capturing and analysis of images. Among the many useful features of the TiVi202 Small Objects Tracker software the following are of particular interest:*

- *Automatic capturing of photos.*
- *Automatic tracking of blackhead or whitehead spots in up to 6 photos.*
- *Minimum and maximum spot sizes are set by the Users.*
- *The result of the analysis process is displayed as spot size distribution for individual photos or as the density of spots in a stack of photos.*
- *All results can be exported to ASCII-format spreadsheet diagrams or printed and saved as a pdf-document.*

*We are convinced that the TiVi202 Small Objects Tracker will be a productive tool in the assessment and follow-up of blackhead and whitehead skin spots.*

*Thank you for choosing the WheelsBridge TiVi202 Small Objects Tracker.*

*WheelsBridge AB*

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## 1. INTRODUCTION

Blackhead and whitehead spots are blocked sweat/sebaceous ducts of the skin also known as *comedos*. Blackheads can be removed with commercially available pore-cleansing strips or by more advanced procedures used by dermatologists.

Blackheads and whiteheads can also be removed by squeezing them, but this procedure can also damage the skin by increasing the risk of causing or transmitting infection and scarring, as well as creating an infection deeper in the skin. *Comedo* extractors are frequently used in beauty salons and by dermatologists, usually after using steam or warm water.

The *TiVi202 Small Objects Tracker* makes it possible to automatically track the density and distribution of blackhead and whitehead skin spots and thereby objectively validating a treatment procedure.

The intended use of the *TiVi202 Small Objects Tracker* is to analyse blackhead and whitehead skin spots in experimental and research applications. It is not yet approved for the diagnosis and treatment of disease.

## 2. OPERATING PRINCIPLE

After uploading a sequence of photos, selecting either *Track Dark Spots* or *Track Bright Spots* and optionally drawing a region of interest and clicking the *Show ROI* button, a map of detected spots is displayed in the *Image* panel. When clicking the *Automatic Step* button, the photos in the sequence are successively uploaded and the associated spot maps and the actual number of spots for each image are calculated and displayed. When the *Diagram* button is clicked the *Small Objects Tracker Diagram* window is displayed showing the *Number of Spots* versus *Spot Size* for each image. By clicking the *Spot Distribution* radio-button, the *Number of Spots* versus *Photo Number* is displayed in the diagram. The data sets behind these curves can be exported to a spreadsheet by clicking the *Export Data* button.

The process of selecting candidate spots for being accepted as spots is based on the following criteria:

1. The spot width and height as defined by a rectangle enclosing the actual spot as set by the *Spot Min Size* and *Spot Max Size* sliders and visualized by clicking the *Show Spot Size* button.
2. The aspect ratio (width to height) of this rectangle is larger than 0.8 and smaller than 1.2.
3. The area of the spot divided by the area of this rectangle is greater than the set Symmetry factor (between 5% and 80%).

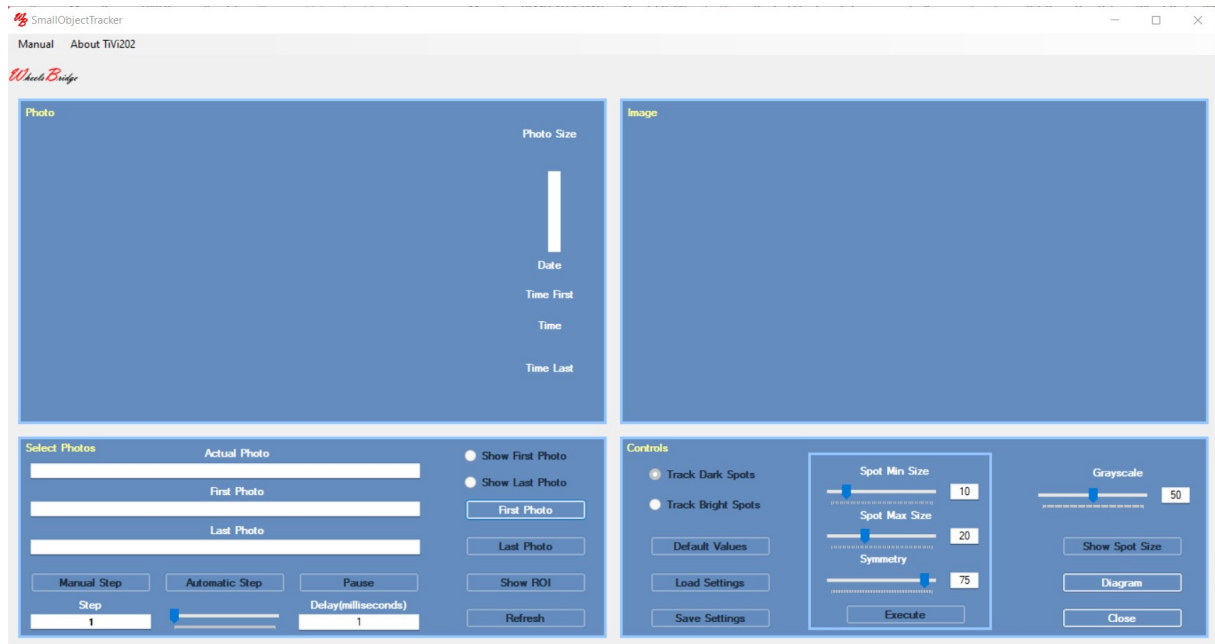
## 3. GETTING STARTED

The basic features of the *TiVi202 Small Objects Tracker* are probably best explained by way of an example. In the following example it is assumed that the photos *Blackhead-0001* to

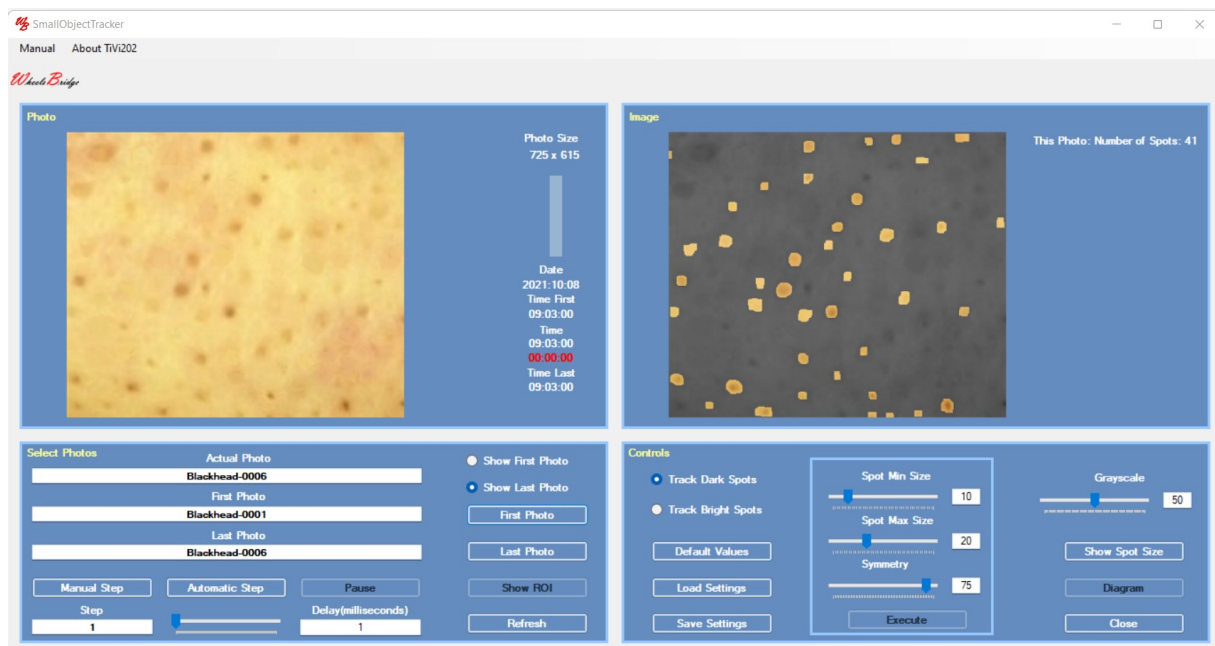
## TIVI202 SMALL OBJECTS TRACKER

*Blackhead-0006* have been captured by a TiVi camera system and stored in the *TiVi202 demonstration* folder. These photos display blackhead spots on the tip of the nose.

1. Open the *Small Objects Tracker* extension from the **Extension** pull-down menu in the *TiVi700 2.0* window.



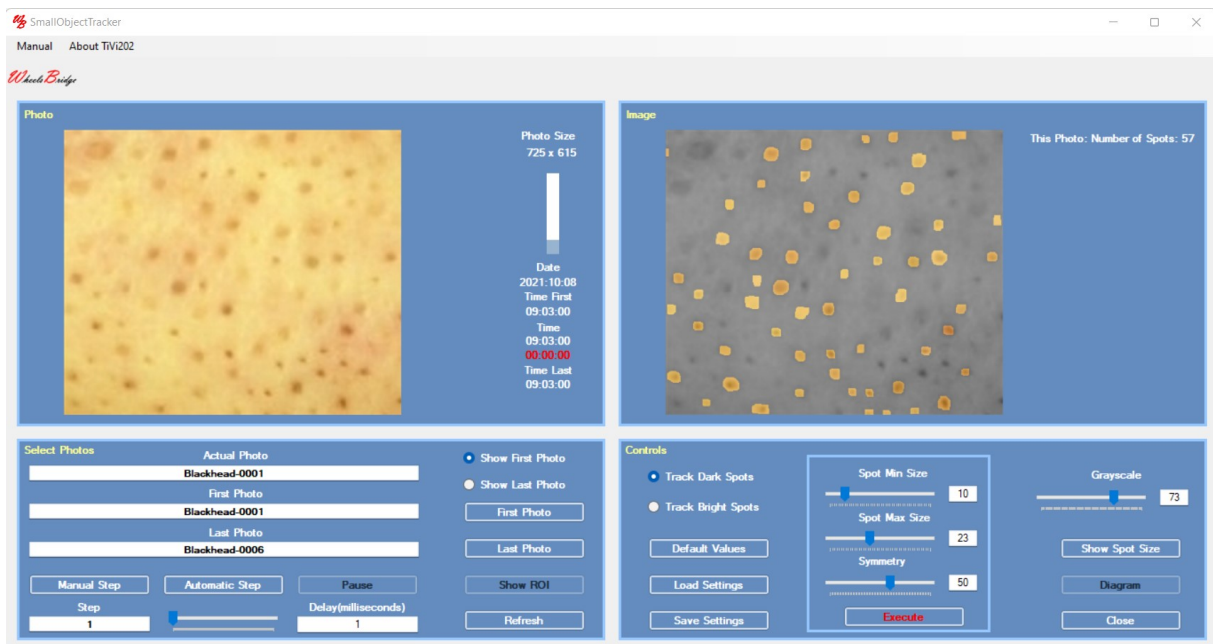
2. Click the **First Photo** button and navigate to the *TiVi202 demonstration* folder. Double-click the *Blackhead-0001.jpg* file.



- The window displays the photo in the **Photo panel** and the corresponding Spot-map in the **Image panel** for the last photo in the sequence. Click the **Show First Photo** radio-button.



- Drag the **Spot Max Size** slider to the right to set the maximum spot size to 23 and then drag the **Grayscale** slider to display 73. Set **Symmetry** to 50. Click the **Execute** radio-button to implement the changes in spot size.

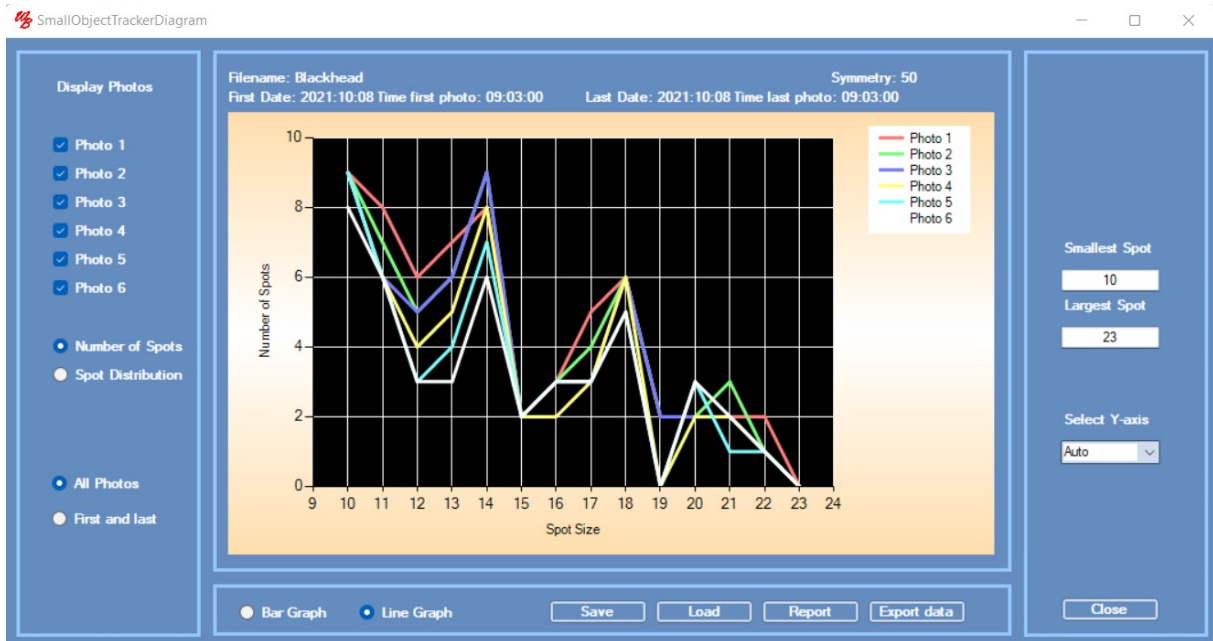


- Click the **Automatic Step** button to scan through the four photos and calculate the associated spot images. The number of spots for each image are displayed in the **Image**





**panel.** Click the **Diagram** button to open the *TiVi202 Small Objects Tracker Diagram* window.

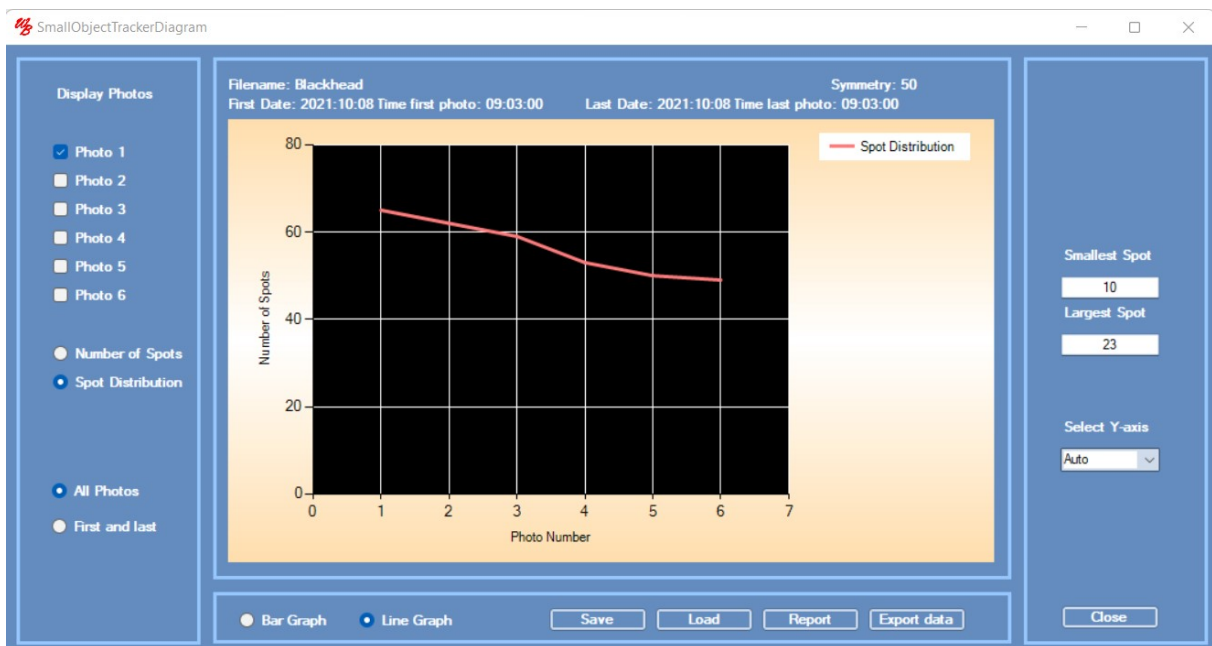


6. Deselect and select photos in the **Display Photos** panel to display only the curves corresponding the checked photos.



7. Click the **Spot Distribution** radio-button to display the spot distribution.

## TIVI202 SMALL OBJECTS TRACKER



8. Click the **Number of Spots** radio-button and check the **Photo1** and **Photo2** checkboxes.



9. Click the **First and Last** radio-button to display the number of spots corresponding the the last and first image in the sequenec.





## TIVI202 SMALL OBJECTS TRACKER

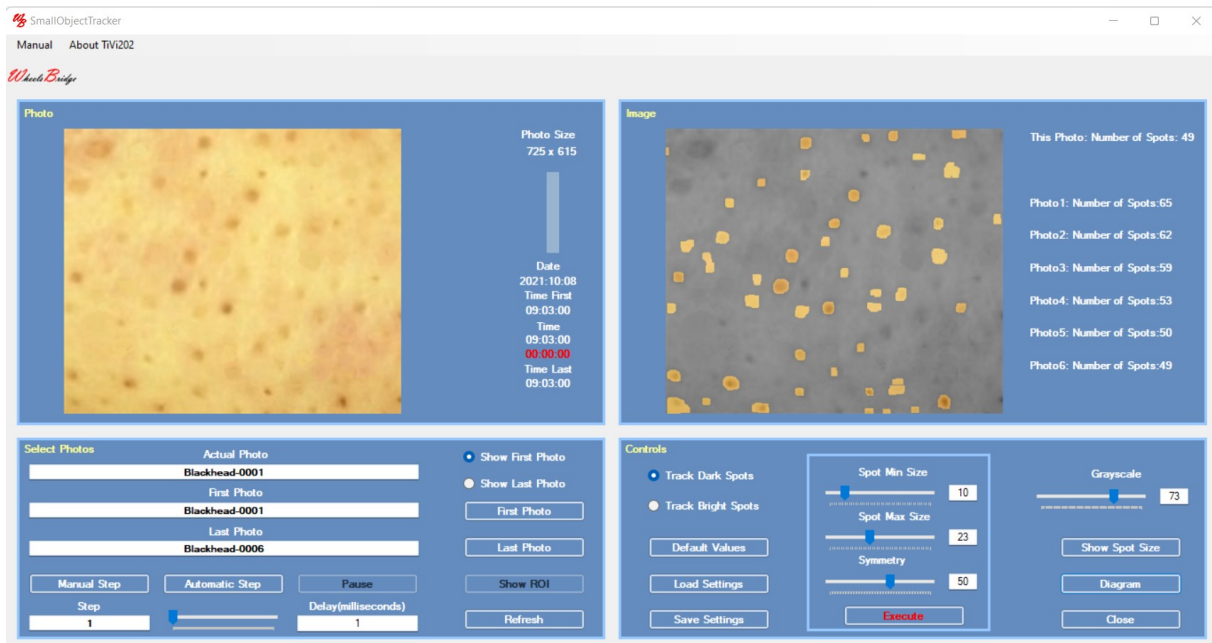


12. Click the **Report** button to generate a printable report and the **Export Data** button to export data to a spreadsheet.

13. This completes the **GETTING STARTED** section.

## 4. DETAILED DESCRIPTION

### *The TiVi202 Small Spots Tracker window*



### Photo Panel

1. **Photo** – displays the photo.
2. **Photo size** – displays the size (in pixels) of the photo .
3. **Drawing a ROI in the photo** – use this option to draw a ROI (Region of Interest) in the photo. This ROI is displayed when the **Show ROI button** is clicked.
4. **The vertical bar** – to display the relative number of the photo displayed.
5. **Time & Date** – displays the time and date at which the displayed photo was captured

### Image Panel

1. **Image** – displays the spot map superimposed on the gray-scale version of the photo.
2. **Photo: Number of Spots** – shows the number of spots detected in the photos with the set minimum and maximum size limits.

## Select Photo Panel

1. **Show First Photo button** – to display the first photo in a sequence.
2. **Show Last Photo button** – to display the last photo in a sequence.
3. **First Photo button** – to select the first photo to be displayed from file.
4. **Last Photo button** – to select the last photo to be displayed from file.
5. **Show ROI** – to display the drawn ROI.
6. **Step edit box** – to select the step in the photo sequence to be displayed (default value = 1).
7. **Actual Photo text box** – displays the name of the actual photo. To select a specific photo in a sequence, insert its name and click the **Enter** button on the keyboard.
8. **First Photo text box** – displays the name of the first photo in the sequence.
9. **Last Photo text box** – displays the name of the last photo in the sequence.
10. **Manual Step button** – to manually step through the photos in the sequence.
11. **Automatic Step** - to step through the photo sequence automatically.
12. **Pause** – to temporarily halt the automatic step through process.
13. **Delay slider** – to set the delay time between displaying successive photos at automatic step through.
14. **Refresh** – to restore to default values.

## Controls Panel

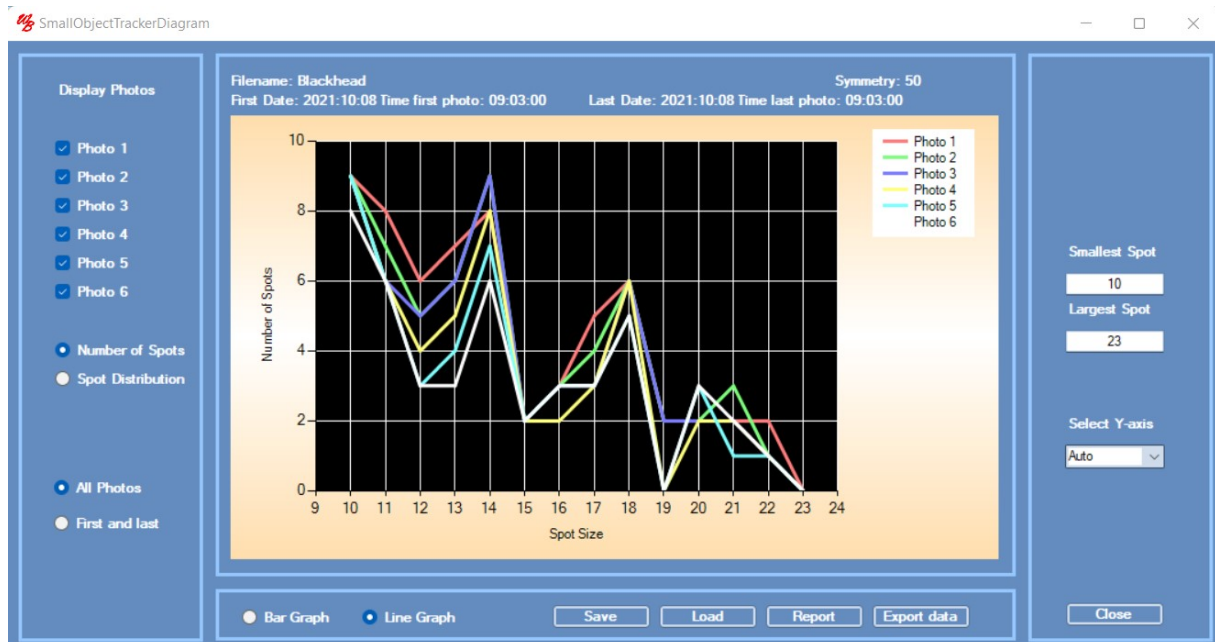
1. **Track Dark Spots radio-button** – to track dark spots (blackhead spots).
2. **Track Bright Spots radio-button** – to track bright spots (whitehead spots):
3. **Load Settings** – to load stored parameter values (min and max size and darkness).
4. **Save Settings** – to save parameter values (min and max size and darkness).
5. **Spot Min Size slider** – to set the minimum size of detected spots.

6. **Spot Min Size textbox** - to set the minimum size of detected spots.
7. **Spot Max Size slider** – to set the maximum size of detected spots.
8. **Spot Max Size textbox** - to set the maximum size of detected spots.
9. **Symmetry slider** – to set the symmetry parameter. A low value accepts also irregular shapes of the spot, while a higher value accepts only spots that are round, elliptical, quadartic or rectangular in shape.
10. **Symmetry textbox** – to set the symmetry parameter.
11. **Execute button** – to execute new spot min and max size settings.
12. **Grayscale slider** – to set the gray tone of the background photo.
13. **Grayscale text box** - to set the gray tone of the background photo.
14. **ShowSpot Size button** – to display rectangles corresponding to the smallest (red) and largest (green) spot size.
15. **Diagram** – to open the *TiVi202 Small Objects Tracker Diagram* window.
16. **Close** – to close this window.

### **Pull-down menus**

1. **Manual** – to open the on-line *TiVi202 Small Objects Tracker* manual.
2. **About** – about the *TiVi202 Small Objects Tracker*.

**The TiVi202 Small Spots Tracker Diagram window**



1. **Photo1 – Photo 6 checkboxes** – to display or hide the photo *Number of Spots* curves.
2. **Number of Spots radio-button** – to display *Number of Spots* versus *Spot Size*.
3. **Spot Distribution radio-button** – to display *Number of Spots* versus *Photo Number*.
4. **All Photos radio-button** – to display all photos selected.
5. **First and Last radio-button** – to display the first and last photo curves.
6. **Bar Graph radio-button** – to display data as bar graphs.
7. **Line Graph radio-button** – to display data as line graphs.
8. **Save button** – to save the current diagram.
9. **Load button** – to load a saved diagram.
10. **Report** – to generate a printable report in pdf-format.
11. **Export Data** – to export data to a generated spreadsheet.
12. **Smallest Spot** – to set the size of the smallest spot displayed.
13. **Largest Spot** – to set the size of the largest spot displayed.



**14. Close** – to close the current window.