How to use WinStarFinder v0.1.2b

Preface

WinStarFinder needs not be installed. You only have to extract the zip file and to copy all files into one folder. Start the program with WINSTARFINDER.EXE. WinStarFinder may be operated directly from CD.

WinStarFinder uses the DLL files libCint.dll, libCore.dll and libMinuit.dll witch are part of the root software package (http://root.cern.ch). For additional information on root an its copyright see below.

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1. Introduction

WinStarFinder as a Win32 application to create CMDs from ST6 Image files. It was created for the Astronomy Team of the Kopernikus-Gymnasium in D-57537 Wissen. WinStarFinder is Freeware. Feel free to copy and use it as you like to.

2. How to create a CMD

2.1 Common procedure

The following step-by-step instructions should enable you to create a CMD from two ST6 images taken in blue (B) and green (V for visual).

First WinStarFinder needs a blue and a green image oft the investigated cluster. Therefor press File -> Open Blue/Green image to open a blue (B) and a Green (V) flatfield corrected ST6 image. Such mages for eight different open galactic star clusters may be found at http://www.sternwarte-betzdorf.de/profhd/index.html#data or in the folder „B-V-R-Bilder flatted“. All thes images are corrected concerning dark

subtract and flatfield. For example take M36-B01.ST6 and M36-V01.ST6. Note that the images must be in ST6 uncompressed format.

Then adjust the background for each B and V image by using the text fields below the images or by adjusting the track bar besides the text fields. Note that two overlapping stars are useless for further evaluation of the data. Therefore, don't let too many stars overlap each other.
If the Cluster covers only a part of the image be sure to select that region by dragging a rectangle around that region from the upper-left corner to the lower-right corner in the blue image to reduce the number of field stars in the CMD.

Now press the two "find stars" and the "compare pictures" button! WinStarFinder then will calculate the numbers N_B (blue) and N_V (visual/green) of electrons in the pixels concerning the same star as an admeasurement for the B and V magnitudes of the stars.

You can select a star by clicking on it in either image. The star will then be highlighted in the list view at the bottom of the window.

Double-click on the highlighted line to access the star-properties-window. There you can select the star to be a calibration-star and specify the V and B-V values taken from an extern catalogue[2)]. Also you can check the "ignore star"-box to tell WinStarFinder not to display the star in the CMD. You should do so for all overlapping stars.

Mark at least three stars as calibration-stars and specify the V and B-V values although we recommend about five calibration-stars for a serious evaluation. In addition, mind to use a calibration-star at both extremes of the magnitude-spreading in the cluster.

Then press the "calculate magnitudes" button! After this step you can additionally take a look at the calibration-stars and the calibration curve by checking the "view calibration" box beneath the images. You can click on one of the green dots representing the calibration-stars to select the particular star. This feature is handy too remove calibration-stars which have a strong deviation. If you do so be sure to press the "calculate magnitudes" button afterwards.

Now WinStarFinder is able to calculate the final apparent B and V magnitudes of the considered stars by means of the number N_B and N_V and of the calibration function.

Now you can save the finished CMD by pressing File -> Save.... In the Save as... Dialog you can select to save the CMD as a monochrome or a colour bitmap file or, by default, save only the V and B-V data in an Html-chart. Use the File-Type field to select the type of output.

2.2 Specifics at star clusters containing stars with great differences in brightness

If there are very bright and very faint stars in one single pair of B resp. V images it causes difficulties in quantitative interpretation. Exposure times, that are good for bright stars, are not enough to display fainter stars with a good signal to noise ratio. Exposure times, that are good for faint stars, make “overflow” the pixels for bright

stars. Then there will occur brightness values much greater than 65536[1)]. WinStarFinder will regard all these values to be exactly 65536.

For corrective construct two fifferent CMDs, one for a pair of short exposured B and V images, and another for a pair of long exposured images. In the folder „B-V-R-Bilder flatted“ for each star cluster and for each colour B and V you will find two images. The first (file name ends with “…01”) has a short, the second (file name ends with “…02”) a longer exposure time.

The CMD constructed out of the images with short exposure times gives athentic information of the upper part of the CMD, that concerns stars with smaller V magnitdes. The CMD from the images with longer exposure times is suitable for the lower part of the CMD for stars with greater V magnitudes. With an image processing software you can combine the suitabe parts of both CMDs.

3. Functions reference

3.1 WinStarFinder main window

Below each image you find two trackbars, the upper to adjust the range of the image, the lower to adjust the background. Note:T the range value only affects how the image is displayed in WinStarFinder, not the creation of the CMD.

The text field below the trackbars can also be used to adjust the background value. Valid entries are from 0 to 65535.

Beside the text fields you find "Display calibrate curve" checkboxes. These checkboxes can be set after specifying at least one calibration star to view the stars entered magnitude in dependence on the logarithm of the cummulated brightness of the stars pixels. If WinStarFinder has allready calculated the magnitudes of all stars the calibration curve is also displayed.

You can use the "Reset selection" button to deselect the whole image.

The checkboxes Custom colours can be used to use the colours defined in the Colour configuration dialog.

The Auto update checkboxes make the images update with the frequency defined in the text field below.

The Search stars buttons make WinStarFinder search the pictures for stars.

The Compare images button makes WinStarFinder compare the images and find corresponding stars in both the B and V images.

After you have searched the images for stars you can click on a row in the list at the bottom of the window or a star in one of the images to select a star.

After you have Compared the images you can double click on a row in the listview to set the star's properties.

3.2 The „Configuration -> display“ menu

The checkboxes Custom colours can be used to use the colours defined in the Colour configuration dialog.

The Auto update checkboxes make the images update with the frequency defined in the text field below.

You can check the Complex output checkbox to gain more information in the Html file WinStarFinder saves.

The Draw calibration stars option lets the calibration stars appear green in WinStarFinder.

Check Thick stars in CMD bitmap to make the stars in the Bitmap files WinStarFinder saves displayed as small crosses with five pixels each.

The Deselect button deselects any selected star.

3.3 The “configuration->algorithm” menu

The Subtract background option witch is checked by default lets WinStarFinder subtract the background for each pixel assigned to a star.

The Manually option in the Images move field enables a checkbox and three buttons in the main window to shift the images against each other manually.

The Rotation images checkbox enables an algorithm witch rotates the images against each other to find more corresponding stars. However if you enable this option you have to select three corresponding stars manually after pressing the Compare images button by selecting the star in the blue and the green image and pressing the appearing Set 1 / 2 / 3 buttons.

With the option Backgrnd. autom. enabled WinStarFinder will try to detect the optimal background for the images. This feature however is very buggy and consumes a lot of time.

The Hot pixel text field sets the minimum brightness of a pixel to be identified as a hot pixel by WinStarFinder. WinStarFinder will mark stars with hot pixels in the Html output file and the 16 colour Bitmap CMD with red colour.

Pixels per star sets the minimum amount of pixels for a star to be drawn red in the output files as well.

3.4 The configuration->colors” menu

In this tab you can control a number of colors used by WinStarFinder to display the images.

4. Contact

Updates of WinStarFinder and this document are available at:
www.sternwarte-betzdorf.de/profhd/index.html
You can send mail regarding WinStarFinder to "der.fabe@gmx.net".

5. Additions

1) The ST6 is a cooled 16 bit camera. Therefor the range of brightness for each pixel is from 0 to 65535.

2) Getting the properties of calibration stars form the Webda-Database:
   Chose: obswww.unige.ch/webda
   -> navigation (left hand side) -> galactic open star clusters
   -> cluster selection on names (right hand side, 2. line)
….-> Insert the cluster name (e.g.: NGC 2632) in the textbox
….-> Press the button: „submit querry“
….-> Click on the name of the cluster (blue) in the table on the left
….-> At “Query” (scroll doen a little bit!): click on „From cluster chart (plotted)“
   There will appear a (negative) image of the star cluster
   -> Click on a star in this image, at the right at “Basic Data” you will find V and (B-V)-Values