Method to obtain the coordinates to be aim from an optimized field of selected standards

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A simple method is presented to obtain the coordinates to be set with the Jorge Sahade (TJS), Helen Sawyer Hogg (THSH) and Solaris-4 (TS-4) telescopes, for which photometric standards selected from a wide field of Landolt (1992, 2007, 2009), or from a field with Sloan Photometric System (SDSS) standards (Smith et al., 2002), are contained within the limits of the CCD to be used.

I will explain the procedure using as an example the Landolt SA95 field, which contains 44 standards distributed in approximately 1 square degree. Since the fields of the direct images acquired by the TJS, the THSH or the TS-4 are much smaller, the observer will have to select at his discretion a group of standards from that large field, optimizing to the maximum the field of the CCD that he will use.

To do this, recreate the Landolt fields by downloading digitized images from the database of The STScI Digitized Sky Survey (field.fit), and for each one of them create a template to load in the SAOImageDS9 (field.reg), where they are all stars numbered by Landolt for both the UBVRI Photometric Standard Stars in the Magnitude Range 11.5 <V <16.0 Around the Celestial Equator (Landolt, 1992) -and introducing its improvements made in 2009 (Landolt, 2009) - (526 stars in 86 fields), as well as for the UBVRI Photometric Standard Stars around the Sky at -50 ° Declination (Landolt, 2007) (109 stars in 34 fields).

The same was done for the standards of the Sloan Photometric System (u ′ g ′ r ′ i ′ z ′) by digitizing fields that contained at least two standards from the Smith et al. 2002 work, The u ′ g ′ r ′ i ′ z ′ Standard Star System (158 standards, 73 of them grouped into 20 fields). Isolated standards are not included in any field.

In the following link are the folders **Landolt Celestial Equator Standard Stars**, **Landolt Around -50deg Standard Stars**, and **Sloan Digital Sky Service Standard Stars**, which in turn contain the subfolders of each digitized field with their identified stars, and their respective tables: **Landolt Celestial Equator Standard Stars Table-LuisM.pdf**, **Landolt Around -50deg Standard Stars Table-LuisM.pdf** and **Smith Sloan Digital Sky Service Standard Stars-LuisM.pdf** (only standards grouped in fields) and **Complete Smith Sloan Digital Sky Service Standard Stars-LuisM.pdf** (containing all the Sloan's standards -Smith (2002)-):

[Standards fields (UBVRI) and (*u′ g′ r′ i′ z′*) digitized with their identified stars and tables](#)

Thus, for example, within the folder **Landolt Around -50deg Standard Stars**, you will find, for example, the subfolder **WD 0830-535**, and within this, the files **WD_0830-535.fit** and **WD_0830-535.reg**, which are respectively, the digitized Landolt WD 0830-535 standards field and its corresponding file of regions with the standards numbered according to their author, ready to be loaded with the SAOImageDS9 once the image has been displayed in it.

Suppose then that we want to observe some Landolt standards of the SA95 field with the TJS, with the Roper CCD with Focal Reducer (RF), and let's see step by step how to proceed to choose from it, at the observer's discretion, a group of standards optimizing to the maximum the surface offered by that CCD:

STEP 1: Once we have decided which field will be observed, we download it from the corresponding folder. In our example, from the SA95 subfolder found in the Landolt Celestial Equator Standard Stars folder, we downloaded the files SA95.fit and SA95.reg.

STEP 2: With SAOImageDS9 we open the SA95.fit image and once it is displayed, we load the SA95.reg template by doing: Region → Load regions (in ds9 Format) (Fig. 1):
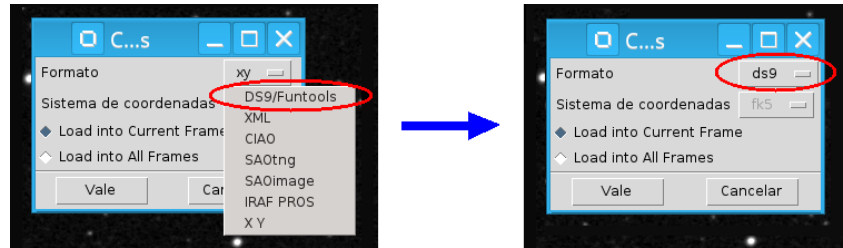

Fig. 1. This is the window that SAOImageDS9 opens, when we load a region. We must set "Format ds9".

We will see the unfolded image of the field SA95 of Landolt, with its 44 numbered stars, and in dotted line, the contours of the fields of the CCD Roper (with and without RF) of the TJS, and of the CCD Sbig STL1001E of the THSH (Fig. 2)
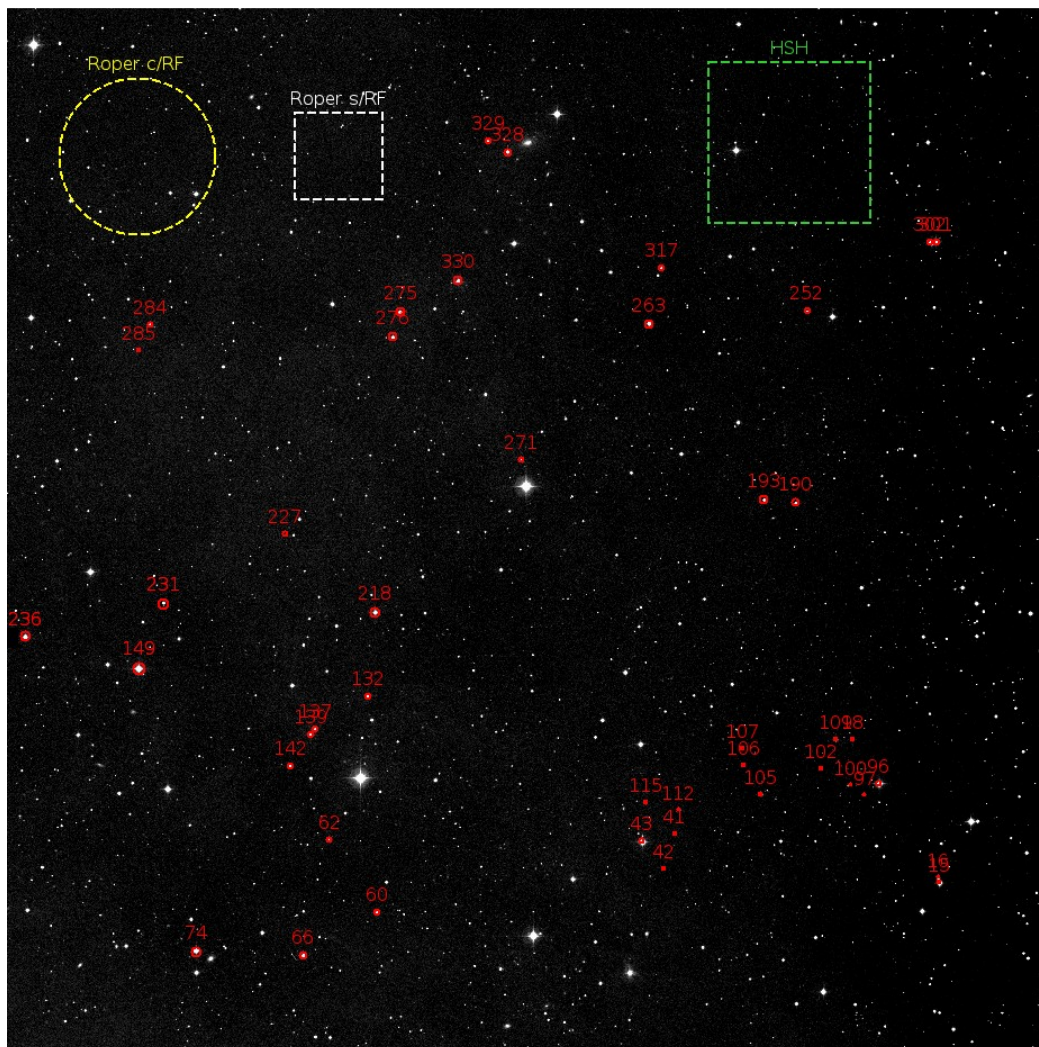

Fig. 2. Digitized image of the Landolt SA95 field, with the SA95.reg region loaded.

An advantage that can be seen with the naked eye is that, unlike the letters in Landolt's works where it is sometimes difficult to identify some stars, in these digitized images we can zoom in with the mouse wheel, and see each standard clearly.

STEP 3: As we want to observe with the Roper CCD of the TJS with RF, with a single click with the left mouse button inside the yellow circle (Fig. 2) (because we observe with the Roper c / RF), we select it. Then we capture it and drag it with another click without releasing the left button, until we take it to the region of the field that is desired.
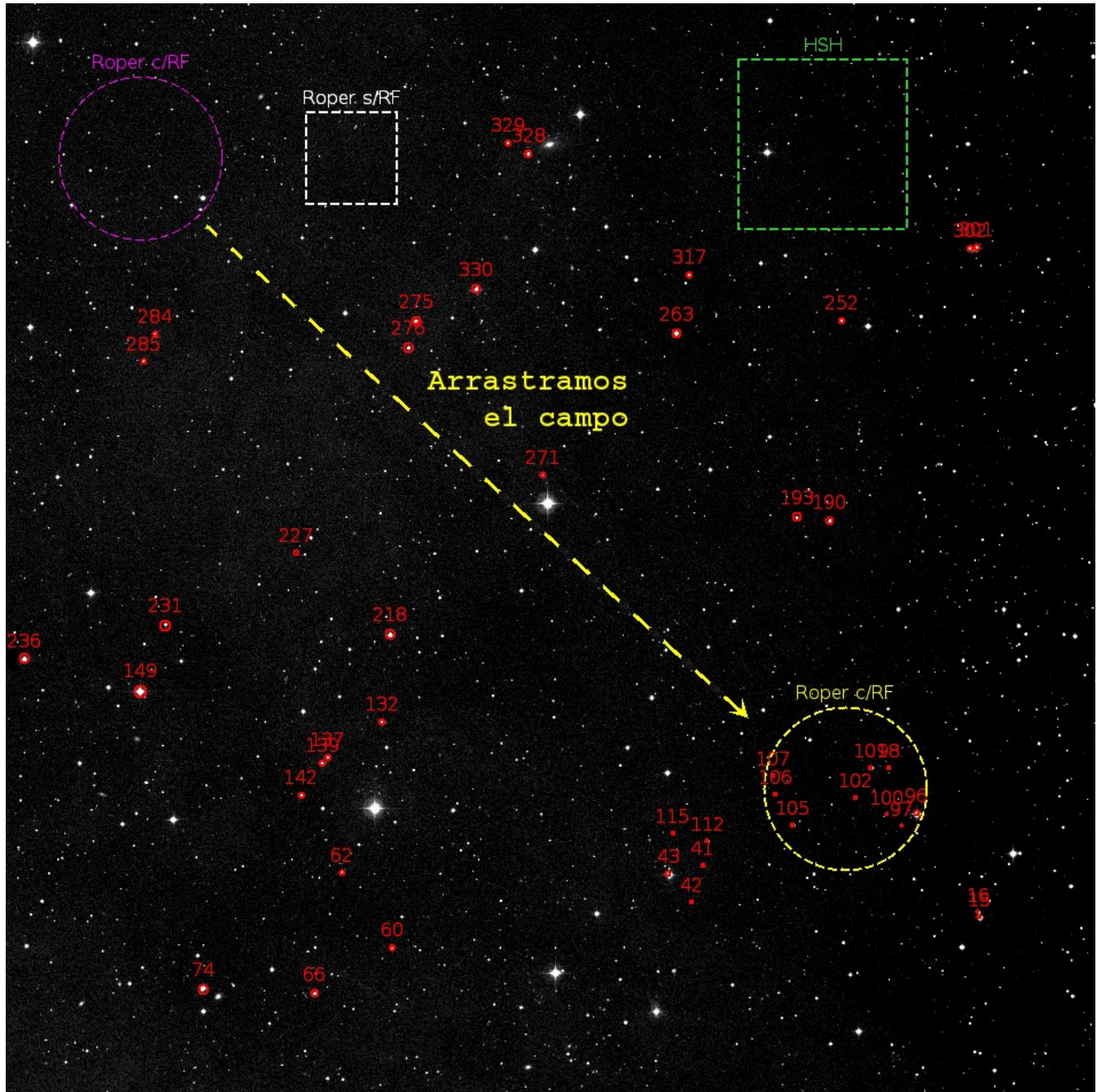

Fig. 3. New location of the RF Roper field in the digitized field, containing the selected standards.

STEP 4: We center the yellow field of the Roper in the group of selected standards, optimizing its surface to the maximum. If the yellow circle is clicked - we will know it because four points will be differentiated at the ends (see them in Fig. 5) -, it can be moved more precisely on the image with the keyboard arrows.
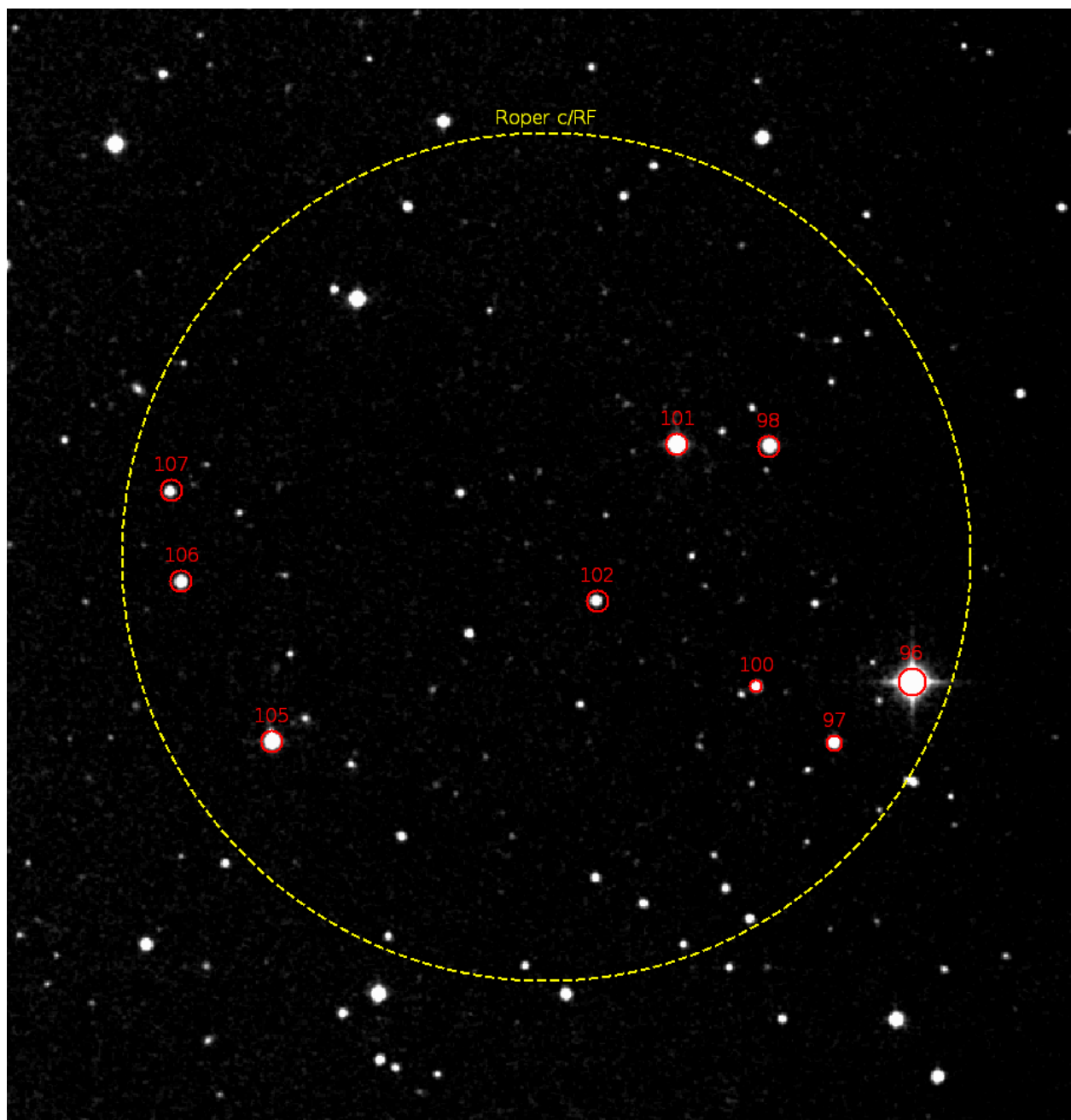

Fig. 4. Fine positioning of the Roper field optimizing its dimensions in the image, as it will be seen in the image that we will acquire with the TJS.

STEP 5: Finally, just by double-clicking inside the yellow field of the Roper CCD, the SAOImageDS9 will display a window with the coordinates of its center, which are none other than the coordinates that we must enter into the telescope to see our selection.
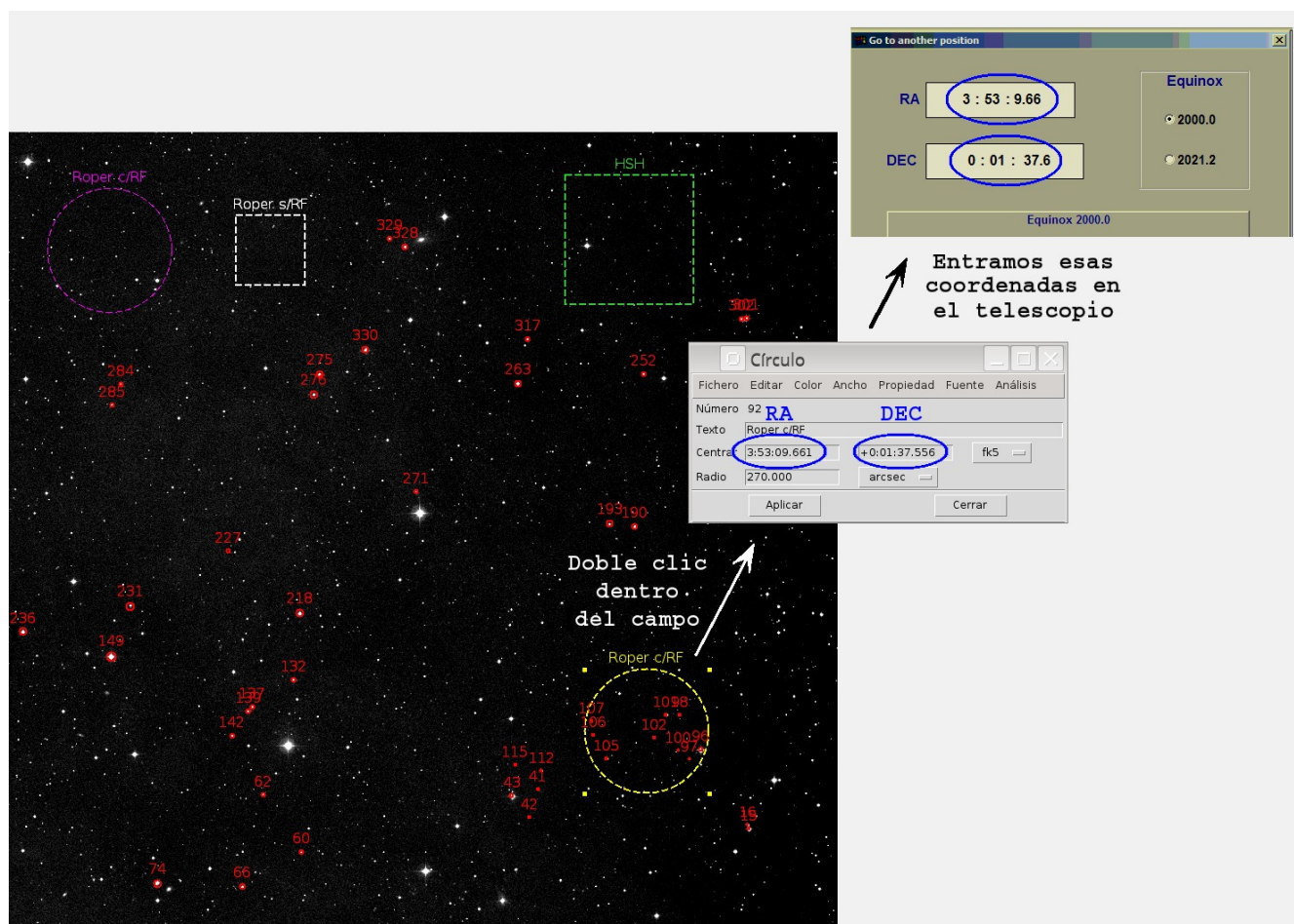
Fig. 5. Window that SAOImageDS9 displays when we double click inside the Roper field, and which are the ones that we have to enter into the program that manages the telescope to achieve our objective.

Bibliography

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