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**Fundamental Research to Improve Understanding of the Accuracy,
Reliability, and Measurement Validity of Forensic Science Disciplines**

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***Improving the Understanding and the Reliability of the Concept of
"Sufficiency" in Friction ridge Examination***

User Instructions for PiAnoS 4

PiAnoS Release 4.0, <https://ips-labs.unil.ch/apps/pianos4-nij/>

User Instructions Version 1.2 / CC / May 28th, 2012

Table of Contents

1	Just after logging in	3
1.1	Compatibility check with your browser	3
1.2	Initial survey.....	4
1.3	List of cases	6
2	The Case Window in PiAnoS	7
3	Saving, Submitting and Undo.....	9
4	Analysis Phase.....	10
4.1	Quality tool (Q)	10
4.2	A few tips to annotate quality	12
4.3	Minutiae Tool (M).....	13
4.4	Ridge tracing tool (R).....	15
4.5	Other features annotation tool (O)	17
4.6	Case notes and conclusion associated with the analysis phase.....	18
5	Comparison phase.....	20
5.1	Binding both views	20
5.2	Annotation of matching minutiae.....	20
5.3	Annotation of “non matching” minutiae	22
5.4	Pairing of matching minutiae (P).....	24
5.5	Case notes and conclusion of the comparison phase	26

1 Just after logging in

1.1 Compatibility check with your Web browser

PiAnos4 is coded in HTML5, SVG+Javascript. It requires no plugins to run. Normally all modern browsers can run PiAnoS4 smoothly (regardless of the operating system) using only stock browser functionalities. However, it may be incompatible with some old browsers (such as, for example, Internet Explorer 6, 7 or 8 under Windows XP). Once you are logged in, PiAnoS4 will hence automatically check whether your browser is compatible and if needed provide you with option to cope with some incompatibility.

The following screen is displayed when no incompatibility has been detected (Figure 1)

The screenshot displays a web interface for a browser compatibility check. It is divided into three main sections by horizontal bars. The first section, titled 'Welcome !', contains a message to the participant, a thank you note, a statement about the need for a compatible browser, and a closing message from the project team. The second section, titled 'Browser compatibility check', contains two items: '1. Javascript:' with a green bar indicating 'Enabled !', and '2. Is browser compatible ?' with a green bar indicating 'Yes !'. The third section, titled 'Next step', contains a message stating 'All tests passed, you are ready to go !', a recommendation to switch to Firefox 4+ if problems occur, and a button labeled 'Start the study !'.

Welcome !

Dear participant,

Thank you for participating in this study. You will be using PiAnoS, a fingerprint examiner annotation tool. PiAnoS is entirely web-based, and runs inside your browser.

To make sure you get the best possible experience, we need to check that your browser is able to run PiAnoS. If the tests fail, a course of actions will be suggested.

We would like to thank you in advance for taking some of your precious time to help us.

The project team

Browser compatibility check

1. Javascript:

Enabled !

2. Is browser compatible ?

Yes !

Next step

All tests passed, you are ready to go !

Should you encounter problems after this page, please switch to Firefox 4+ before giving up. A version that requires no installer and no administrative rights exists: Firefox Portable.

Start the study !

Figure 1: Browser compatibility check – here no incompatibility has been detected.

If an incompatibility is detected, PiAnoS will suggest way to correct that problem (Figure 2).

Browser compatibility check

1. Javascript:

Enabled !

2. Is browser compatible ?

No !

Next step

We are sorry, some tests failed !

Unfortunately, your browser does not seem to be able to run PiAnoS. You may at your option:

- **Recommended :** Use [Firefox Portable](#), a version of Mozilla Firefox that requires no installer and no administrative rights.
- Install [Mozilla Firefox](#)
Note: this requires administrative rights on your system. If this is a problem, please see the previous option.
- Prefer [Google Chrome](#), [Apple Safari](#), [Opera](#), or any browser that supports recent web standards.
Note: same restrictions as previous point apply.
- Ignore this message and [continue](#) at your own risks. If you decide to do so, just keep the "Portable Firefox" keywords in mind for future googling :)

Figure 2: Browser compatibility check – here an incompatibility has been detected and ways to correct the issue are suggested

The choice of the solution is left to you and is highly dependent on your administration rights on the computer you are using. The solution that does not require any administration right takes advantage of a standalone application: Firefox Portable (http://portableapps.com/apps/internet/firefox_portable). Once installed, and launched, just type the URL for the project: <https://ips-labs.unil.ch/apps/pianos4-nij/> and re-enter your username and password. You should be ready to go.

1.2 Initial survey

Following the compatibility check, you will be asked to conduct an anonymous initial survey as shown in Figure 2. This survey will be prompted only once (at your first login) and will capture information in relation to your training, experience and reporting practices. Press *Submit* to pursue.

Sex
<input type="radio"/> Male <input type="radio"/> Female
Expert Status
<input type="radio"/> Certified Latent Print Examiner (i.e. IAI certified, FBI certified, or other governmental certification) <input type="radio"/> Latent Print Examiner - trained to competency and actively working cases <input type="radio"/> Latent Print Examiner - trained to competency but no longer actively working cases (e.g. manager, crime scenes only, or other duty that no longer requires latent print case work). <input type="radio"/> Latent Print Trainee - currently in training and not responsible for reporting out case results. <input type="radio"/> Other, please explain: <div style="border: 1px solid black; height: 50px; width: 280px;"></div>
Years of experience performing Latent Print examinations (you may include your training period).
Please select ▾
Approximately how many hours per week would you estimate that you spend analyzing and comparing latent prints?
Please select ▾
Approximately how many latent print cases per month would you estimate that complete?
Please select ▾
Which approach your laboratory is using for the determination of suitability ?
<p>Approach #1 (commonly referred to as "of value for identification"): Only impressions of value for individualization are compared. If a latent print cannot be individualized when presented with the correct (corresponding) exemplars from the same source as the latent print, then the latent print is deemed "no value". Under this approach, when an "inconclusive" opinion is rendered, it always means "I need additional exemplars to complete the comparison".</p> <p>Approach #2 (commonly referred to as "of value for comparison"): Impressions of value for individualization (and possibly for exclusion value only) are considered. If a latent print bears some corresponding characteristics to a clear, known exemplar, but insufficient to individualize, I would report "Inconclusive". Under this approach, when an "inconclusive" opinion is rendered, it may be for several reasons (e.g. quality or completeness of the exemplars, insufficient characteristics to individualize, unable to locate in the exemplars, etc.)</p>
Please select ▾
Does your SOP have defined criteria to determine whether a print is suitable for further examination ?
Please select ▾
What is the most common type of case you work on daily ?
<div style="border: 1px solid black; height: 30px; width: 120px;"></div>
Do you develop your latent prints by yourself ?
Please select ▾
In your practice do you frequently use 3rd level details for identification ?
Please select ▾
Submit

Figure 2: Initial survey just following the first login.

1.3 List of cases

After the initial survey, you will face the screen showing the list of cases assigned to you (here reduced to three in Figure 3, we will have about 15 trials):

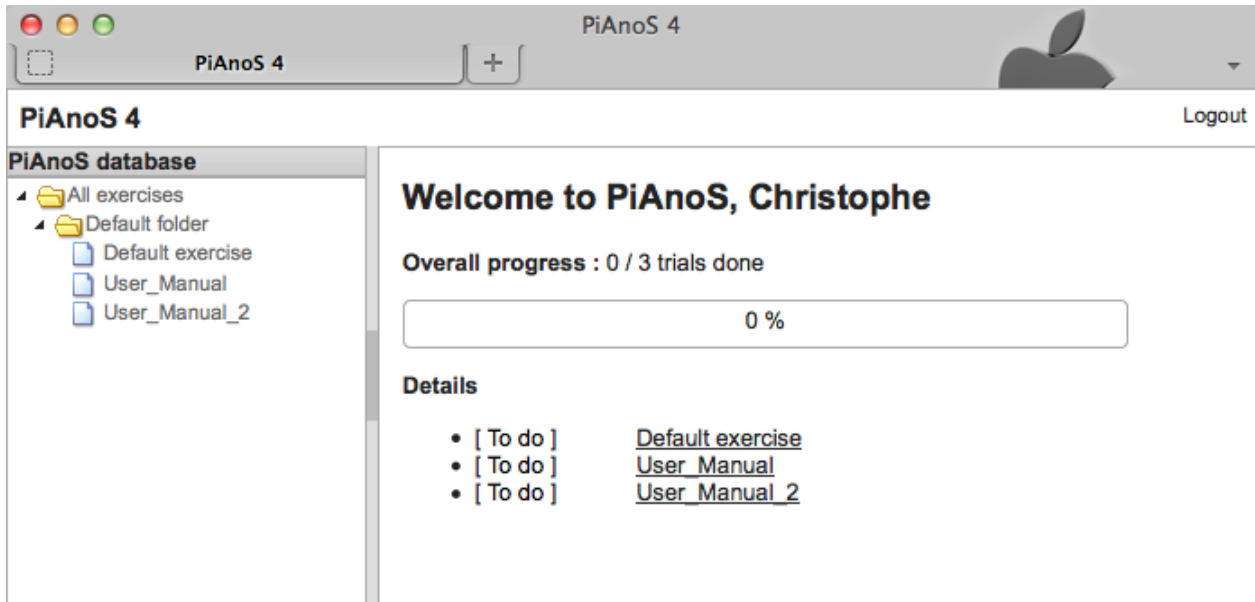


Figure 3: List of cases that you are invited to deal with and the progress made.

Select a case by clicking on the associated link (for the purpose of this manual, the case *User_Manual_2* is used) and then click on the “Start this exercise” link (Figure 4).

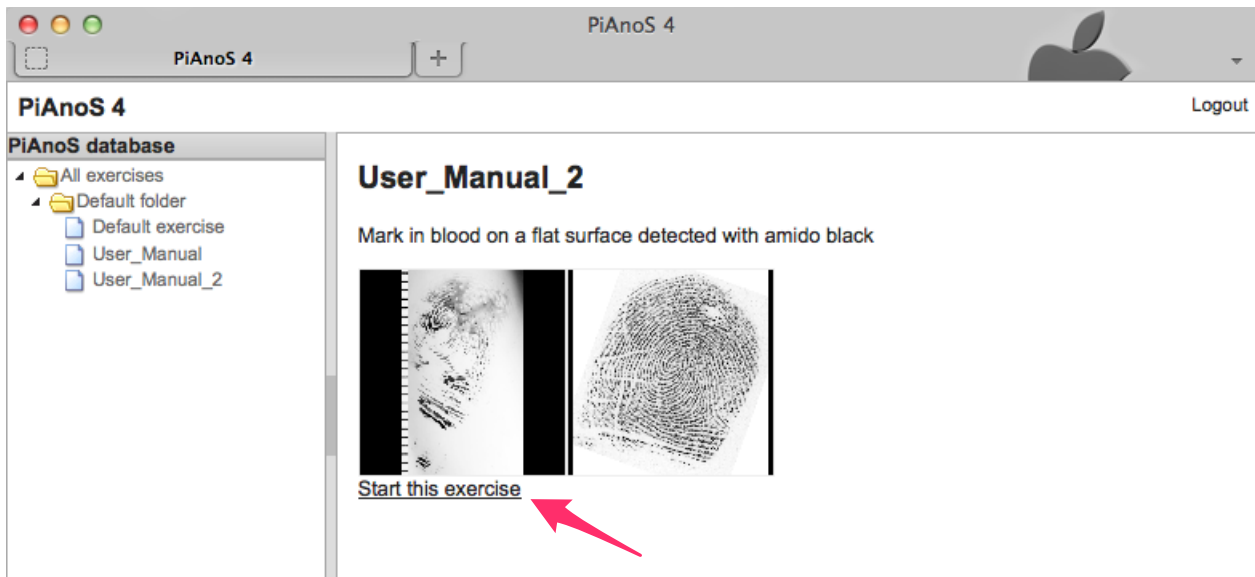


Figure 4: Once a case is selected, the link “Start this exercise” allows to initiate the case. On the top right corner, the link to “Logout”.

2 The Case Window in PiAnoS

A case will appear in a window as shown in Figure 5. As any point, you can go back to the list of cases by clicking on PiAnoS 4.

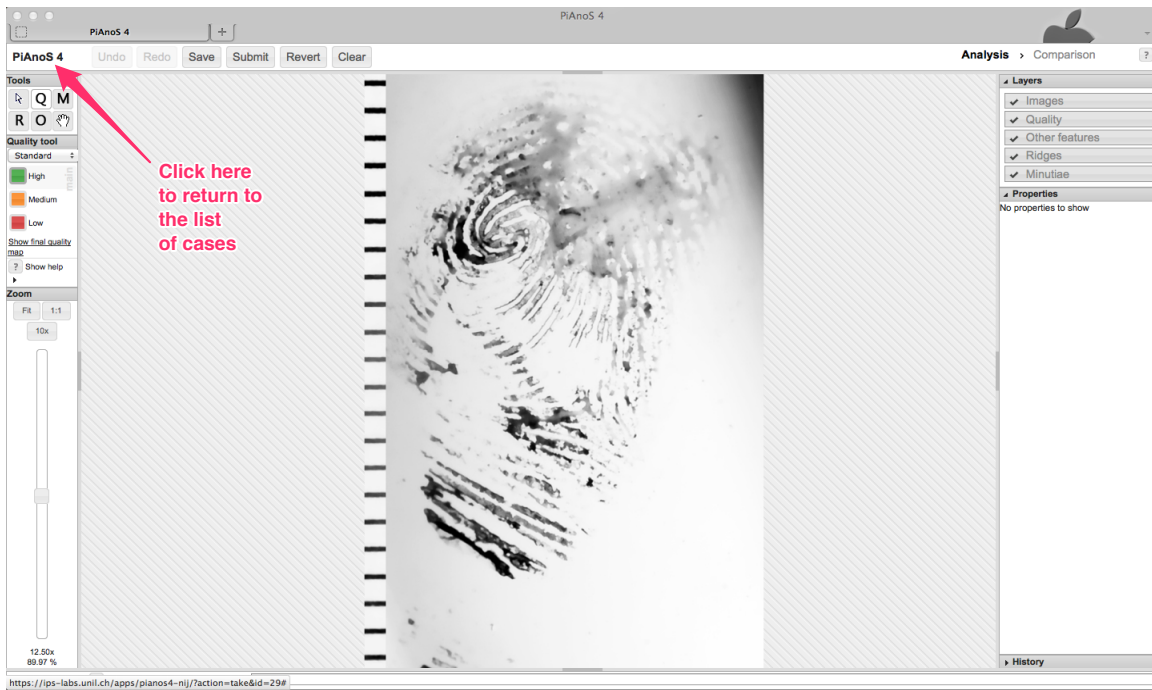


Figure 5: User interface displayed at the start of a case.

The frames in PiAnoS 4 are organized as follows (Figure 6):

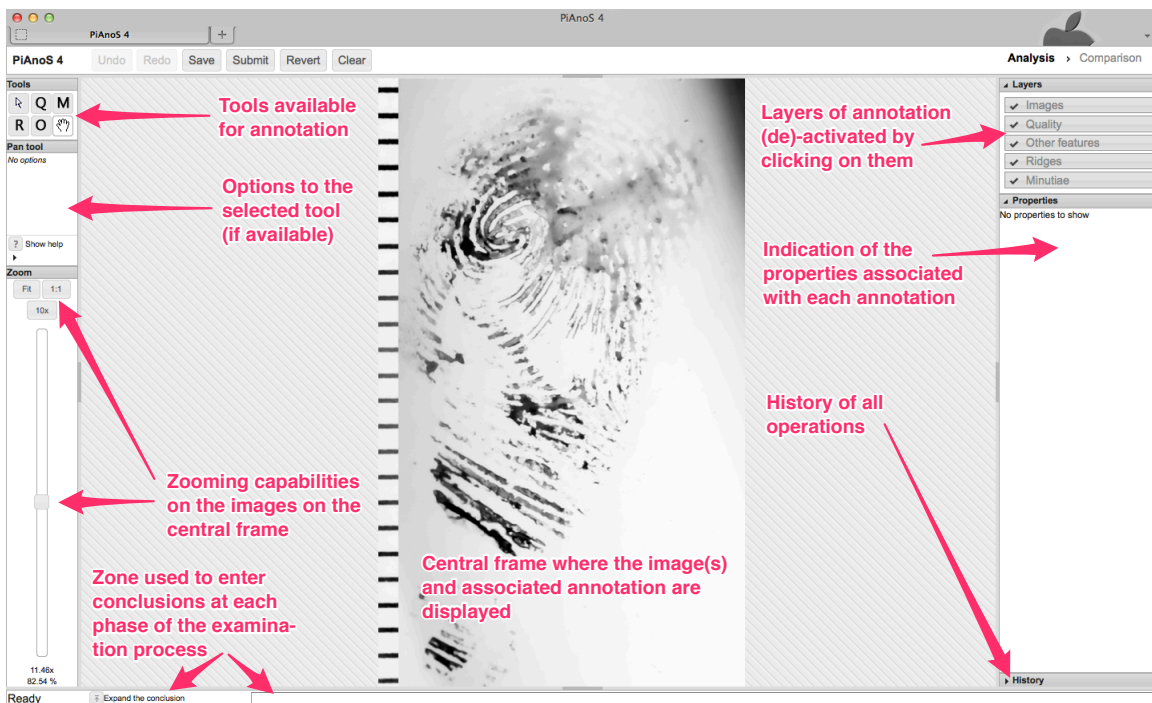


Figure 6: Explanation of the frames in the PiAnoS user interface.

To move from one annotation tool to the other, and to activate/deactivate panels, the following shortcuts are available (Figure 7):

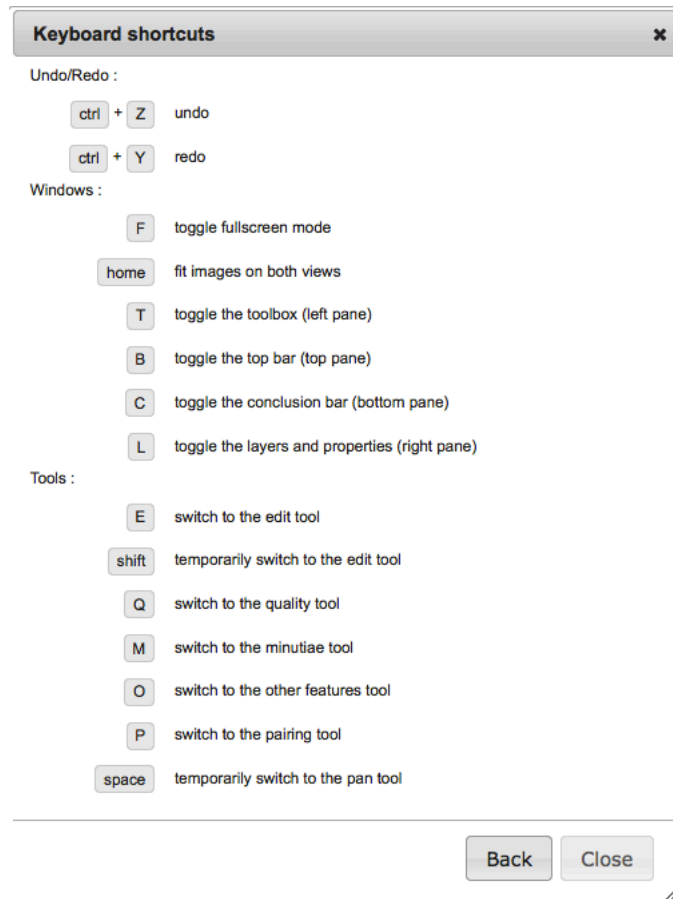


Figure 7: Shortcuts used to select annotation tools and activate panels.

One advantage of the panel system is the possibility to hide them to focus your attention on the annotations. For example, in Figure 8, we show how the screen can be cleared (using the F shortcut) from all side frames to concentrate only on the image to be assessed. All keyboard shortcuts remain active, allowing selecting the appropriate annotation tools, without having to activate the corresponding frame. These functionalities are available in both analysis and comparison phase.

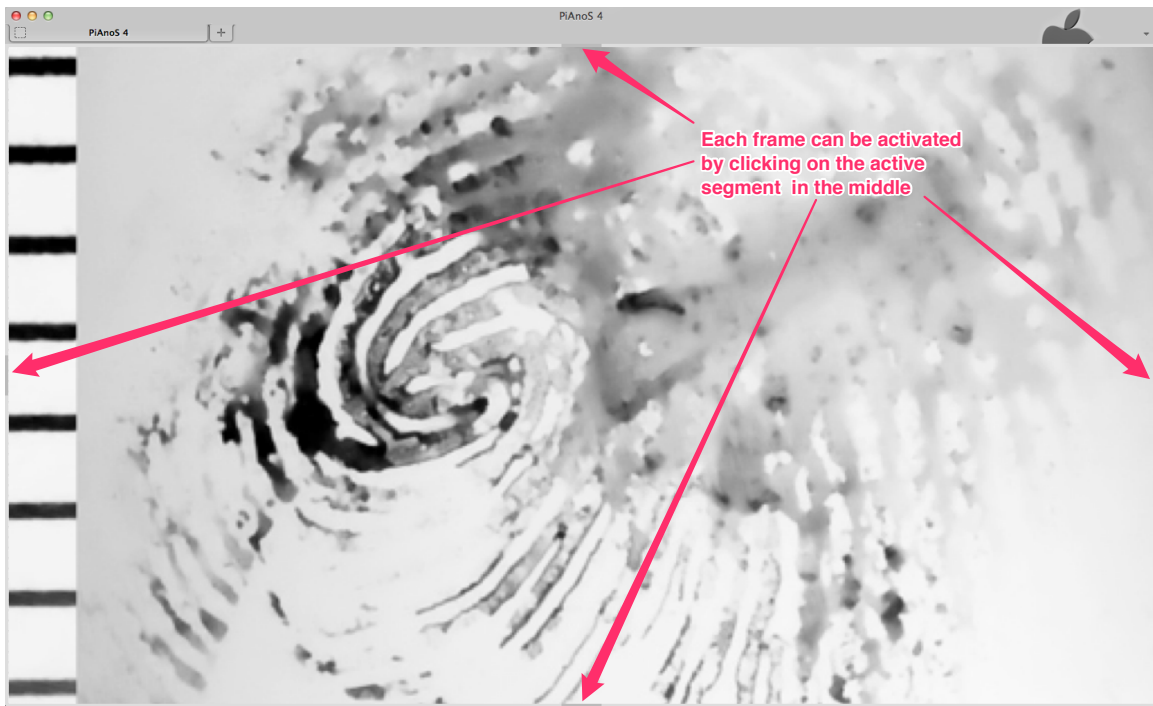


Figure 8: Use of the full screen mode (F). The respective frames can be activated by the shortcuts T, B, C and L or by double clicking on their respective active middle segments. The shortcut F will activate/deactivate them all at once.

3 Saving, Submitting and Undo

Everything carried out in PiAnoS can be saved (undo, redo) and monitored as shown in Figure 9.

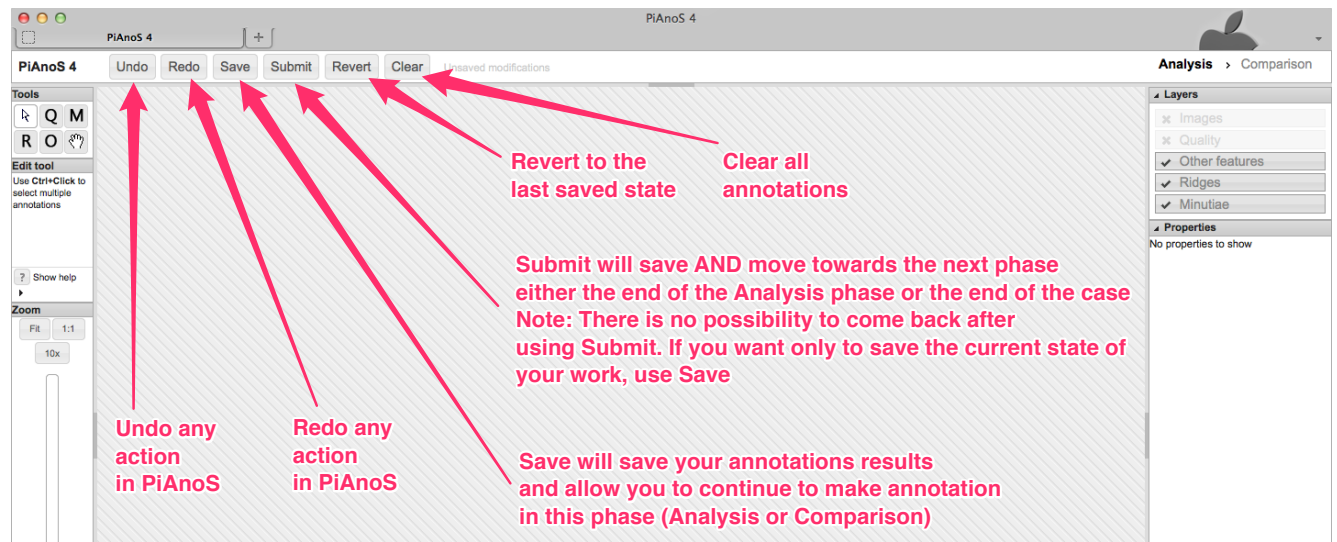


Figure 9: Saving, submitting and undo/redo options.

4 Analysis Phase

During the analysis phase, the annotation tools are used to document all features that will guide the examiner in forming a decision at the end of the analysis phase. PiAnoS offers a range of tools and also the possibility to type case notes (section 4.6).

4.1 Quality tool (Q)

Assignment of quality is made by delineating zones of perceived quality using the Quality tool (Q). PiAnoS4 has two standards implemented for this task: the first is based on a three-level system (good, moderate and weak), the second is based on 6 levels specified by the recent work of CDEFFS (<http://fingerprint.nist.gov/standard/cdeffs/index.html>), that will shortly become the ANSI/NIST standard for extended feature documentation.

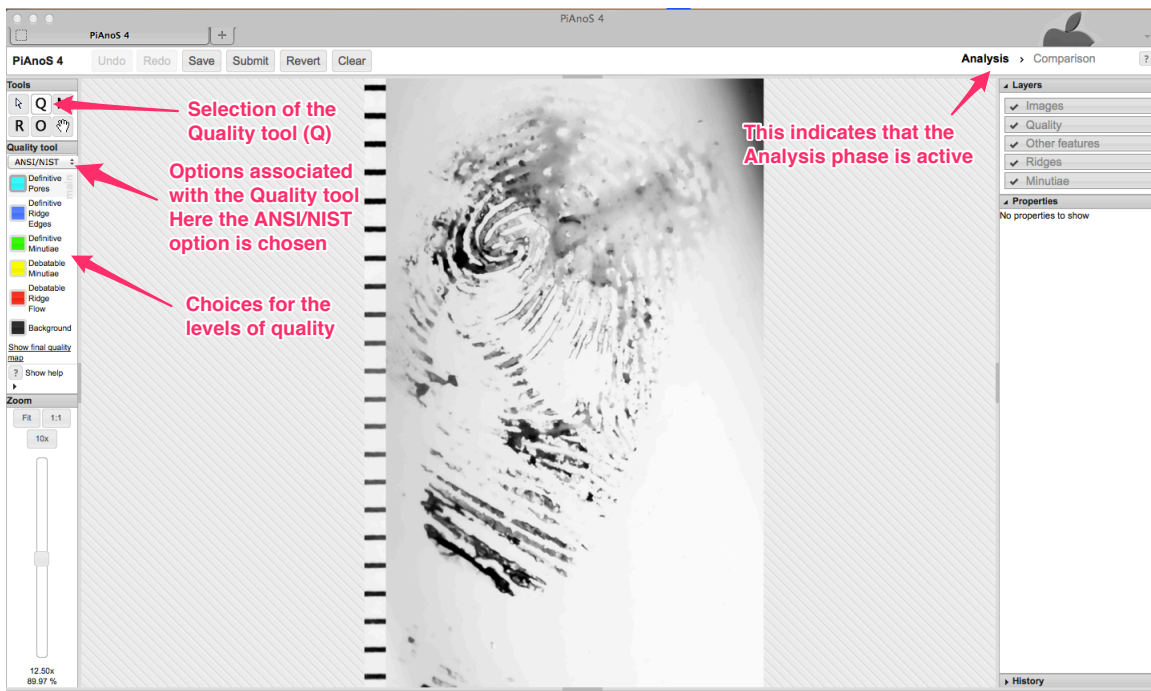


Figure 10: Selection of the Quality tool (Q) and options available for the annotations.

For this study, we plan to use a *Standard* three-level system. Using the Quality tool (Q), the user can delineate the sections of the mark showing the appropriate level of perceived quality, as shown in Figure 11.



Figure 11: Selection of the *Standard* three levels system for Quality annotation.

The Quality tool allows you to draw surfaces/zones delineating the corresponding level of quality. One click will start the segment of the shape, a double-click will close and finalize it.

The three levels are defined as follows:

Quality tool	Definition of the Standard three-level system used in PiAnoS
Standard	An area is annotated of high quality if: Level 1 is distinct; Level 2 details are distinct; There are distinct Level 3 details.
High	An area is annotated of medium quality if: Level 1 is distinct; Most of the Level 2 details are distinct; There are minimal distinct Level 3 details.
Medium	An area is annotated of low quality if: Level 1 may not be distinct; Most of the Level 2 details are indistinct; There are no distinct Level 3 details. Low quality (RED) is used only when you can see ridges in the degraded mark area, but indistinct minutiae. It is should not be used to indicate areas without any ridges (such as a drag mark of a finger)
Low	Following SWGFAST: Level 1 detail refers to the overall ridge flow. Level 2 detail refers to individual friction ridge paths, friction ridge events (e.g., bifurcations, ending ridges, dots, and continuous ridges) and their relative arrangements. Level 3 detail refers to ridge structures (edge shapes, and pores) and their relative arrangements. Creases, scars, warts, incipient ridges, and other features may be reflected in all three levels of details.

An example of annotation of quality is shown below in Figure 12.

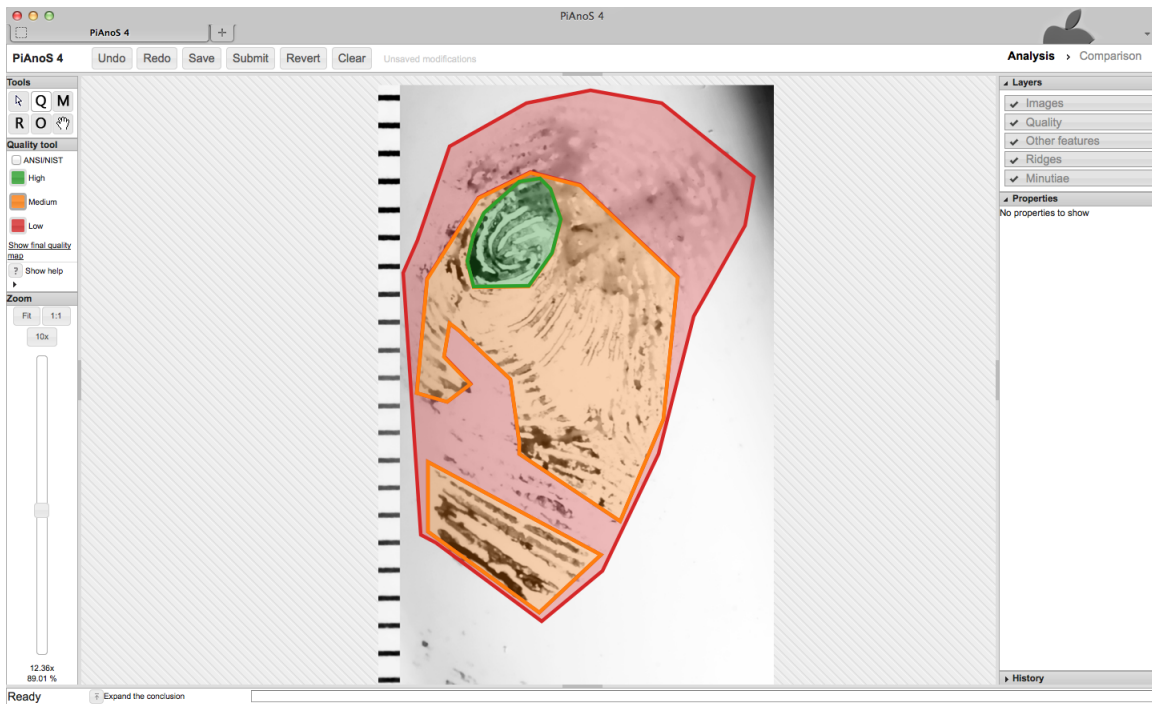


Figure 12: Quality annotations of the mark.

4.2 A few tips to annotate quality

An annotated area can be selected (once the Edit tool is selected) by clicking on it. Multiple selection is possible using Ctrl-Click. Once selected, the anchor points used to construct the area. Each of these points can be moved to reshape the form. The area and its anchor points can be further edited by Ctrl-Click. It then allows choosing between various options as shown in Figure 13.

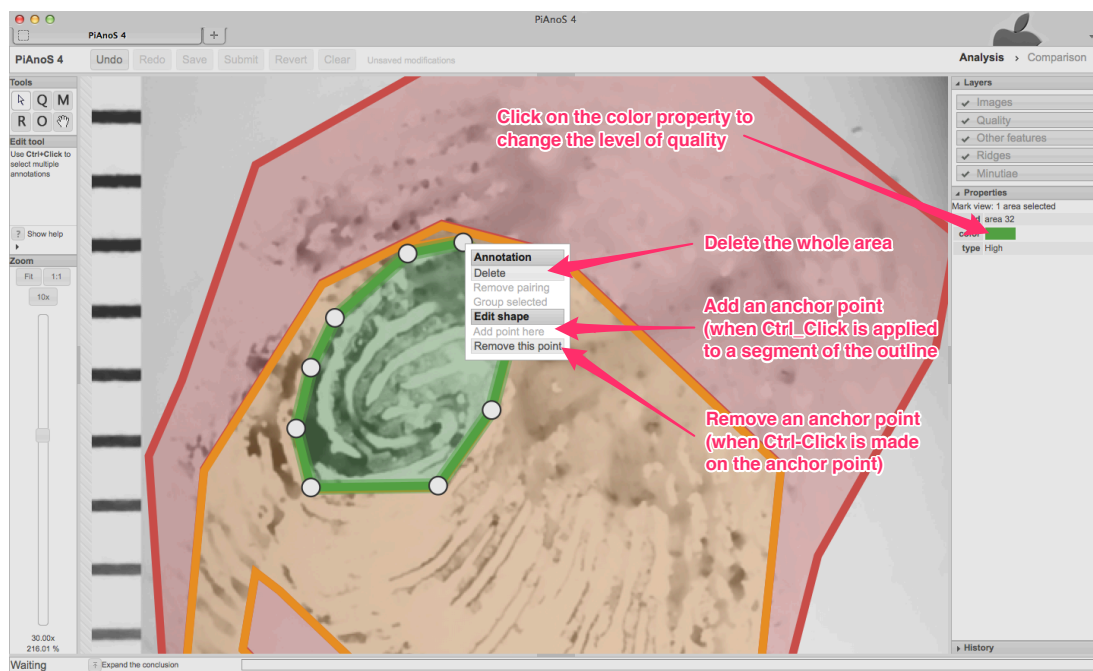


Figure 13: Further possibilities to edit quality zones using Ctrl-Click.

Further tips can be found in the help section of the Quality tool (Figure 14), activated by the link in the tool area (Figure 11).

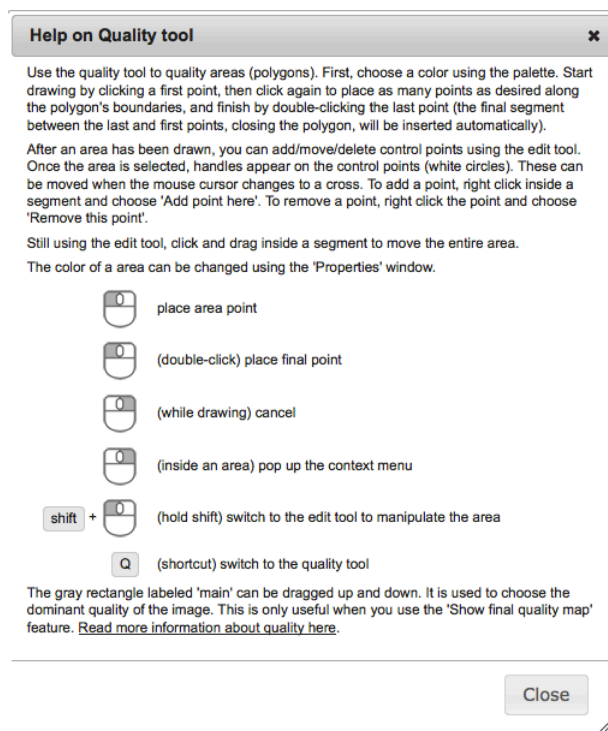


Figure 14: Help screen available for the Quality tool (Q).

4.3 Minutiae Tool (M)

It is expected that you annotate **all minutiae** using the minutiae tool (M). Minutiae are assigned as either ridge ending or bifurcation when their type and location are discernable on the mark. If only type (but not location) is uncertain, a specific annotation, called *Type unknown*, is used. By extension when location (and *de facto* type) is unclear, a fourth type of minutiae, called *Position unknown*, is used. The choice of the visual marker has been made in order to reflect that decreasing levels of certainty. The four markers are shown in Figure 15:

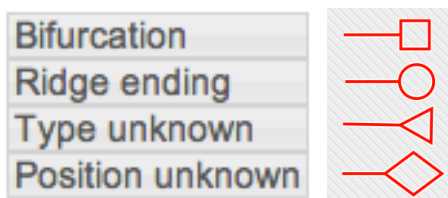


Figure 15: Illustration of the four types of minutiae (in order from type to bottom).

To add a minutia, the process is very similar to how it is done on an AFIS system, as explained in the help screen of the tool (Figure 16).

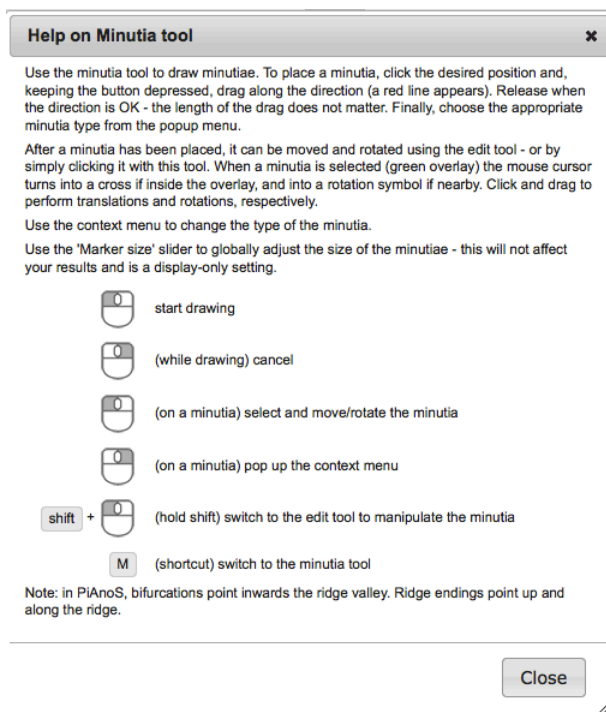


Figure 16: Help screen available for the Minutiae tool (M).

Figure 17 shows the annotation of the first minutia (a bifurcation) to the mark in analysis phase.

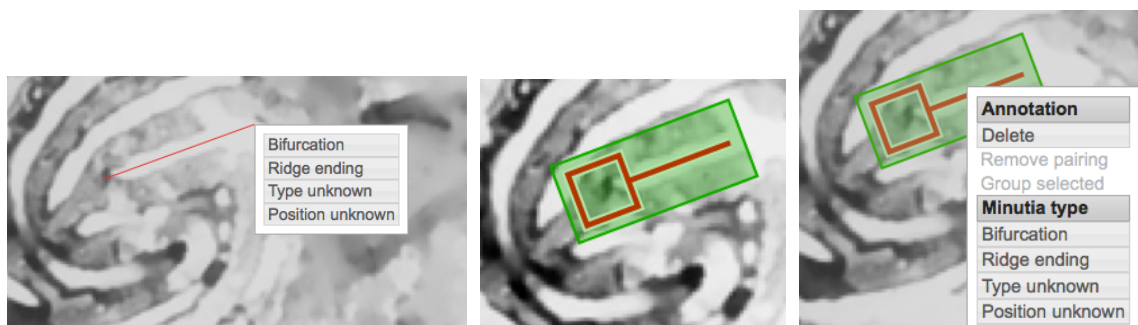


Figure 17: Left: Annotation of a minutia using the minutiae tool (M). Middle: Minutiae can then be selected (green outline), moved when the mouse cover the green box. The direction can be adjusted when the mouse is outside the box. Right: A hold-shift and click allows to delete or to change minutia type. Note: Delete (←) will also delete the minutia.

You are invited to annotate all the minutiae on the mark (even if in your opinion, the amount of information is overwhelming). Results for that mark is given in Figure 18. To ease visibility of minutiae, the Marker Size can be adjusted (here to 2, the default being 4).

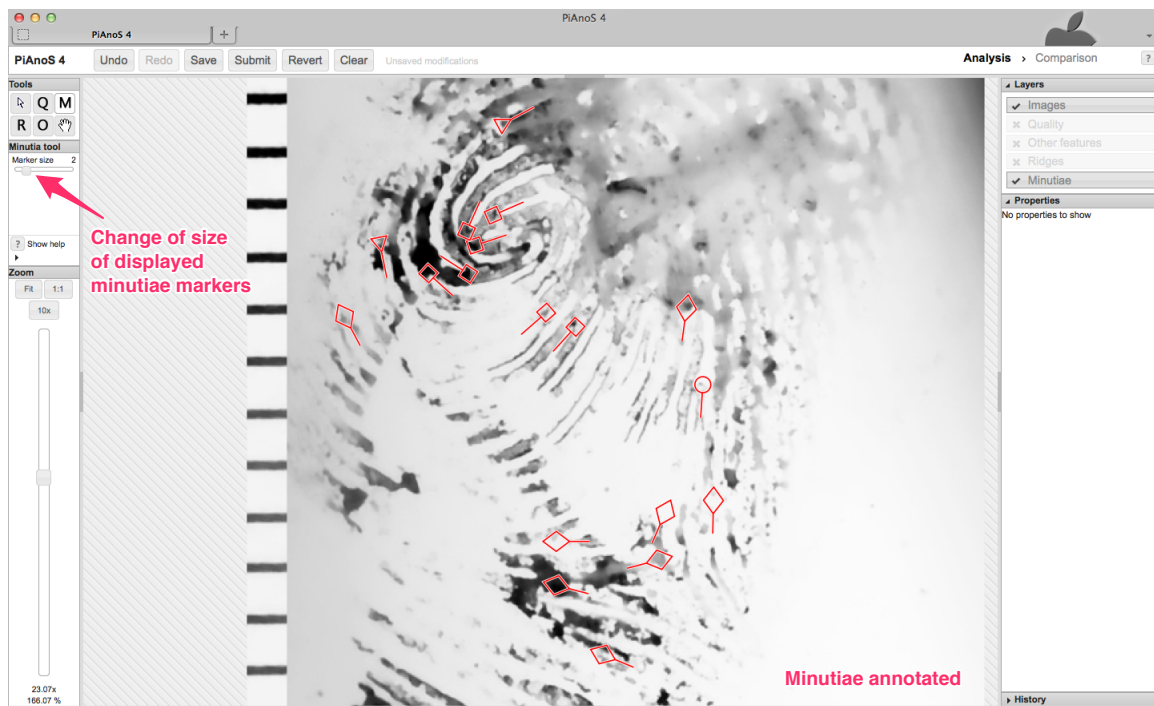


Figure 18: Annotation of all minutiae on the mark.

4.4 Ridge tracing tool (R)

It has been proven useful to trace ridges (or alternatively valleys) to help assess the ridge flows. A specific tool has been designed to help in that task. Ridge tracing is not compulsory. The tool can be used as deemed necessary by the examiner. The ridge tracing can also be made only in specific areas requiring such assistance (typically when the quality is low). When the Ridge tracing tool is activated (R), drawing of the ridges is simply made by clicking along the ridge until a double click that finalize the drawing (Figure 19).

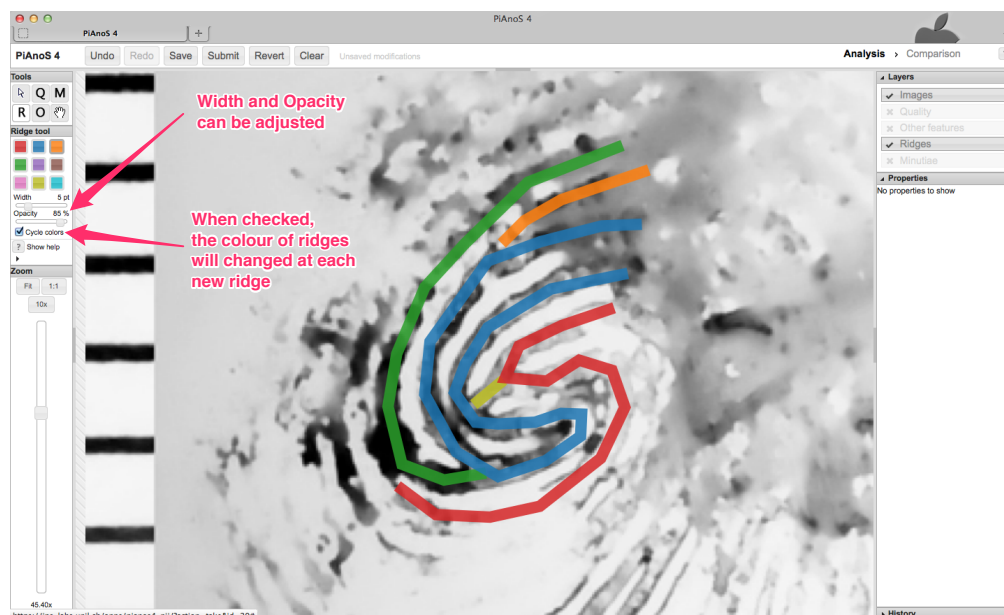


Figure 19: Example of tracing a few ridges on the mark.

All ridges can be edited and modified with the mouse (Figure 20).

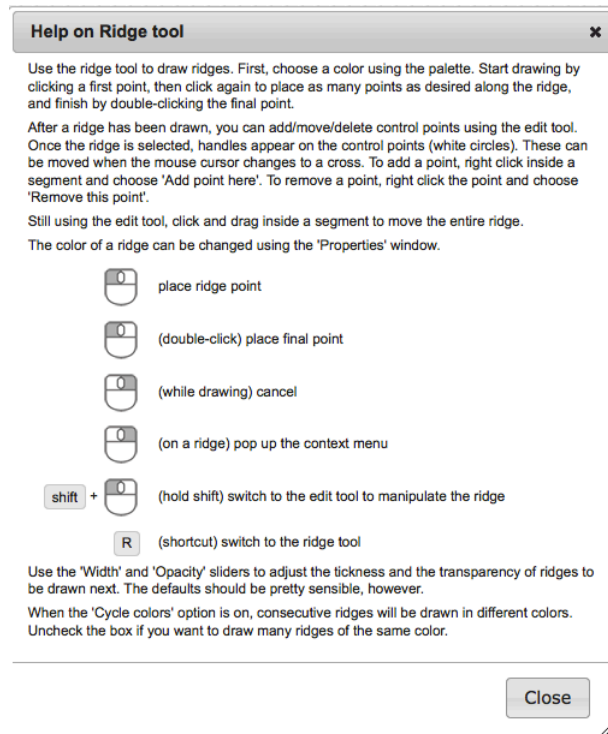


Figure 20: Help screen available for the Ridge tracing tool (R).

When a ridge is selected, its anchor points can be moved, deleted (←) or modified (right click) as shown in Figure 21.

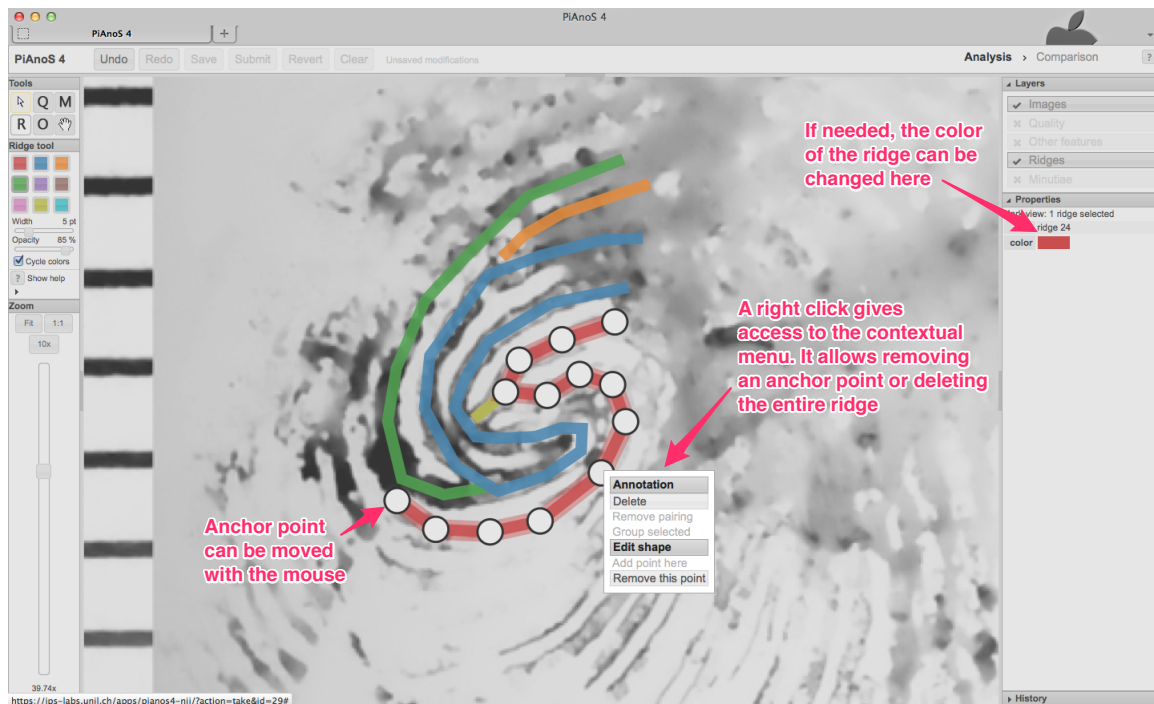


Figure 21: Editing capability available for the ridges.

4.5 Other features annotation tool (O)

Other features such as scars, wrinkles or creases can be indicated using a dedicated tool (O). It is shown below (Figure 22):

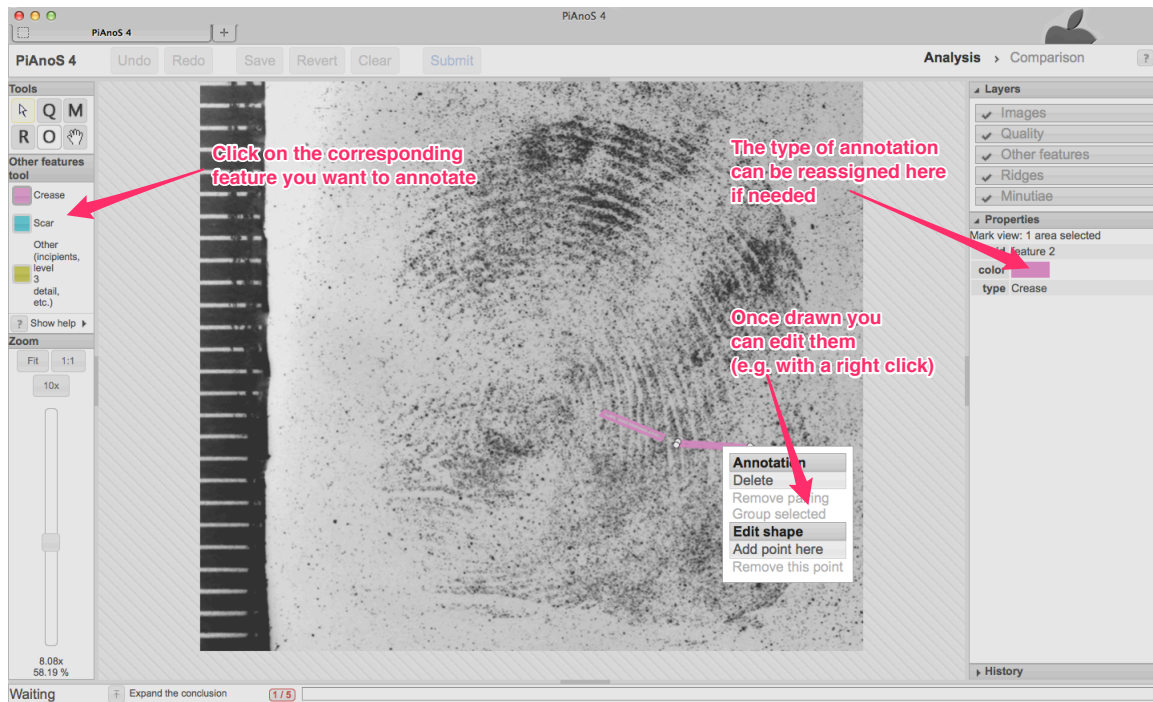


Figure 22: Annotation of a potential wrinkle using the Other features tool (O). Here, the example is shown on another mark showing wrinkles.

The possibilities for editing are very similar to the other tools. The help tips are as follows (Figure 23):

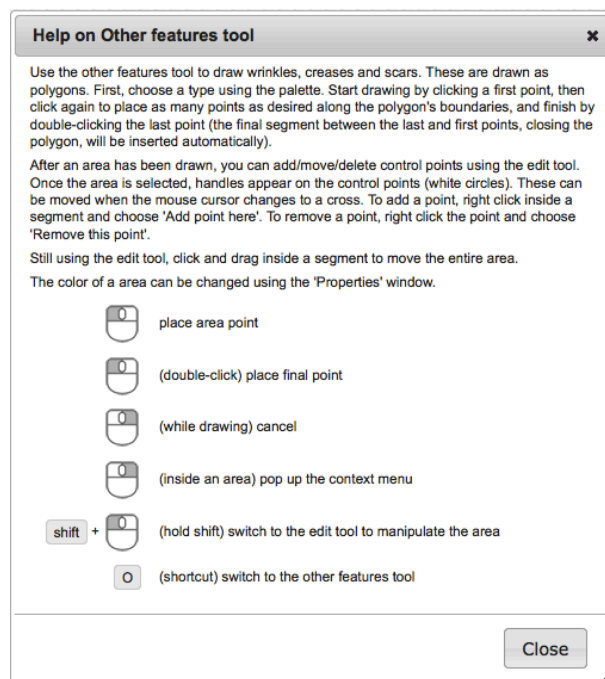


Figure 23: Help screen available for the Other features tool (O).

Note that *pores* are not annotated as such, the indications of the highest quality means that pores are visible to a certain extend.

4.6 Case notes and conclusion associated with the analysis phase

The bottom frame of the interface allows you to conclude the analysis phase.

A free text section is available (and can be easily resized in the interface). Please use it as case note to document your analysis. That section allows documenting observations in addition to the annotations such as the observation of slippage, distortion, multiple appositions, etc...

The other parts of the conclusion section are more structured than the free text section because there is a need to standardized the output, especially in relation the approach you have adopted in the survey regarding “suitability”. The steps for concluding the analysis phase are shown in Figure 24.

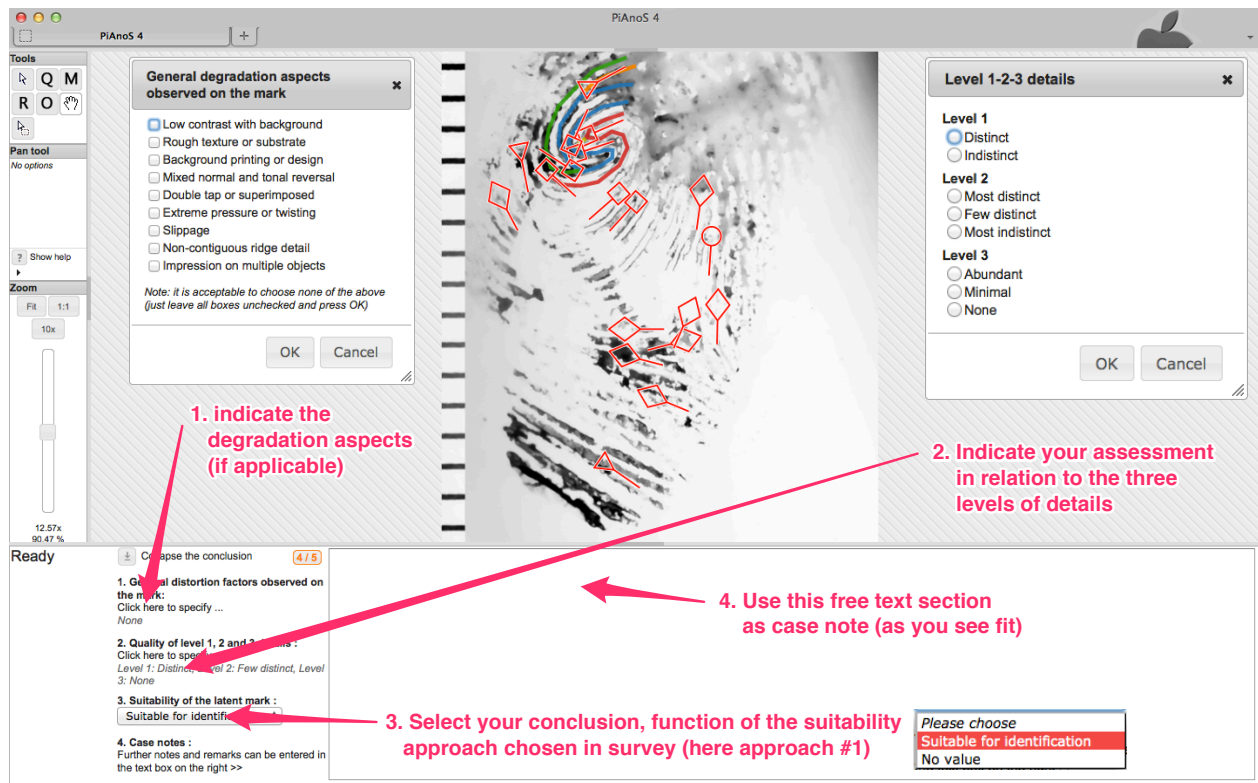


Figure 24: Five steps involved in the conclusion section associated the analysis phase.

The possibilities for the conclusions depends on the choice of approach to suitability as defined below:

Suitability approach	Definition	Possible conclusions for following the analysis phase
Approach #1	<p>Commonly referred to as “of value for identification”: Only impressions of value for individualization are compared. If a latent print (or mark) cannot be individualized when presented with the correct (corresponding) exemplars from the same source as the mark, then the mark is deemed “no value”.</p> <p><i>Note:</i> Under this approach, when an “inconclusive” opinion is rendered following the comparison/evaluation stage, it always means “I need additional exemplars to complete the comparison”.</p>	<ul style="list-style-type: none"> • Suitable for identification • No Value <p><i>Note:</i> The term “suitable” indicates that the mark is or may be identifiable. Practice has shown that most examiners will mean “is”, but it was felt important to recognize that the conclusion following analysis may be subject to revision. The label “No Value” to a mark refers only to its potential to be individualized. Marks allowing potential exclusion but failing the individualization threshold will be qualified as “No Value” in that approach #1.</p>
Approach #2	<p>Commonly referred to as “of value for comparison”): Impressions of value for individualization (and possibly for exclusion value only) are considered. If a latent print (or mark) bears some corresponding characteristics to a clear, known exemplar, but insufficient to individualize, I would report “Inconclusive”.</p> <p><i>Note:</i> Under this approach, when an “inconclusive” opinion is rendered following the comparison/evaluation stage, it may be for several reasons (e.g. quality or completeness of the exemplars, insufficient characteristics to individualize, unable to locate in the exemplars, etc.).</p>	<ul style="list-style-type: none"> • Suitable for identification • Suitable only for exclusion (but not for identification) • No Value <p><i>Note:</i> The term “suitable for identification” indicates that the mark is or may be identifiable as before. The second option “suitable only for exclusion” indicates that the mark is not expected to be individualized but have sufficient features to allow an exclusion or an association of a strength that is less than an individualization. The term “No Value” is reserved to marks of quality that is insufficient either to associate or to exclude.</p>

Note: The term “identification” is used for all conclusions as meaning “individualization”.

For the purpose of this study, we invite you to process further with the comparison stage even though the conclusion of your analysis for that mark is “No Value”.

It is only now that the results are submitted (using the SUBMIT button, see Figure 9). It means that you will move to the comparison phase. All results in analysis cannot be changed anymore at this stage, nor will it be possible to modify your analysis. At the outset of the comparison phase though, the annotation made during analysis are displayed on the mark as a starting point. They can be modified as required. Annotations results are kept completely separately in both phases.

5 Comparison phase

The same annotation tools are available during the comparison stage. All annotation tools can be used.

5.1 Binding both views

It is often convenient to be able to bind both images (mark and print), so that when you move one, the other move also with it. To do that the Pan tool offers a mechanism to put two anchor points on the each side and bind them (Figure 25).

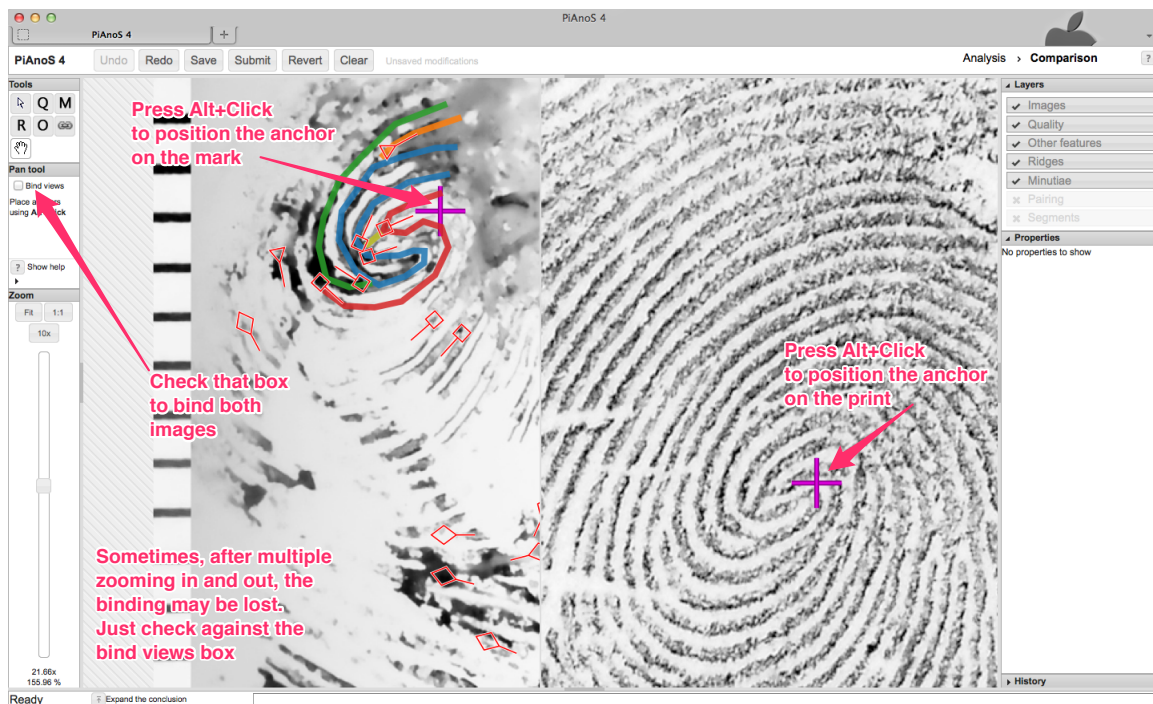


Figure 25: Use of “bind view” in comparison phase, available with the Pan tool.

5.2 Annotation of matching minutiae

For the purpose of this project invite you to annotate the matching minutiae according to the following guidelines:

- Annotate on the mark and the print only the minutiae that are considered to be in association. Hence do not annotate all minutiae visible on the print. **But we ask you to indicate all the minutiae on correspondence even if the total amount of**

information is overwhelming and you would have stopped your annotation process earlier in casework.

- If a minutia was indicated on the mark but not available on the print (due to a lack of clarity, or an area that is not displayed), then simply remove the additional minutia on the mark.
- If a minutia was annotated on the print but was not indicated on the mark (e.g. missed), you can annotate the mark with a minutia only if, in your opinion, the minutia on the mark is a reality that could have been indicated during the analysis phase.
- If the type of minutia is different (e.g. viewed as a bifurcation on the mark and a ridge ending on the print), leave the annotations as such. There is no need to adapt the type given in analysis, unless an obvious misjudgment occurred.

In Figure 26 is illustrated the annotations of matching minutiae on the mark and the print (on the right).

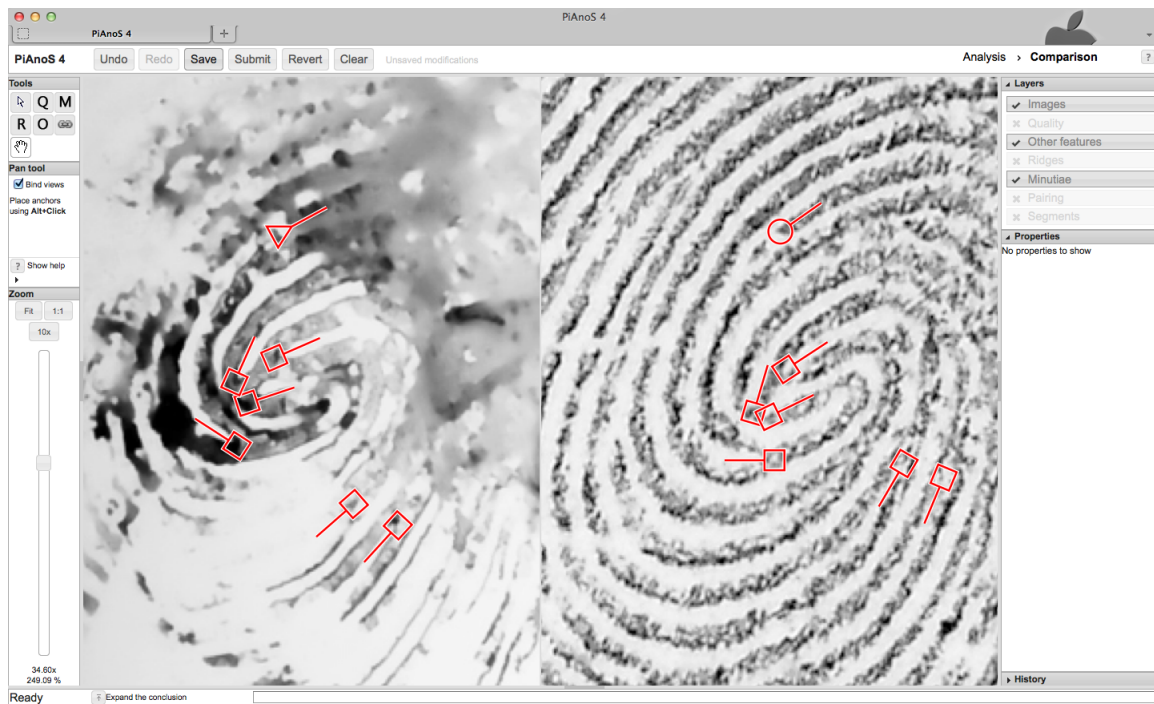


Figure 26: Annotation of the minutiae on the mark and the print using the Minutiae tool (M).

It goes without saying that if you want to take advantage of the Ridge tracing tool (R), it can be done (Figure 27).

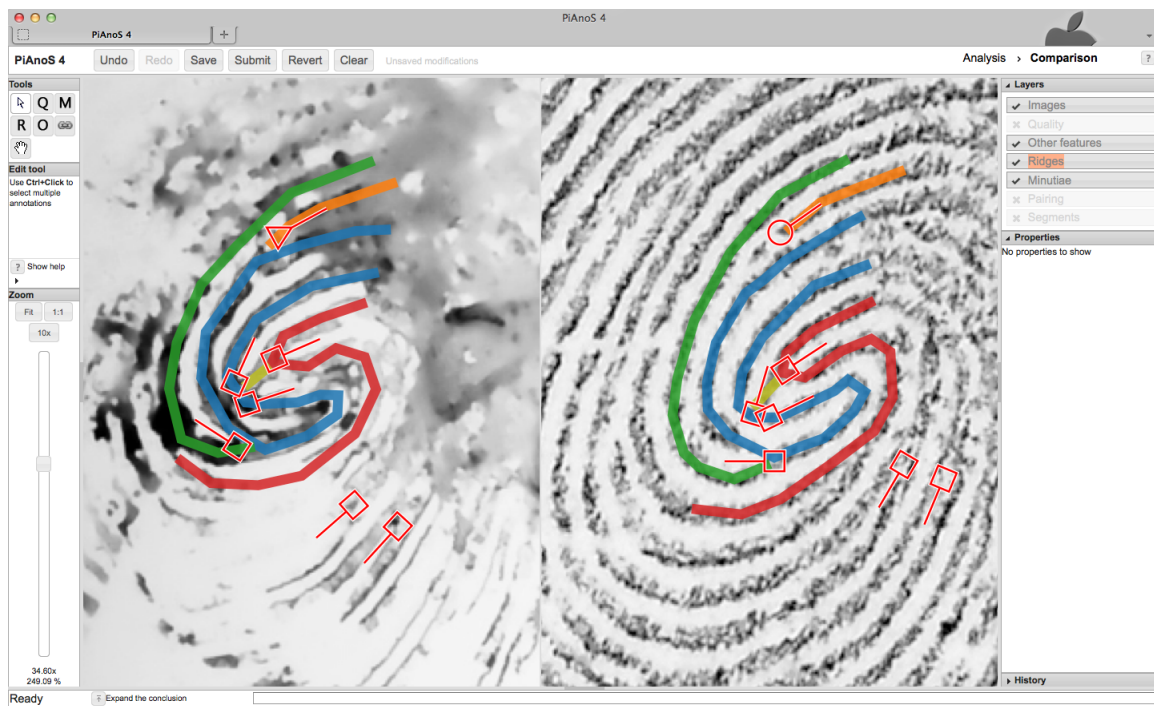


Figure 27: Annotations in comparison phase using the ridge tracing tool (R).

5.3 Annotation of “non matching” minutiae

Differences can be indicated using a specific type of minutiae called “Difference” (Figure 28).

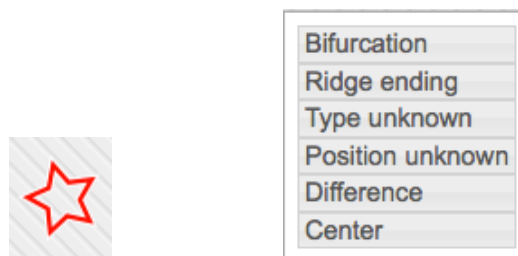


Figure 28: Annotation used to indicate a potential minutiae discrepancy.

If a minutia is clearly visible on the mark and absent on the print (and the quality of the print cannot be invoked as a explanation for the difference), then annotate that location on the print with the minutia type “difference” as shown Figure 29. Conversely if a minutia is clearly visible on the print and absent on the print, annotate the minutia on the print and indicate it as a difference on the mark.

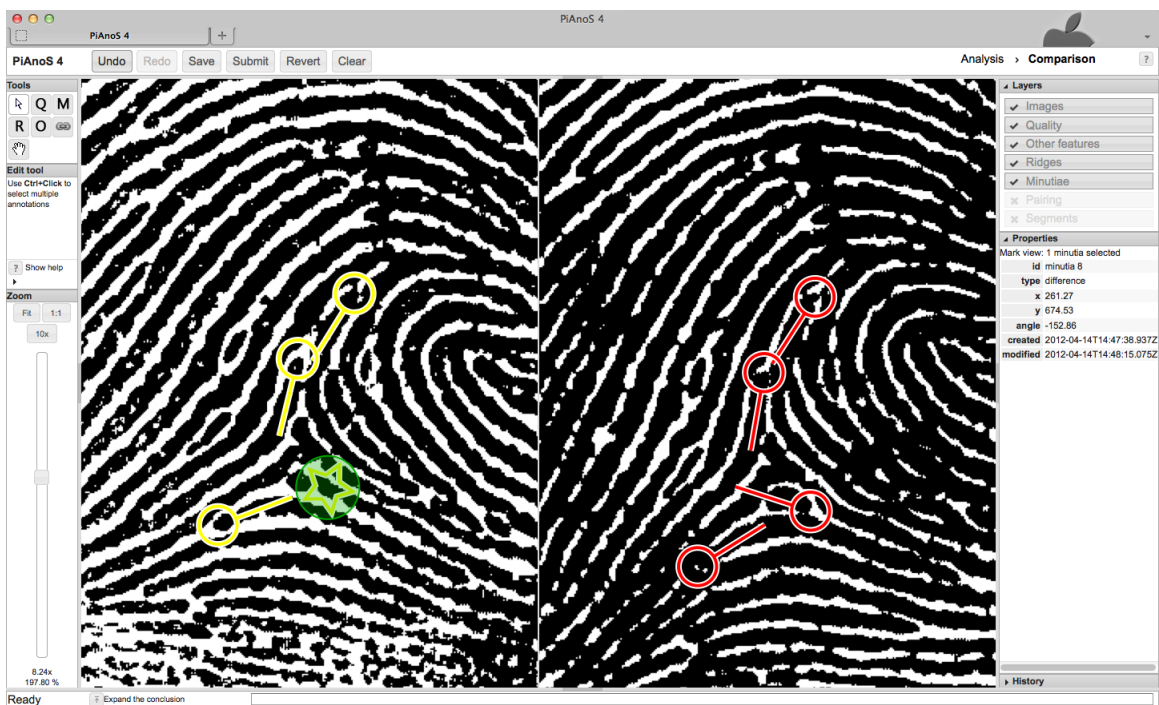


Figure 29: Annotation of a difference during the comparison phase. Case based on images from Ferguson, B., "Minutiae Discrepancy in the Delta Area", *Fingerprint Whorld*, vol. 18 (69), p. 110, 1992.

Note that in the context of this study, the indication of a perceived difference does not mean de facto that an exclusion will be declared. The purpose is just to transparently indicate the

observations made. Hence as in the case above (Figure 29), an examiner may conclude to an identification even though a “difference” has been indicated.

5.4 Pairing of matching minutiae (P)

In addition you will be invited to pair minutiae that are deemed “matching”. A specific interface has been designed for that task, available only during the comparison phase (Figure 30).

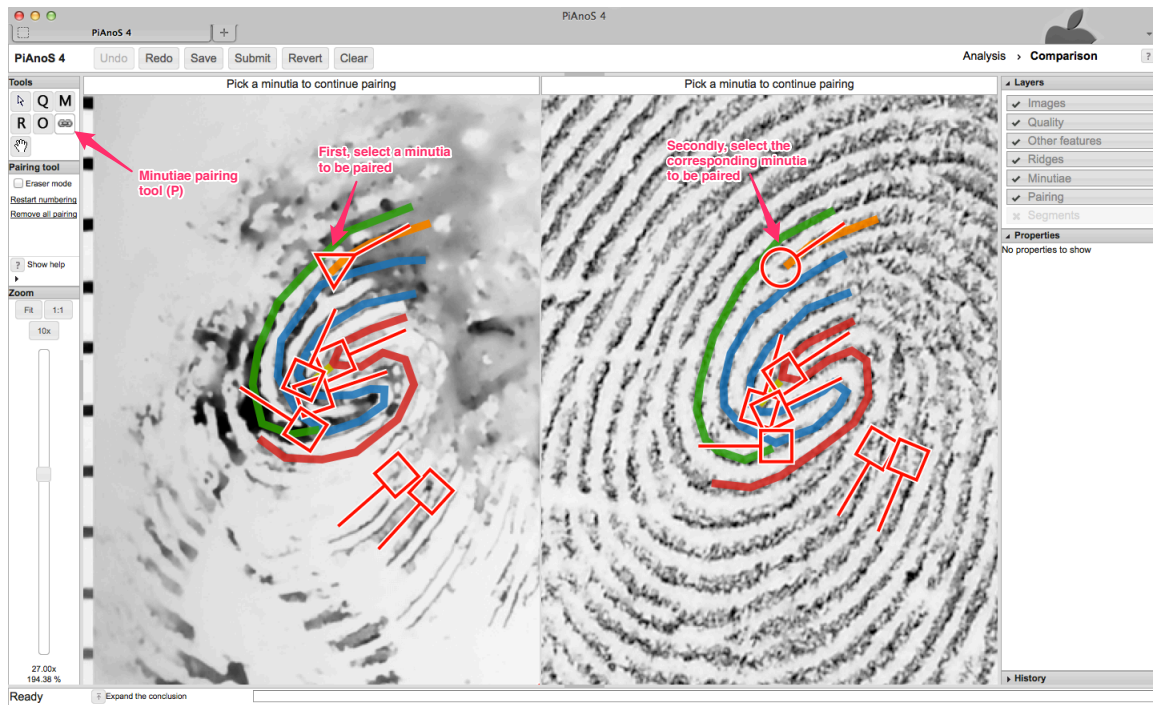


Figure 30: Pairing of a “matching” minutiae in the mark and on the print using the Pairing tool (P).

The process is repeated for all minutiae to be paired (Figure 31).

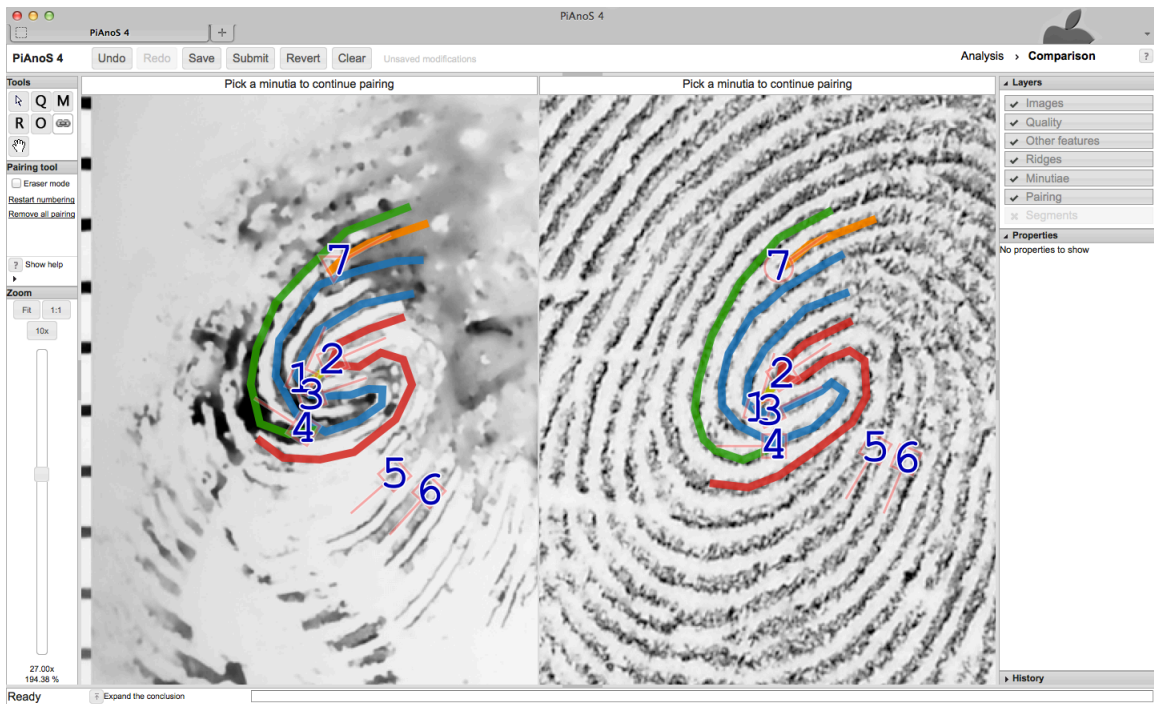


Figure 31: Pairing of all “matching” minutiae using the Pairing tool (P).

Pairing can be changed using dedicated tools shown in Figure 32 and explained in the Help screen available for that tool (Figure 33).

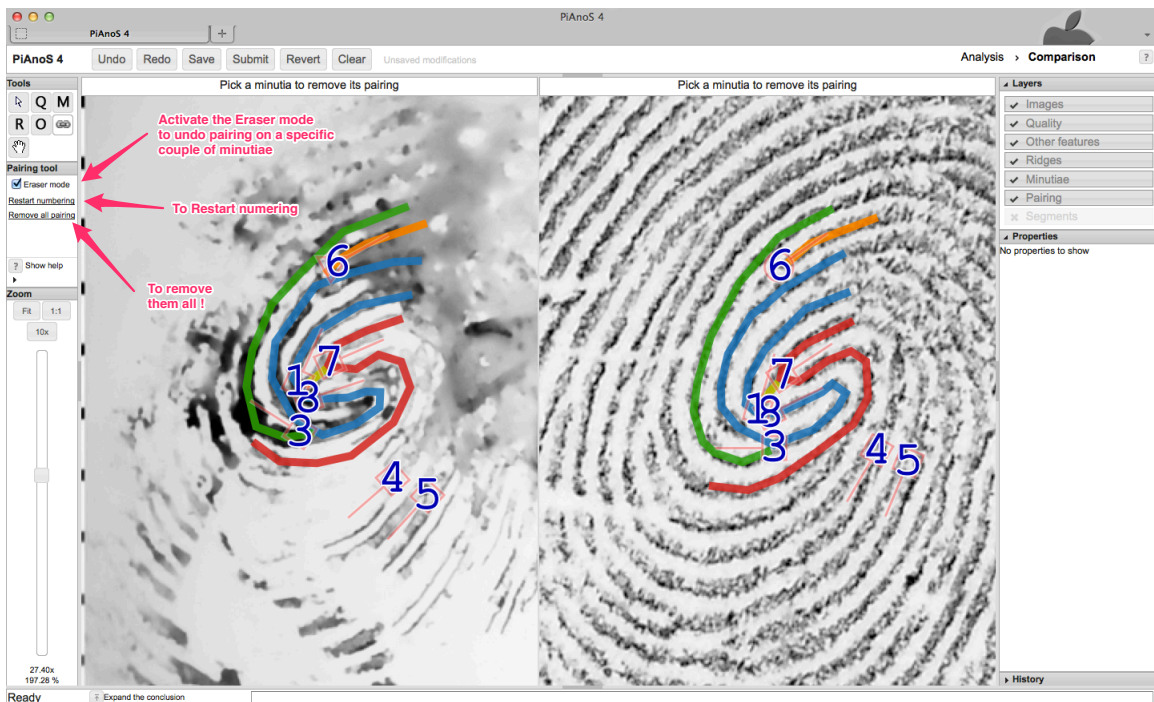


Figure 32: Tools available to undo the pairing, remove all pairings and renumbering. Note that the Eraser mode needs to be unchecked in order to restart the pairing.

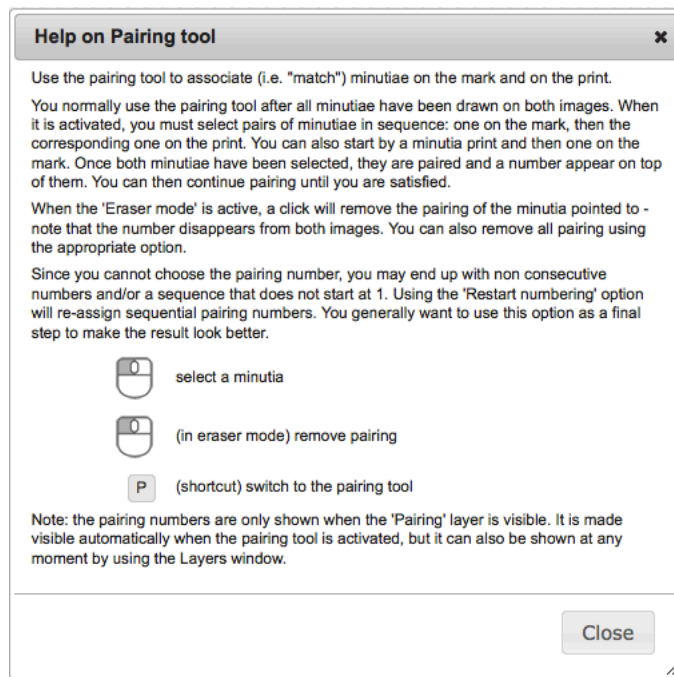


Figure 33: Help screen available for the Minutiae pairing tool (P).

5.5 Case notes and conclusion of the comparison phase

During the comparison, feel free to use the free text area available in the conclusion section to document your comparison. At the end of the comparison phase, you will be asked to conclude according to options shown in Figure 34.

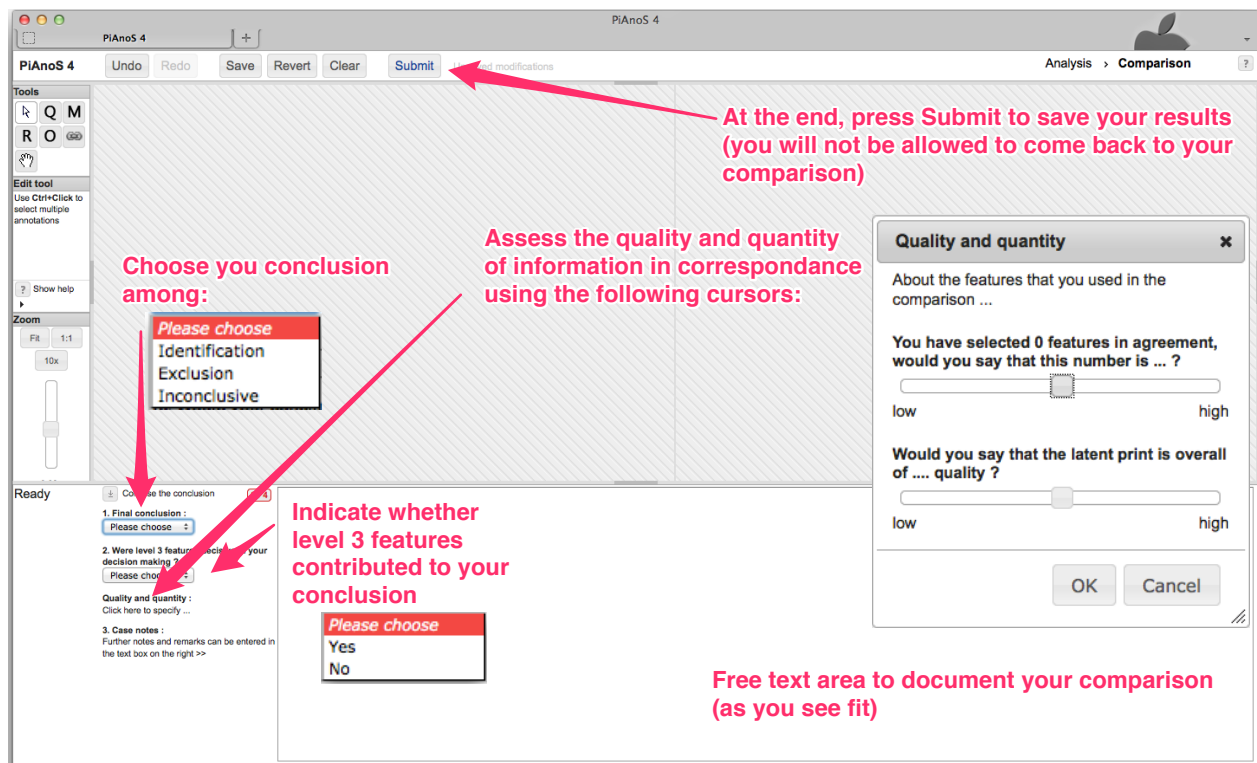
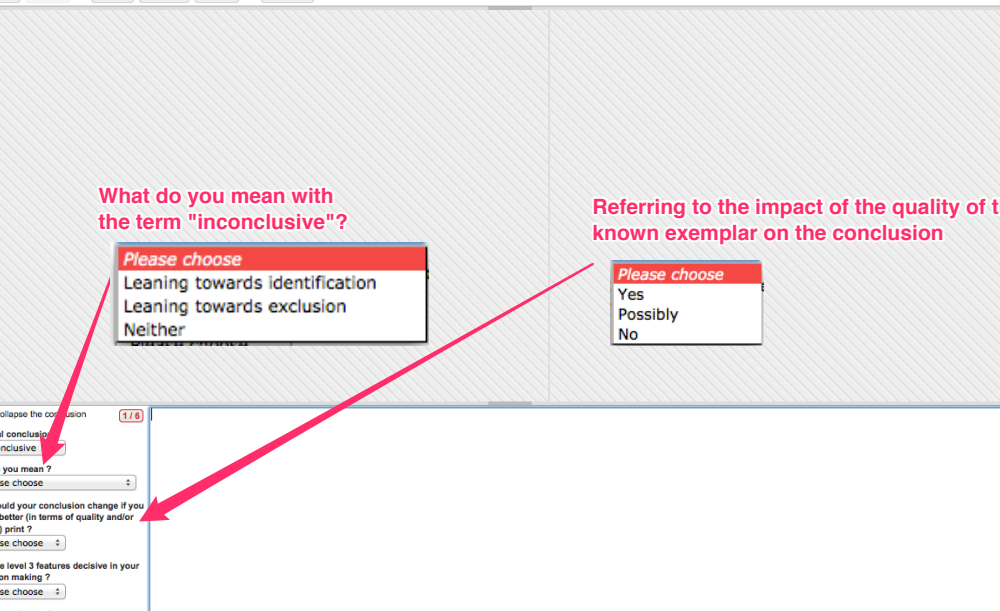


Figure 34: Conclusions possibilities following the comparison phase.



Page 27 of 27