

Photographic Analysis and Comparison in PhotoDocumentor Version 2.0

By John Melville, MS, MD



Copyright © 2014 Business Casual Software LLC

Useful Keyboard Shortcuts

Throughout the program

	Make new text expansion
	Begin / End Audio Recording
	Save the current file
	Restore the last deleted item

In the Image Analyzer

	Close the image analyzer
	Delete the current tool
	View the image analyzer full screen
	Resize the image to fill the screen (Home)
	Rotate the image 90 degrees

In the Image Comparer (In addition to keys above.)

	Swap front and back image
	Show image comparer full screen
	Set image to manipulate
	Zoom image in or out
	Move the image
	Rotate the image
	Decrease / Increase the size of the changes.

In the Trace Evidence Screen

	Create a new item in this item's parent folder
	Create a new folder in this item's parent folder
	Create a new item in this folder
	Create a new folder in this folder

	Previous / Next Page
	Zoom page to fill screen (Home)
	Rotate the page 90 degrees

In the Scanned Items View

	Previous / Next Page
	Zoom page to fill screen (Home)
	Rotate the page 90 degrees

In the Form View

	Insert a blank line into the form
	Move the blank line up and down in the form
	Fill in the default value for this field
	Copy from another instance of this form
	Paste from a numbered slot
	Copy to a numbered slot
	Copy the entire form to clipboard as text
	Structured paste
	Structured interview question
	Go to the next field
	Navigate fields

Inside the Image Preview

	Previous / Next Image
	Rotate the image 90 degrees
	Show the image full screen
	Open the image analyzer

In the Traumagram

	Zoom page to fill screen (Home)
	Add a trauma point

Introduction

Welcome to this introduction to PhotoDocumentor. PhotoDoc is an electronic medical record designed specifically for use in medical forensics. PhotoDoc's tools can be divided into the following major tasks:

- Acquire information from a variety of sources, including cameras, scanners, x-ray systems, and patient interviews.
- Organize this information into meaningful units.
- Analyze forensic information using state of the art audio and image processing tools and PhotoDoc's unique image comparison tool.
- Report the results of a forensic analysis.

The present course will focus on PhotoDoc's image analysis and comparison functions. The images and examples used in this course come from forensic odontology. A demonstration in the afternoon of Day 1 will showcase some of PhotoDoc's functionality that is not covered in this course.

Please indulge me in a little bit of history here. I wrote PhotoDoc because, as a child abuse pediatrician, I needed it. Before medical school, I completed a master's degree in computer science with an emphasis in computer graphics. It irked me that I was trying to make important diagnostic decisions based on digital images without even the basic tools that came standard on my lab workstation as an undergraduate. As my career advanced from a part time SART examiner through child abuse fellowship and now as a child abuse subspecialist, my needs expanded and PhotoDoc grew up with me.

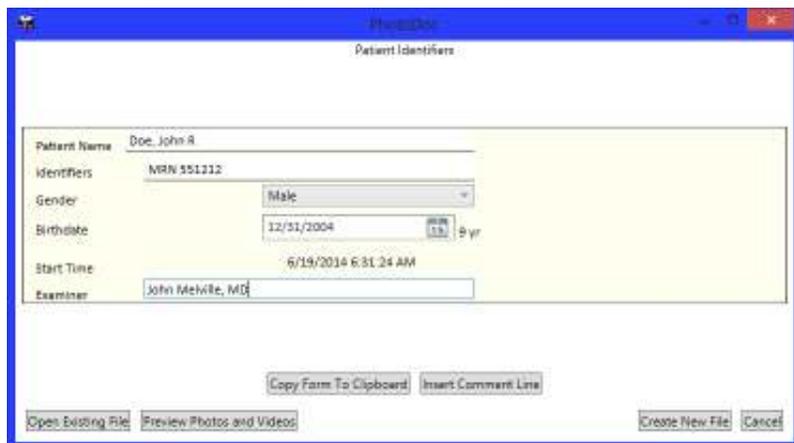
Now you have it. PhotoDoc is my labor of love and I hope you find it useful. Please send me comments, but especially your criticism, at JohnMelville@gmail.com. Now, on to the course!

John Melville, MS, MD

Table of Contents

Importing and Organizing Images	4
Crawl: Basic Image Comparison	9
Walk: Rectification	13
Breather: Other Features of PhotoDoc.	19
Run: Advanced Rectification and Measurement	23
Homework	27
Day 2	27

Importing and Organizing Images



When you start PhotoDoc for the first time, PhotoDoc presents the new file dialog. Enter the patient name, date of birth, gender, name of the examiner, and identification numbers(s) pertaining to this patient.

You could also open an existing file by clicking the button. Previewing photos and videos will be addressed later.

Click the “Create New File” button to select a name and location for this file. Once you create a file, PhotoDoc will automatically save your work every 30 seconds. You can also save your work by pressing **CTRL + S** on the keyboard.



PhotoDoc opens the Folder View. Information in PhotoDoc is stored in pages. Folders contain pages or other folders. Right now this folder does not have any pages in it.

On the left hand side of the screen you see the patient demographic information and a number of command buttons.

The grey bar on the right is the Sidebar. The sidebar provides access to other pages, photos, or recorded audio, regardless of what page is opened. Click the buttons to open the sidebar pages. Click again to close.

The name of the folder is “Folder.” Like most names in PhotoDoc, you can double click the name of the folder to change it.

In the commands on the left, click the New Page button.



The New Page view shows the different kinds of pages PhotoDoc supports.

- Folders hold and organize other pages.
- Trace Evidence pages document evidence collection and print labels for evidence items.
- Photos pages hold digital photographs and videos.
- Interviews recorded with PhotoDoc live on Audio Pages.
- Photo Comparison pages are the topic of the next lecture.
- Document pages feature a simple word processor for reports, letters, and etc.
- Traumatograms and Traumatogram Keys document the location of injuries on the body.
- Growth charts document growth in children and serve as indexes to scanned items.

Select a new Photo Sheet and click OK.



Do the following operations to import and organize photos.

1. In a Windows Explorer window, open the folder \PhotoDoc Training\Lec 1 Fundamentals\Doll Photos on the training CD.
2. Select all of the photos by pressing **CTRL** + **A**
3. Drag the files to PhotoDoc.
4. Rearrange the photos by dragging and dropping them.
5. Select a photo by clicking it. Select multiple photos by clicking while holding **CTRL** or **SHIFT** .
6. Select some Photos and click the delete photos button.
7. Press **CTRL** + **ALT** + **Z** to undelete the photos you just deleted.
8. Double click one of the photos.



Photo Preview allows you to rapidly flip through a group of photos to get the gist of it.

- **PG DN** / **PG UP** Flips forward / backward through photos.
- **HOME** / **END** Rotates the image by 90 degrees.
- **A** Opens the image analyzer, which is covered in the next lecture.
- **F** Displays the photo in full screen mode.
- **ESC** Closes the Photo Preview

The Photo Preview displays the camera make, model, date, and GPS coordinates, if present in the image metadata. To hide this display, put the mouse pointer on top of it.

Press the **CTRL** key, release it, and then press **CTRL** and hold it down. You must do this sequence of key presses within one second.

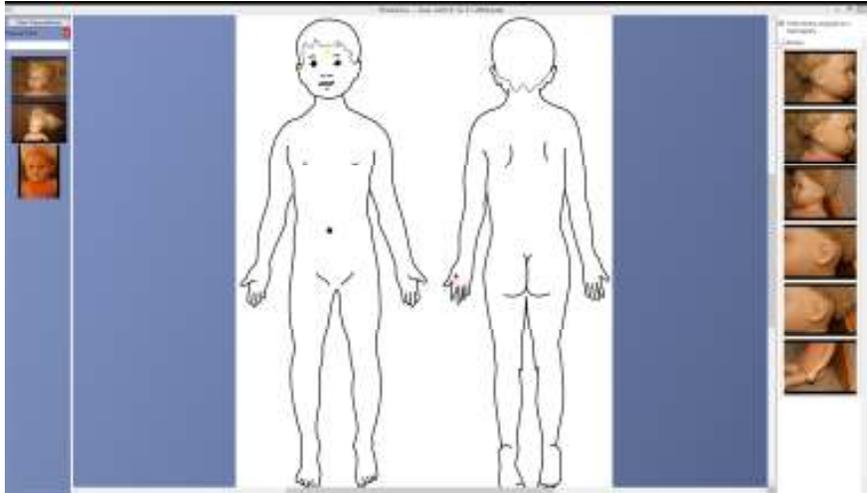
PhotoDoc shows the on-screen magnifier tool. The on-screen magnifier makes a small portion of the screen twice as big. You can move the magnifier with the mouse. The magnifier will show up until you release the **CTRL** key.



The on-screen magnifier works throughout PhotoDoc. The on-screen magnifier is a convenient way to check details while working on an image. Later you will learn about zoom, which is helpful for defining the part of an image you are working on.

Release the **CTRL** key to end the magnifier. Press the **ESC** key to close Photo Preview and return to the Photos Page.

Press the **F12** key, or click the Folder Button in the upper right to return to the Folder view.



Insert a traumagram into the current folder:

1. Click the New Page button.
2. Select Traumagram
3. Double click a picture to insert a traumagram.

Sort photos anatomically

1. Click the Photos button on the right to show the Photos sidebar.
2. Check the “Hide photos assigned to a traumagram” box.
3. Select one or more photos using **SHIFT** or **ALT** while clicking.
4. Drag the photos to the traumagram.
5. Type a description of the point in the text box on the right.

Add a second traumagram and add some trauma points to it

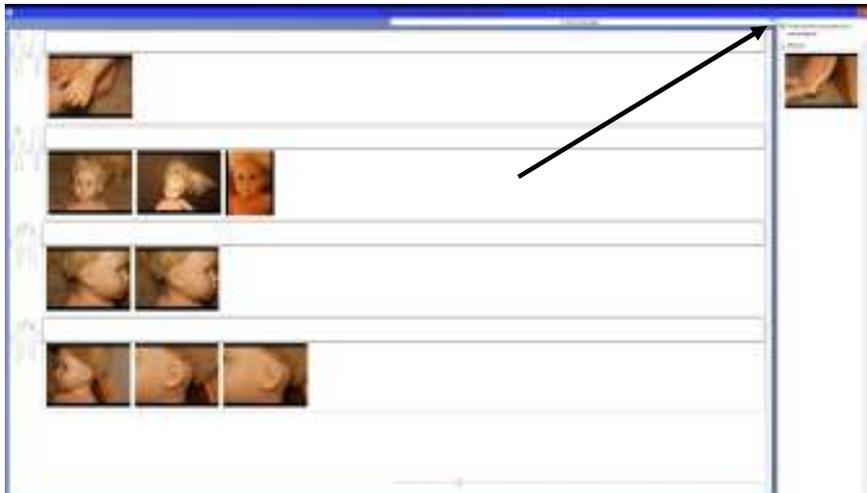
Add a traumagram key.

1. Press F12 or click the Folder button to show the folder.
2. Double click the name of one of the traumagrams, and type a new name in the box that appears.
3. Click the New Page button.
4. Double click the Traumagram Key item.

Notice that you can drag photos between the trauma points and the photo sidebar.

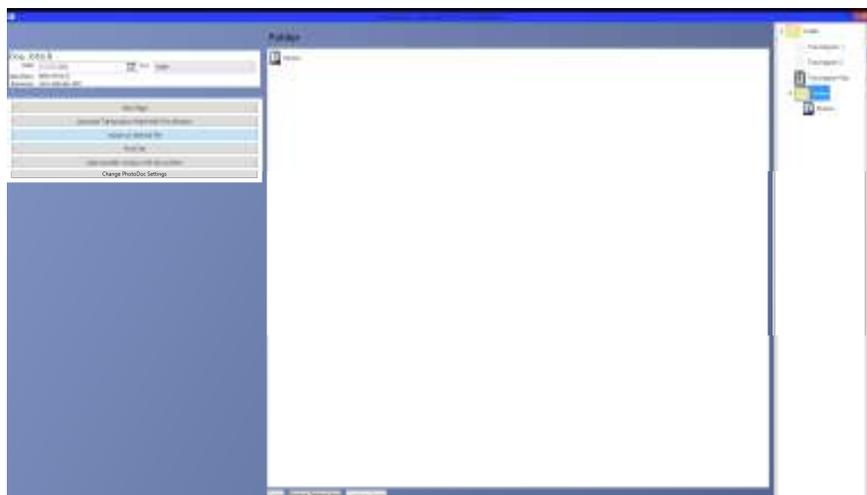
Determine which traumagrams are listed in the key.

1. Press the down arrow indicated in the image.
2. Select and unselect traumagrams to be included in the key.



Press F12 to return to the folder view.

Rename the “Photos” page.



Create a folder.

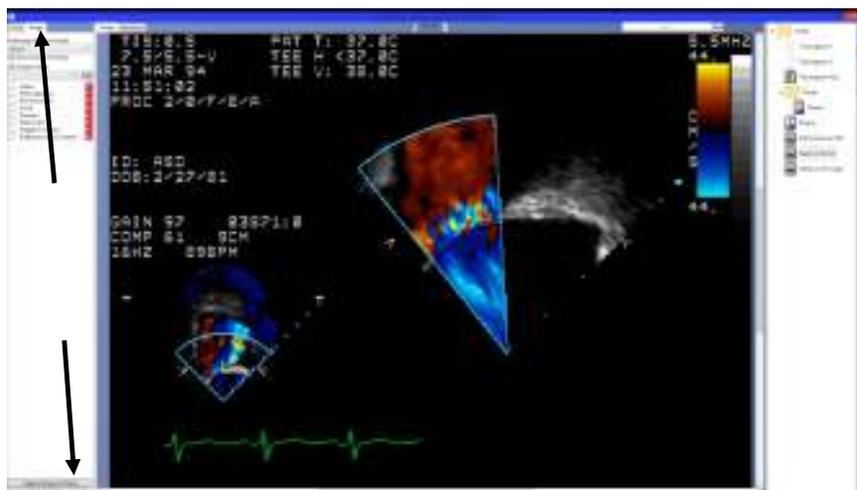
1. Click the New Page button.
2. Double Click Folder
3. Click the Pages button on the right.
4. Drag the Photos Sheet into the Folder.
5. Double click the word "Folder" and rename it.
6. Press F12 several times to select the root folder.

Import additional Images

1. Click the "Import External File Button"
2. Navigate to the \PhotoDoc Training\Lec 1 Fundamentals\Photo Types folder on the student CD.
3. Select all of the files (using **CTRL** + **A**) and click Open.

Observe what has happened.

- There was no photo page named "Photos" in the root folder. PhotoDoc created one and put the two JPEG images, which only have one frame, on that sheet.
- The PDF, DICOM, and TIFF image each could have multiple frames (even though the TIFF image does not.) PhotoDoc creates a Scanned Document Page for each.



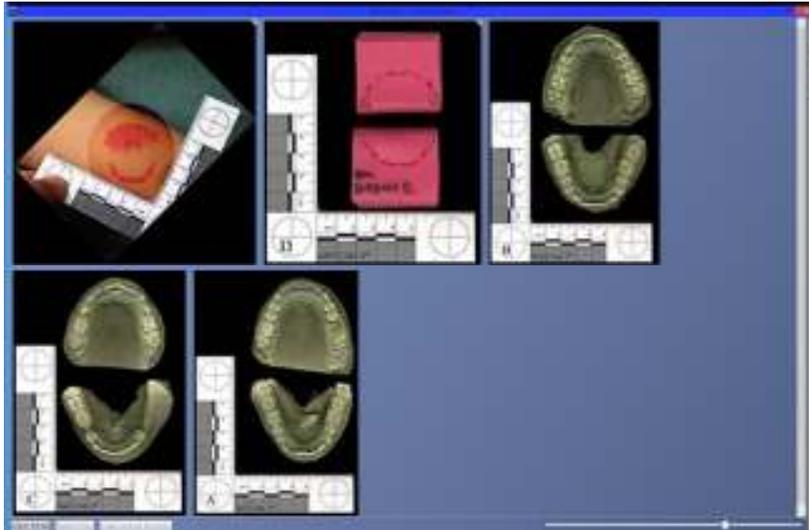
To make a Photo from a Scanned Document.

1. Double Click the scanned document.
2. Select the appropriate page using **PG DN** / **PG UP** .
3. Click the Image tab on the left hand tool box.
4. Click the Capture Page as Photo button.

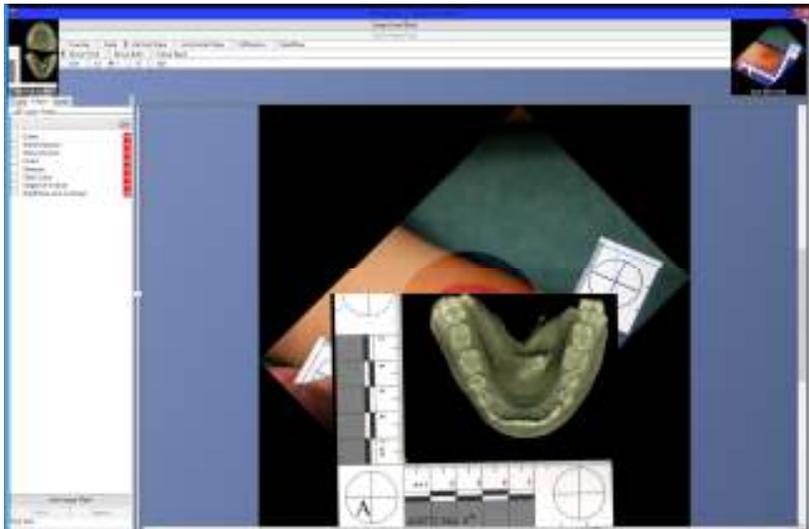
After creating a photo, you can delete the scanned document, if desired.

1. Press F12 to go to the folder.
2. Click the Page to Delete.
3. Click the Delete But
4. Press **CTRL** + **ALT** + **Z** to undelete the page.

Crawl: Basic Image Comparison



1. In a Windows Explorer window, open the folder \PhotoDoc Training\Lec 2 Basic Image Comparison on the training CD.
2. Double click the file "Lecture 2.pda"
3. Double click the "Photos" page.
4. Review the photos. We will attempt to match the bite mark to one of the dental models.
5. Press F12 or click the Folder Button to go to the Folder View.
6. Click the "New Page Button"
7. Double click "Photo Comparison."

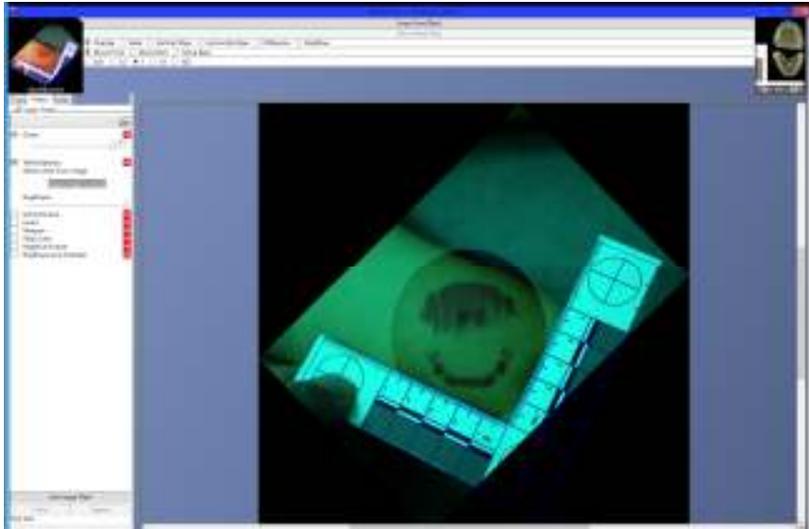


1. Click the clock in the right upper corner. Double click the bite mark photograph. This is the back photo.
2. Click the clock in the left upper corner. Double click the model for suspect A. This is the front photo.

The photo comparator shows two photos, a front and a back photo. In general you will manipulate the front photo. Swap the front and back photos by pressing **PG UP** or **PG DN**.

The first row of radio buttons controls how the two images are combined. Press **C** to cycle through the comparison options. Some of the options display a slider control. You can also control the slider by right clicking on the image and dragging the mouse.

Press the **PG UP** key to make the bite mark the front photo.

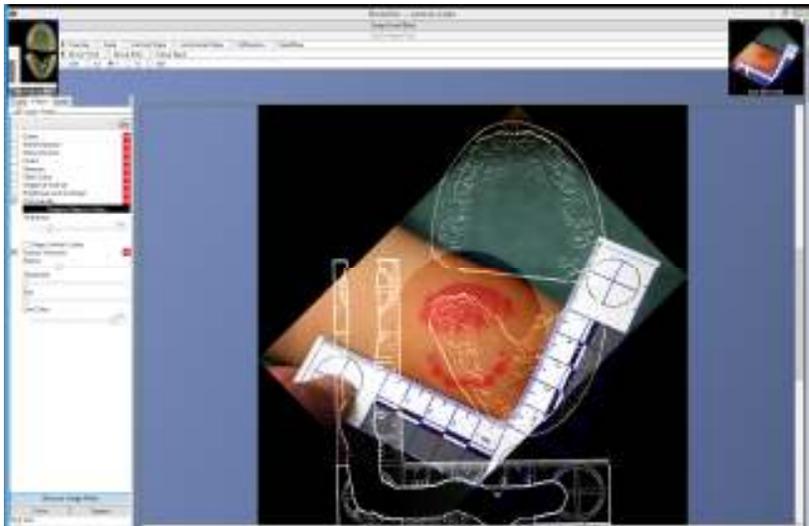


Click the Filters tab in the tool box on the left. Filters can make a bite mark clearer. Click the box to apply various filters to the front image. Drag and drop filters to change the order in which they are applied.

The White Balance Filter requires you to pick a color. Drag the mouse from the “Drag to select a color” box until the cursor is over something white, and then release.

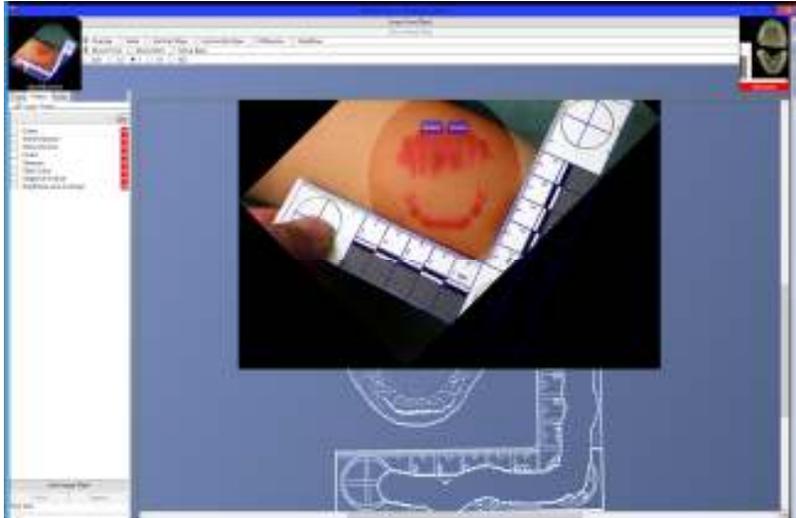
After trying out several filters, press **PG UP** to make bring the dental model to the front.

In the drop down above the filters, select “Chroma Key” and click Add. Then increase the threshold until the black background disappears. (Chroma Key defaults to black. You could have picked a color to eliminate, like you did with the white balance.)



1. Click the “Use Image Mask” button.
2. Click the “Circle” Button.
3. Erase the ruler by left-clicking and dragging over it. Use Right click and drag to restore parts of the image.
4. In the drop down box above the filters select “Hollow Volumes” and click “Add”. Use the “Radius” slider to select thicker or thinner lines, and the “Threshold” slider to eliminate finer lines.
5. On the little image on the upper left, click “Not Mirrored” to flip the image over.

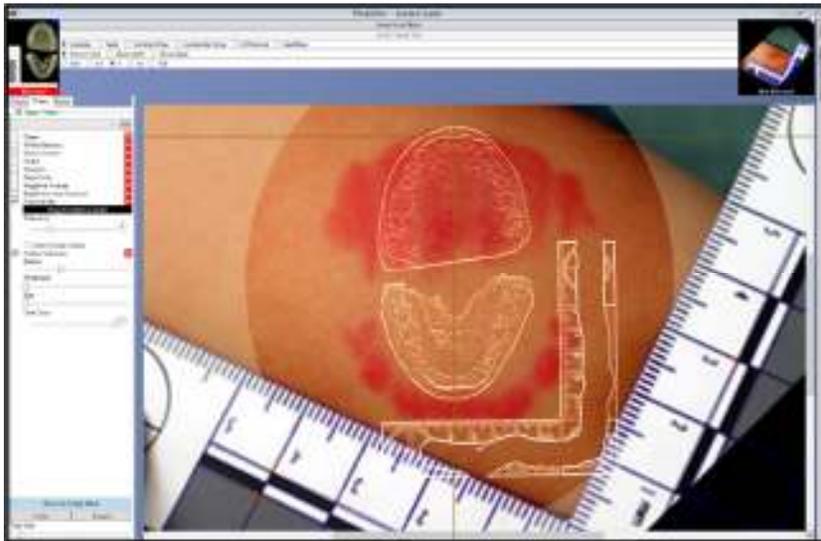
At this point you have a flipped hollow volume overlay, the remaining task is to line it up with the bite mark beneath it.



1. Press **PG UP** so that the bite mark is the front image.
2. Click and drag the image so that the upper arch is centered near the top of the screen. Two patches labeled "Rotate" and "Zoom" appear.

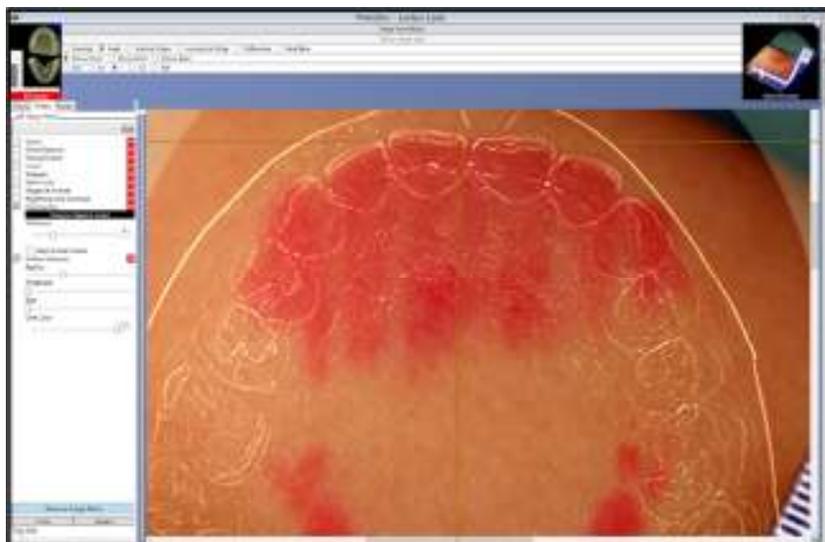
Rotations and zooms each have a "center of transformation." The COT is the one point that will not move during the rotation or zoom. When you double click the image you set the COT. The COT is exactly halfway between the two patches.

3. Click the "Zoom" patch and drag the mouse forward and backward. This makes the image bigger and smaller.
4. The "Rotate" patch works similarly to rotate the image around the patches



1. Press **PG UP** to move the bite mark to the back layer.
2. Drag the dental model so that the center of the arch overlies the center of the arch in the bite mark.
3. Along the left and top sides of the comparer are two yellow lines. Drag them such they cross at the apex of the dental arch, as noted in the image to the left.
4. Line up the two images using the following keys:
 - **↑** **→** **↓** **←** move the image.
 - **+** **-** make the image bigger or smaller.
 - **HOME** **END** rotate the image.
 - **]** **[** make each keystroke have less or more effect.
 - **W** controls whether keys move the front image, the back image, or both

The point where the yellow lines cross is the center of transformation for zooming or rotating an image from the keyboard.

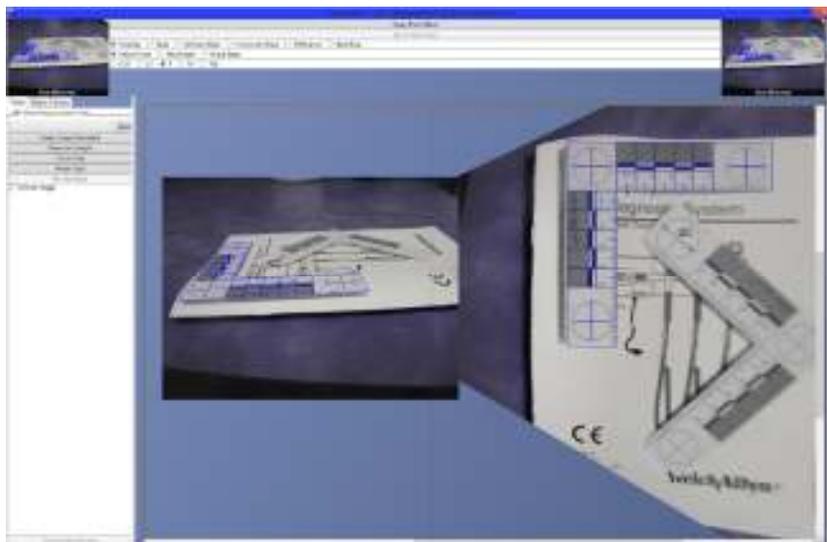


After all that work, the bite mark doesn't match. (Curse your instructor for that.)

Fortunately, you have three other suspects to consider.

Happy practicing.

Walk: Rectification



In the prior lecture we focused on comparing images by lining them up in the photo comparer and combining them in various methods.

In the last chapter, we used the photo comparer to align and compare images. This analysis, however, ignores one of the fundamental differences between bitemarks – their size. By exploiting a ruler, such as an ABFO No 2, in the photo, we can ensure an apples-to-apples comparison.

Some photos, like the photo on the left, suffer from photographic distortion. The OrthoView feature in PhotoDoc can correct some types of distortion. The photos at the left demonstrate rectification.



1. In a Windows Explorer window, open the file \PhotoDoc Training\Lec 3 Measurement and Rectification on the training CD.
2. Double click the “Measurement Photos”
3. Double click the photo to show the photo preview.
4. Press **A** or click the “Analyze” button to show the Image Analyzer.

The Image Analyzer should look familiar – it is a photo comparer with only one photo. More correctly, the photo comparer allows alignment and combination of two image analyzers. In this lecture we will use the image analyzer to evaluate a single image.

This image has two ABFO No 2 rulers we can use for measurement and rectification. We need to tell the computer where the rulers are by overlaying an electronic ABFO No 2 on top of each physical ruler.



1. Click the empty drop down box directly under the text “Show Measurement Tools” and select ABFO # 2.

You will see that PhotoDoc has a number of rulers defined. The virtual ruler must match the physical ruler in the photograph exactly. Virtual rulers are actually small programs that describe the ruler in detail. Custom ruler development services are available from Business Casual Software.

2. Click the Add button.
3. Click and drag on the image to show the virtual ruler.

The next step is to associate points on the virtual ruler with points on the actual ruler in the photograph. If you click on a point, it will turn yellow, indicating that it is the point to be moved. Once you have selected the point to be moved, move it by:

- Clicking the point and dragging it with the mouse, or
- Move the point one pixel at a time using the  keys.

Click on the photograph. The point that used to be blue (and then yellow) is now red, meaning it is a “bound point.” You have told PhotoDoc where that point should show up in the picture. PhotoDoc tries to guess the location of the blue, unbound points from the position of the bound points.

To unbind a point click on it and then click the “Unbind Point” button.





Continue dragging points to the appropriate places in the image until PhotoDoc guesses the remaining points correctly.

The tool works best if you choose points that are:

- As far apart as possible.
- Do not have multiple points in a straight line.
- Are not on the edges of the ruler.

As you add more points, you will notice that each point has less of an effect. For best accuracy, use at least 4 points.

To place points more accurately, use the magnifier by pressing **CTRL** twice within 1 second and then holding it down.





Next, click the Show OrthoView button. (The Show OrthoView button is only enabled when one of the ruler's points is selected.)

The computer shows the rectified image. You will notice that the image is small. You can zoom into the image by double clicking and dragging the zoom button up.

If you have previously zoomed in, you may not see all of the rectified image. Press the **H** key to zoom out to the entire image.

Press the "Clear OrthoView" button to undo the orthoview.

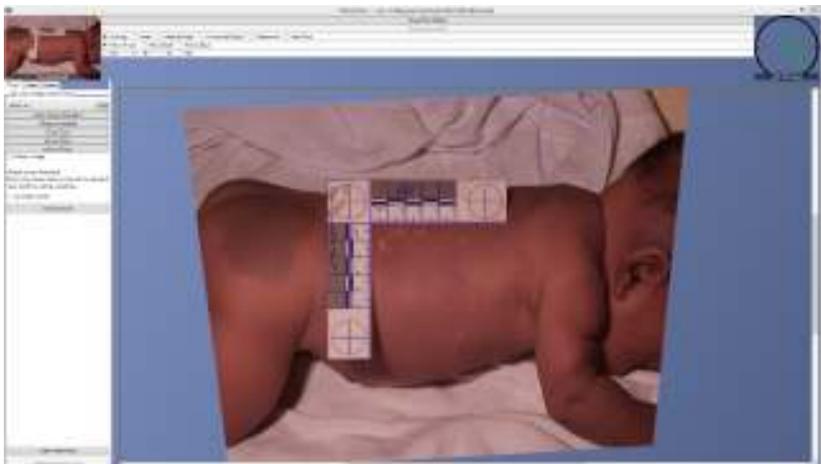


1. Click the "Measure Length Button."
2. Click on the photograph and drag to another location in the photograph. A ruler shows up with the distance between the two points.
3. Notice that you can move the ends of ruler by clicking on them and then dragging them or using the **↑** **→** **↓** **←** keys.

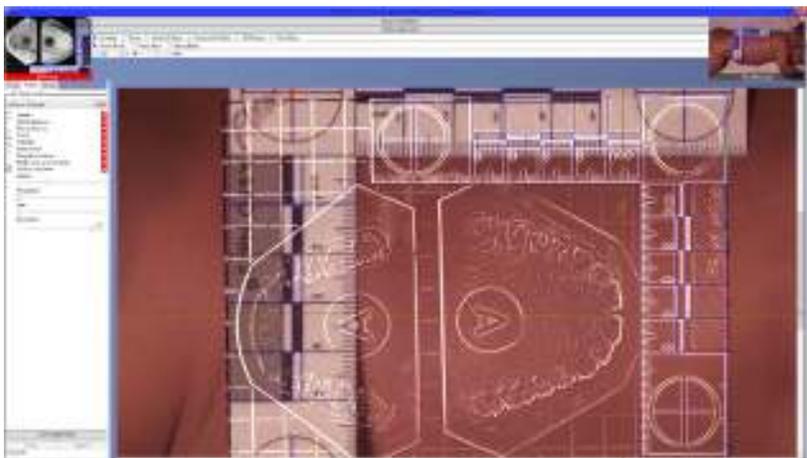
Once you are done, press **ESC** to close the image analyzer.

Close the photos page by pressing F12 or clicking the Folder button.

Create a new image comparison page.



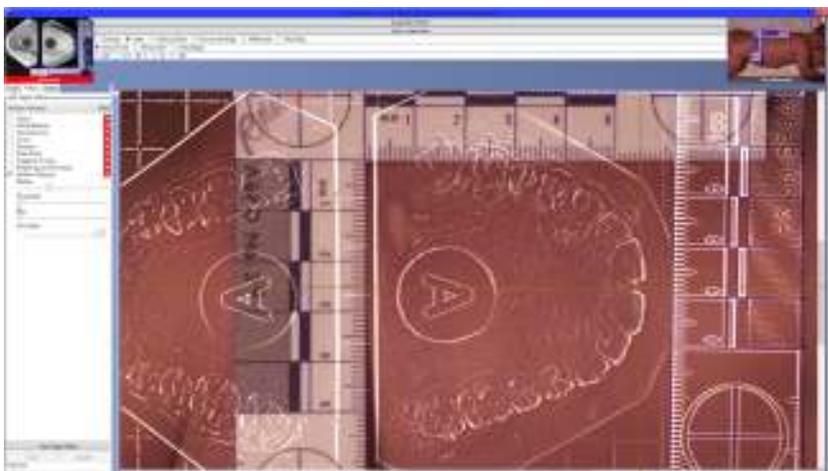
1. Load the bite mark photo pictured on the left into the front frame.
2. Overlay an ABFO #2 ruler on top of the photo. Set at least 4 corresponding points.
3. Click the "Show OrthoView" button to rectify the image.
4. Arrange the image so the bite mark fills most of the screen.
5. Press **PG DN** button to move the image to the back frame.



1. Load the dental model labeled "A" into the front frame of the comparator.
2. Overlay an ABFO ruler and rectify the image.

Notice that in this case, the image is already rectified. We still get benefits, soon to be demonstrated, from rectifying the image. Specifically, the computer can use the ruler to determine how big the image is.

3. Mirror the front image by clicking the "Not Mirrored" bar on the preview.
4. Open the filters tab and enable the Hollow Volumes filter.
5. Arrange the yellow cross hairs as shown to the left.
6. Click the "Set to Same Size" Button.

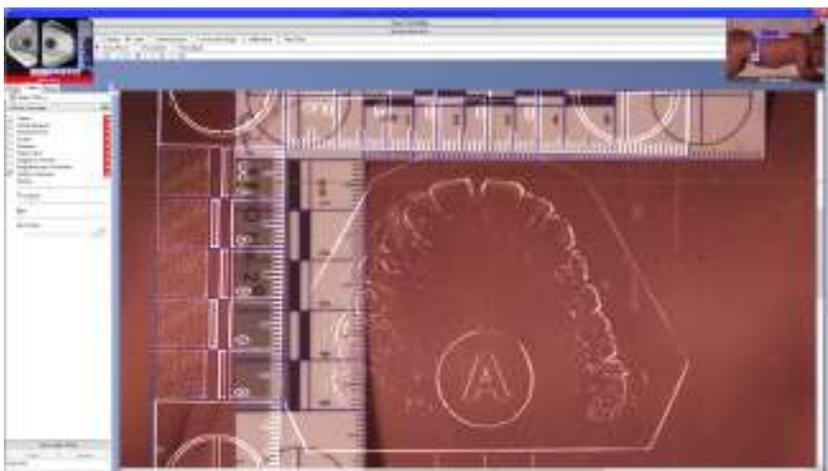


Because both images are rectified, the computer can compute the relative size of the two layers. The button sets the scale on the front frame to match the scale on the rear frame.

Use the Photo Comparator controls to align the images and ... that one doesn't work either. (Double curse your instructor for that.)

Luckily there are another four suspects to consider.

Notice that your ever accommodating instructor has already created rulers on the other four models for you.



As a challenge, go back and do the analysis from Lecture 2, using the rulers and rectification. Notice the improved match using the rectification technology.

Breather: Other Features of PhotoDoc.



PhotoDoc was designed as a comprehensive electronic medical record for medical forensics. I have designed new features as they became necessary in my practice as a sexual abuse examiner and then a child abuse pediatrician. In this lecture, I will briefly illustrate many of the features of PhotoDoc not covered in the remainder of this training.

Video is gaining increasing importance in documenting forensic examinations. Unfortunately many practitioners fail to recognize the importance of quality forensic video analysis tools. In this segment we use the PhotoDoc video analysis features to resolve an important forensic question – was it a face mask foul or not?



Sometimes the first problem for a forensic scientist is merely organizational. Information comes from a variety of sources and often in a variety of formats. The forensic scientist often must organize the data, and separate the wheat from the chaff.

PhotoDoc has built in support for many of the file formats most likely to be seen in medical forensics. You have already seen support for many image and document formats. PhotoDoc imports many different video formats. PhotoDoc supports forms and a word processor (shown later) for examiner's notes and reports.

Eventually though, you will find a file that PhotoDoc does not support. PhotoDoc will hold and organize files it does not recognize. This allows you to keep all of your case information in one place.



Forensic information comes from a wide variety of devices, but many of them can create a file when new information arrives. PhotoDoc can monitor a directory, informally the dump directory, and automatically import new information as it arrives. Additionally, new photos are shown immediately after being imported.

The auto import feature is controlled through the “PhotoDoc Options” dialog and is on the “Hardware” tab.

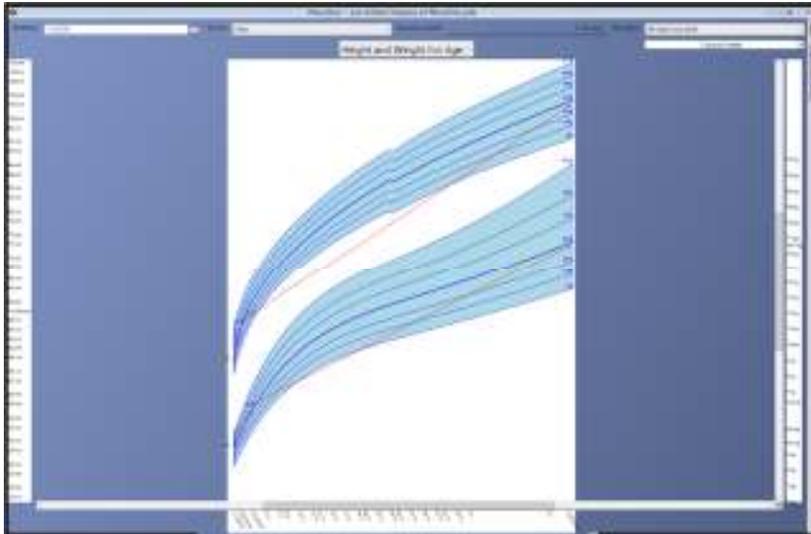


PhotoDoc includes multiple features for handling scanned documents. You have already seen that pages of a document can be converted into images for analysis. Similarly, a scanned document can be created from multiple images.

Documents can be split and combined on the computer. This is an efficient mechanism to organize a large stack of paper – just scan it in and organize it later.

Bookmarks allow the examiner to call out important features for further review.

The document page can be closely integrated with the growth chart page, this allows the examiner to create a linked index to the document content.



I mentioned that PhotoDoc was written by a pediatrician, didn't I? PhotoDoc includes specialized tools for the assessment of failure to thrive in children. Features include:

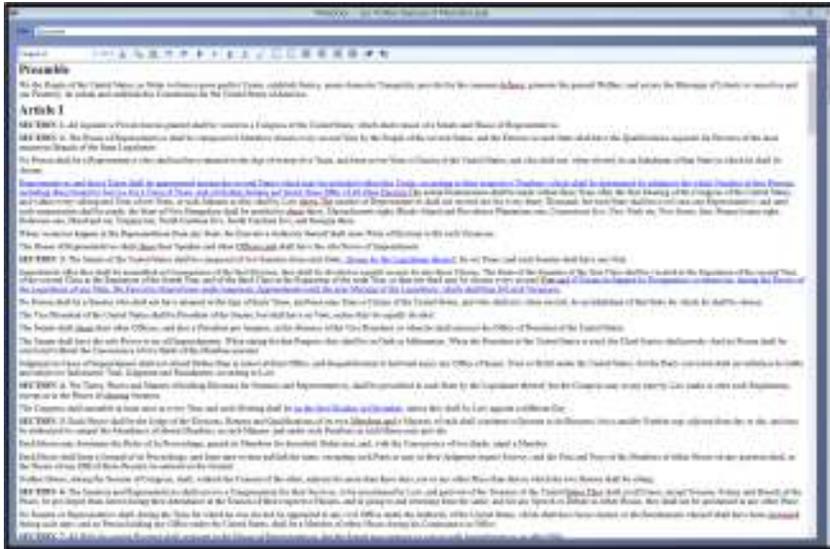
- Standardized NHANES growth charts from age 0-20 yrs including length, stature, weight, head circumference, and body mass index for age. Weight for height graphs are also supported.
- Integrated conversion between metric and imperial units.
- Tool tips highlight events occurring at various points on the graph.
- Computes graphs and percentiles corrected for prematurity.



Professionals responding to sexual assault are frequently tasked with collecting trace evidence. With this collection comes the responsibility to properly label and package the forensic evidence.

The trace evidence screen allows the user to pre-define "kits" of commonly collected trace evidence. PhotoDoc will print individual evidentiary labels for each piece of evidence. This ensures that

1. Evidence on the manifest is not omitted from the kit.
2. Evidence in the kit is not omitted from the manifest.
3. Evidence labels on the envelopes match the manifest.



The document page is ... well it's a word processor. Kind of hard to get excited about but kind of important to have.

I use the documents page for letters, reports, and etc. It keeps all of my information and work about a case in a single place.

The spell checker features a medical dictionary. Quick phrases and structured interviews work in the document view as well.



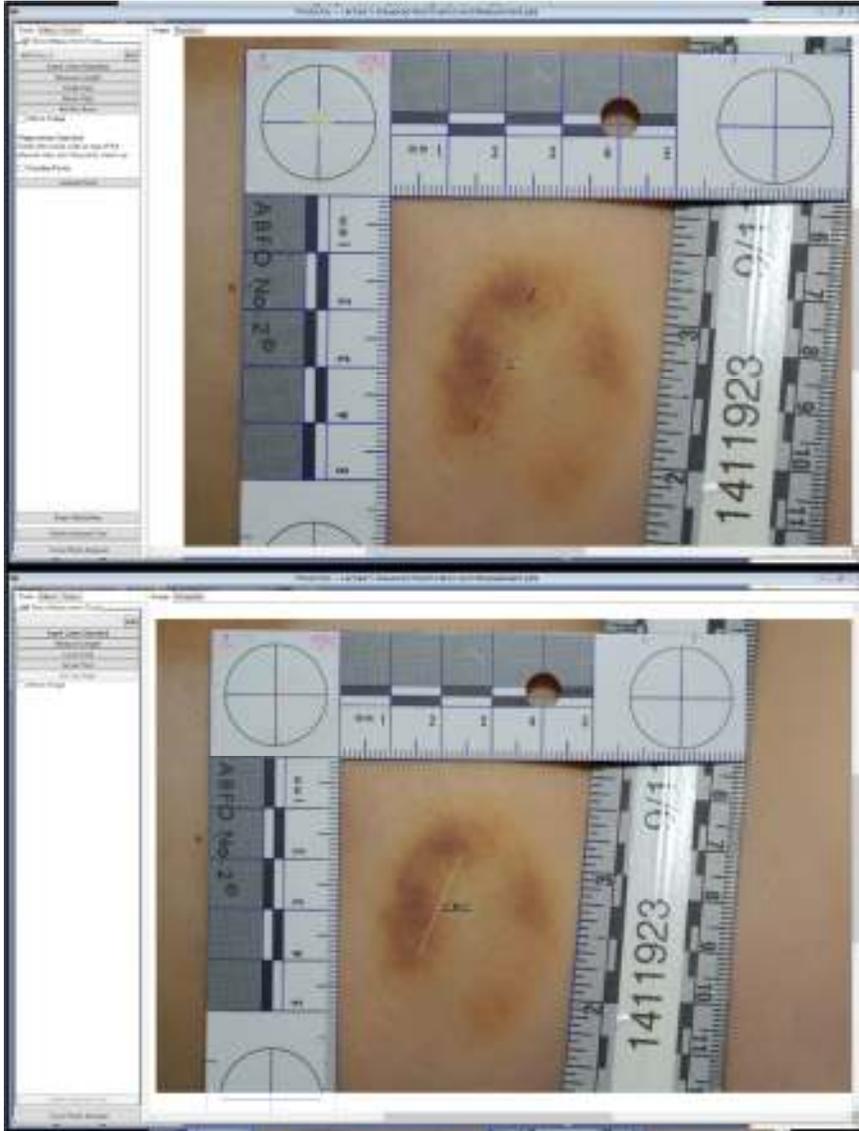
Individualized and task specific forms have the ability to improve efficiency, consistency, and quality of care. Specific features of the PhotoDoc forms engine include:

- Expanding regions provide case-specific guidance
- Quick phrases
- Default entries
- Duplicate entry from a different form
- Insert comments anywhere in a form.

Photodoc records audio during clinical interviews. The interviewer can insert timestamps for future transcription. A transcription pedal allows the examiner to play, rewind and fast forward audio. More advanced audio filters are also available.

The transcription pedal has other uses throughout PhotoDoc that will be demonstrated in class.

Run: Advanced Rectification and Measurement



PhotoDoc rulers can be used for purposes other than rectification, they are also quite serviceable as rulers as well. To illustrate, open the “Lecture 5 Advanced Rectification and Measurement.pda” file in your student materials.

Open the photo sheet named “Linear Standard” and open the first photo in photo analyzer. Align the ABFO No 2 ruler over the given ruler, using at least four bound points.

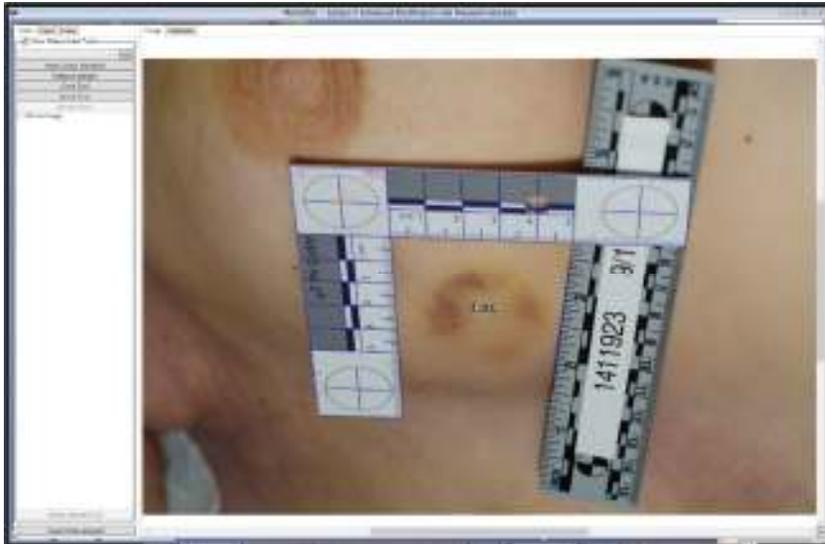
Click the “Measure Length” button then click and drag over the image to create a measurement tool. Use the tool to measure several lengths, as illustrated to the left.

So far we have assumed that all photos would have an ABFO # 2 right angle ruler. Let us presume however, that the ABFO #2 ruler was not present.

Click the “Insert Linear Standard” button and drag the standard on the linear ruler. Set the length of the standard to 2 inches in the pane to the left (press **U** or **X** key to switch units.)

When two or more rulers are present, PhotoDoc shows the range of measurements. Here we see strong agreement between the two rulers because the image is already rectified.

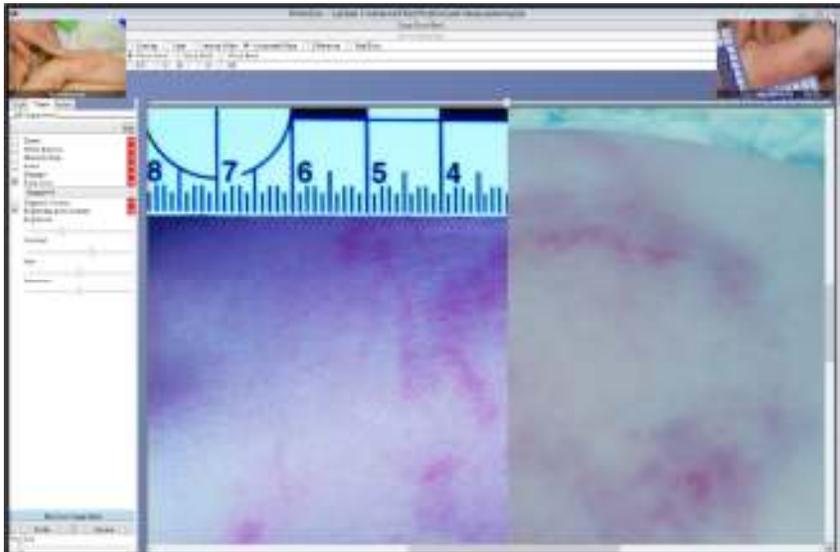
Notice that the linear standard can be used to “Show Orthoview” the Orthoview of the linear ruler does not change the plane of the image.



Open the second image from the “Linear Standard” set in the Image Analyzer. The ABFO ruler has been set for you. Define a linear standard. Measure some lengths. Notice that the linear standard is much less accurate when the photo is not rectified.

Show Orthoviews using the ABFO No 2 and the linear standard as the ruler. Notice that an orthoview of the linear ruler does not change the image.

Next, look at the three images in the “Ad Hoc Rulers” folder. Notice that we have a good photo of the bite without the ruler, a fair photo of the bite with a ruler, and a dental model. We wish to compare the bite without the ruler to the dental model, using the ruler in the second photograph to rectify the first.

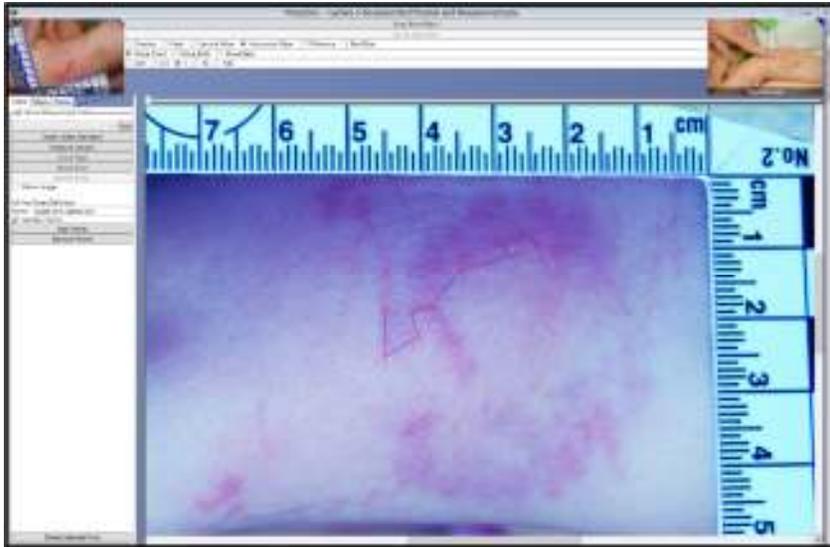


Create a new Photo Comparator page. Load the image with the ruler and the bite image without the ruler into the front and back cells. Notice that the ruler has already been overlaid for you.

Move the photo with the ruler to the front and click the “Filters” tab. Check the “False Color” box and select false color preset # 6. Notice the improvement in contrast. Check the brightness and contrast box to optimize the hue, brightness and contrast of the bite mark.

Press **PG DN** to bring the other image to the front. Repeat the process to enhance the other image.

Roughly align the bite marks. You will be working on the arch of the bite nearest the ruler. Click one of the red points on the ruler to select the rule.



When you select the ruler, the “Ad Hoc Ruler” button lights up. Click “Ad Hoc Ruler.” The ad hoc ruler is based upon, and will be no more accurate than, the ruler that it derives from.

Click 8-12 points in the first image. It is important to select points that you will be able to replicate in the second image. Try to avoid straight lines and pick points that are as far apart as possible.

It is absolutely essential that the points you select lie in the same plane. I do this by rectifying one arch at a time.

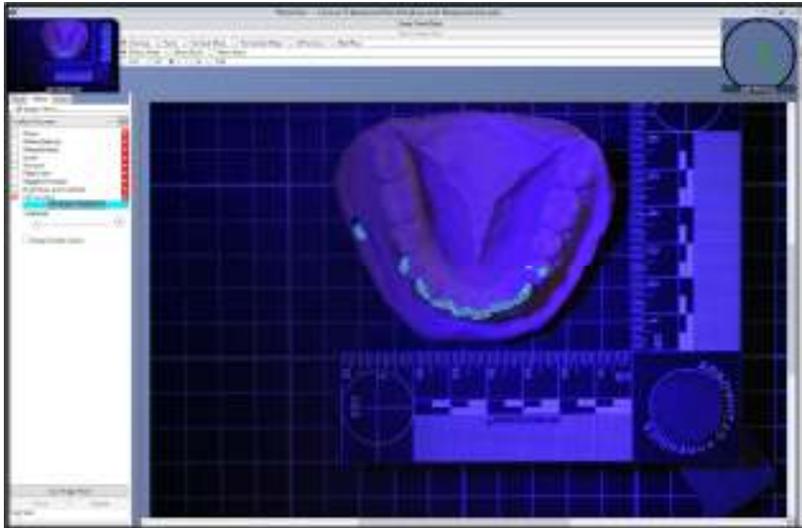
Name your ad hoc ruler by typing the name in the text box in the tool box on the left.



Press **PG DN** to switch to the other image. Select your ad hoc ruler in the drop down box in the tool box and click the “Add” button. Drag the ad hoc ruler over the image like any other ruler.

Place the points of the ad hoc ruler over the points on the bite mark corresponding to points in the original image. Place four or more points, but leave several points unbound. Use the unbound points to check the accuracy of the match.

To check the ad hoc ruler, rectify the image with the ruler using the ruler. Rectify the image without the ruler using the ad hoc ruler. Overlay the ad hoc rulers and ensure that the marks overlie one another.



1. Create an additional Photo comparator.
2. Load the blue dental model image into the front frame. Notice that a ruler has been defined for you.
3. Select the "Filters" tab.
4. Select "Chroma Key" from the drop down and click "Add."
5. Drag the "Drag to Select Color" bar to the green spots on the occlusal surfaces of the teeth.
6. Increase the Tolerance until the green spots disappear.
7. Check "Keep Similar Colors" to show only the green spots.
8. Select "Hollow Volumes" from the drop down. Click "Add."
9. Decrease the radius until a thin hollow volume remains.
10. Rectify the image using the ruler and flip it over.
11. Click the Tools tab. Uncheck "Show Measurement Tools" to hide the, now unnecessary, ruler overlay.



1. Load the image of the arm without the ruler into the photo comparator.
2. Rectify the image using the ad hoc ruler.
3. Hide the ad-hoc ruler.
4. Compare the images. Notice that all the PhotoDoc features work, including the same size feature.

What is going on here? Recall that a ruler in PhotoDoc is just a bunch of points that the computer knows their real world relationships. Because the first photo had a real ruler, PhotoDoc could compute the real-world location of each point, and thus the relationship between each of the points. This made a ruler indistinguishable from any other. In essence, the bite mark becomes its own ruler and everything works as normal.

Homework

On the student CD the Homework folder there are 173 photos documenting bite marks on a child with oral photos and dental molds of a single subjects. Using these images do the following:

1. Organize the photographs to better understand the images provided.
2. Use the image filters to enhance the bite marks.
3. Rectify several images containing rulers and compare them to the dental molds.
4. Several of the dental mold photos contain calipers. Compare measurements using PhotoDoc's length tool to the calipers.
5. Rectify an image without a ruler by creating an ad-hoc ruler.
6. Take a stand – did these teeth make these bites or not?

You will notice that several of these images include rulers that are not ABFO No 2. In your participant folder there is a file named "Instructor's Gift Bag. If you double click this file, PhotoDoc will install additional rulers that will help you complete the assignment.

Day 2

Day 2 is all about practice! Each of our dental faculty will briefly present a case. You will have about 40 minutes to work on the case, and to collaborate with fellow students. The faculty will then present their analysis and assessment of the case.