

Tiops Cephalometric Analysis: Superimposing Photos on Headfilms for shared simulation

Superimposing the lateral facial photo on the patients headfilm can be done effectively with the Tiops4 program. The program makes it possible to perform a simulation of the both images together using a common cranial base reference. The quality of the soft tissue analysis is now further improved due to the easier recognition of the soft tissue landmarks on the photo. This is essential especially when using X-rays with poorly defined soft tissue.

The program makes it possible to compare the soft tissue profile of the X-ray the Photo.

Procedure

1. The headfilm must first be digitized before beginning the photo overlay procedure.
2. Before starting the superimpositioning procedure make sure the photo has been saved in either .jpg or .bmp format and is located in an easily accessible location (e.g. desktop) or folder on the computer.
3. The program will automatically hide the background of the picture when the background has a uniform color. To use this option all pixels of the background of the photo must have the same color preferably gray or green. This can be achieved by taking the photo against a non-reflective surface of uniform color or by changing the background color by using the described [Photoshop procedure](#)
4. Now move to the label **Photo** and open the Photo segment using the right arrow key \leftrightarrow .
5. In the box **Filename** click on  or press $\langle \text{Ctrl} \rangle$ and \leftrightarrow simultaneously and an Open Dialog window pops up showing the content of the Photo folder. Browse to the relevant file at this location or an alternative place (desktop or folder) and click Open.



6. Now adjust the size of the photo to approximately fit the silhouette of the headfilm by changing the **ResolutionX** value (greater value, smaller image) and then click the **Consolidate** icon to place the Photo file in the designated Photo folder. This will at the same time also save the patients file.



7. The actual process of aligning the photo and the headfilm begins by pressing **<Ctrl>** and **<D>** or by clicking the Digitizer Start icon in the upper tools bar which initiates the overlay process.



Ctrl

D

8. You will now see the photo and the headfilm together with the **tracing aligned with the headfilm**. Some of the tool icons are inactivated to prevent you from performing incorrect procedures. However, instead some additional icons will now appear (see next page) and a help guide picture is displayed on the bottom right of the image window.

The screenshot shows the TIOPS4 software interface. The main window displays a patient's headfilm with a photo overlaid. The photo is being aligned with the headfilm's silhouette. The interface includes a menu bar (File, Edit, View, Stage, Simulation, Digitize, Variable, Statistics, Tools, Help) and a toolbar with various icons. On the left, there is a 'Maindata' panel with fields for patient information (Identifier, FirstName, LastName, BirthDate, EthnicGroup, Sex, Keywords, LateralRotation) and dental data (Stage1, No, Type, Date, Regimen, DateOfRusStages, RusStages, ForcedSkeletalAge, DateOfTeeth, NoOfTeeth, ForcedDentalAge, DateOfHeight, Height). Below this is a 'CDS' panel with fields for ChronologicalAge, DentalAge, SkeletalAge, MeanHeight, and PredictedHeight. The 'Lateral' panel shows the Date (13-12-07) and X-ray details (Filename, Mirror, ResolutionX, ResolutionY, Enlargement). The 'Photo' panel shows the Filename, Mirror, ResolutionX, ResolutionY, and Enlargement. On the right, there is a 'Picture Movements' section with instructions for Translate (Shift+LeftMouse => drag) and Rotate (LeftMouse => drag), and a 'Center of Rotation' set to 'prn'. Below this is a 'Terminate with' button and a 'Procedure Specific Controls' section with icons for various functions. At the bottom right, there is a 'Superimpositioning Procedure' section with the text 'Photo on X-Ray' and a red arrow pointing to the photo.

9. The next step is to move the photo so it aligns with the soft tissue profile of the headfilm and simultaneously precisely adapt the size of the photo by changing the ResolutionX value. 

- To **translate** the second film hold down the **<Shift>** key, hold down the left mouse button and release the **<Shift>** key. The picture can be translated when you move the mouse while continuing to hold down the left mouse button at the same time.
- You can **rotate** the second film by moving the mouse while holding down the left mouse button. The center of rotation is located at Pronasale (**prn**) on the first film, once the films are lined up on the facial profile

10. The Superimpositioning procedure can be made easier by using the tools below



A. Click to display **both** photo and headfilm <F4>



B. Click to display the **photo** only <F5> toggles between B. and C



C. Click to display the **headfilm** only <F5> toggles between C. and B



A. Click to **increase** the opacity of the **photo** in increments of 10% <F6>



A. Click to **decrease** the opacity of the **photo** in increments of 10% <F7>



B. Click to hide the **reference** tracing <F8>

C. Additionally you can use the zoom functions:  <F9-F10-F11>

11. Once you have resized and aligned the soft tissue profiles, press <Ctrl> and <R> or click on the Accept Reference icon. This locks the photo and the headfilm together.



12. After you have clicked the Accept Reference icon the headfilm disappears and only the photo is visible. A sequence of soft tissue points is then to be digitized beginning with the Upper Frontal Tangent point (uft). Each landmark is accompanied by an inserted picture showing its precise location and definition.

The screenshot shows the Tops4 software interface. On the left is a 'Maindata' panel with the following information:

Identifier	X2345
FirstName	Sam
LastName	Finckelstein
BirthDate	17-07-95
EthnicGroup	Caucasian
Sex	Male
Keywords	Growth adaptation
LateralRotation	0

Below this is a 'Stage1' dropdown menu with a list of parameters:

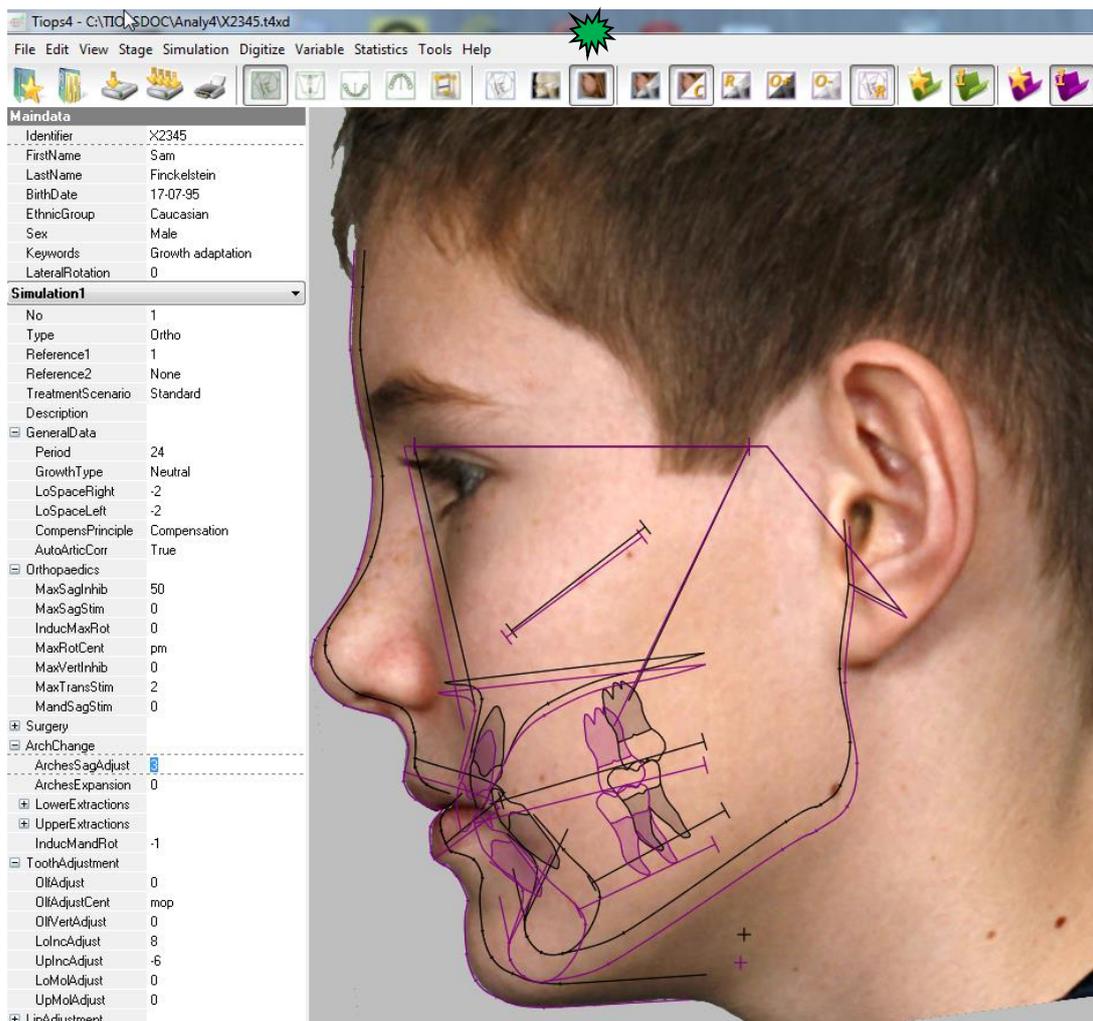
No	1
Type	MA
Date	13-12-07
Regimen	Standard
DateOfRusStages	13-12-07
RusStages	GF-FFF-FFF-EE-FFE
ForcedSkeletalAge	
DateOfTeeth	13-12-07
NoOfTeeth	28
ForcedDentalAge	
DateOfHeight	13-12-07
Height	163

Further down are sections for 'CDS', 'Lateral', 'Xray', and 'Photo' with their respective parameters.

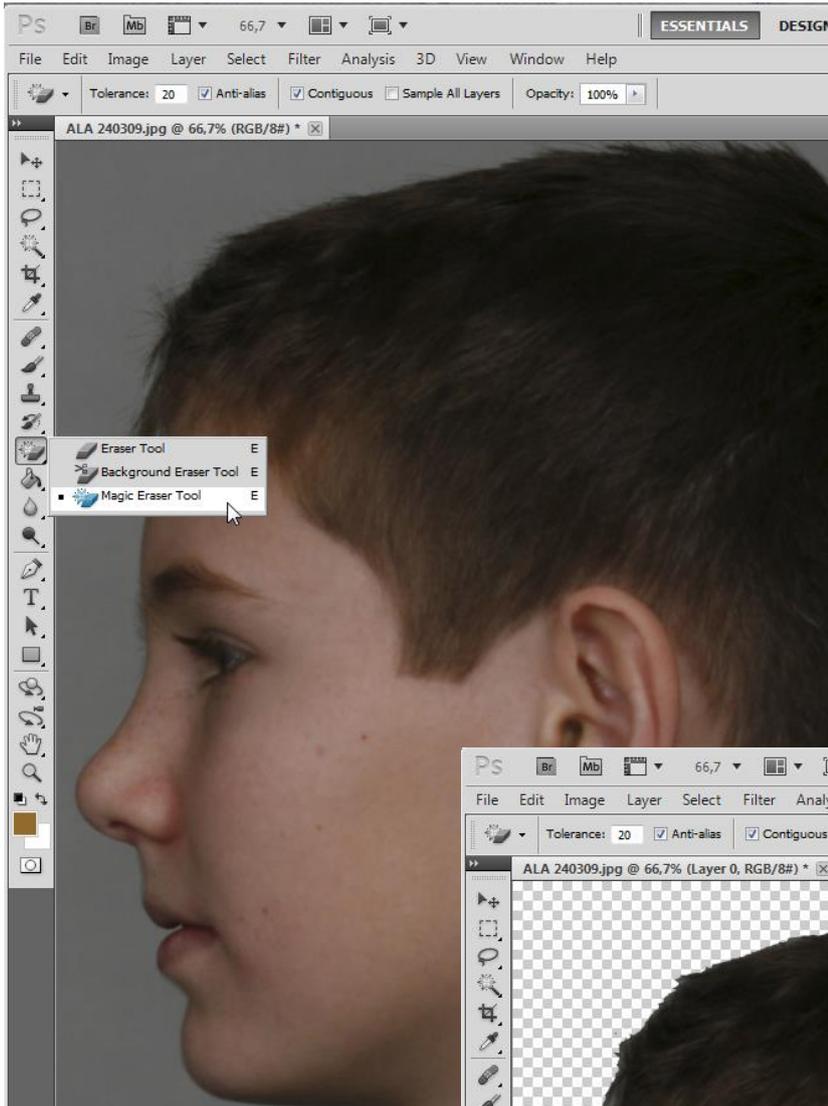
The main window displays a profile of a child's face with a white headfilm overlay. A yellow line traces the upper lip, and a green line traces the lower lip. A magnified inset in the bottom right corner shows the 'prolabium border of the lower lip' with a yellow line and a pink arrow pointing to a specific landmark.

13. Continue to digitize all points. In The Photo sequence some additional Lip Landmarks are included to better define the lip details. Finally you have to accept the pop up message **End of point sequence**.
14. Subsequently the **PhotoPoints** list opens for possible corrections of incorrectly registered landmarks.
15. You can also correct Individual landmarks later, as well as the Overlay Reference, by selecting the actual landmark respectively the **cbr1** point from the PhotoPoints list.
16. **Save** your work
17. When performing a Simulation in growing as well as non-growing patients any change of the skeletal and dental structures will also affect the photo. The result of the simulation is visible for the photo as well by selecting the simulation and clicking the **Display Photo** icon or pressing the **F2** key.

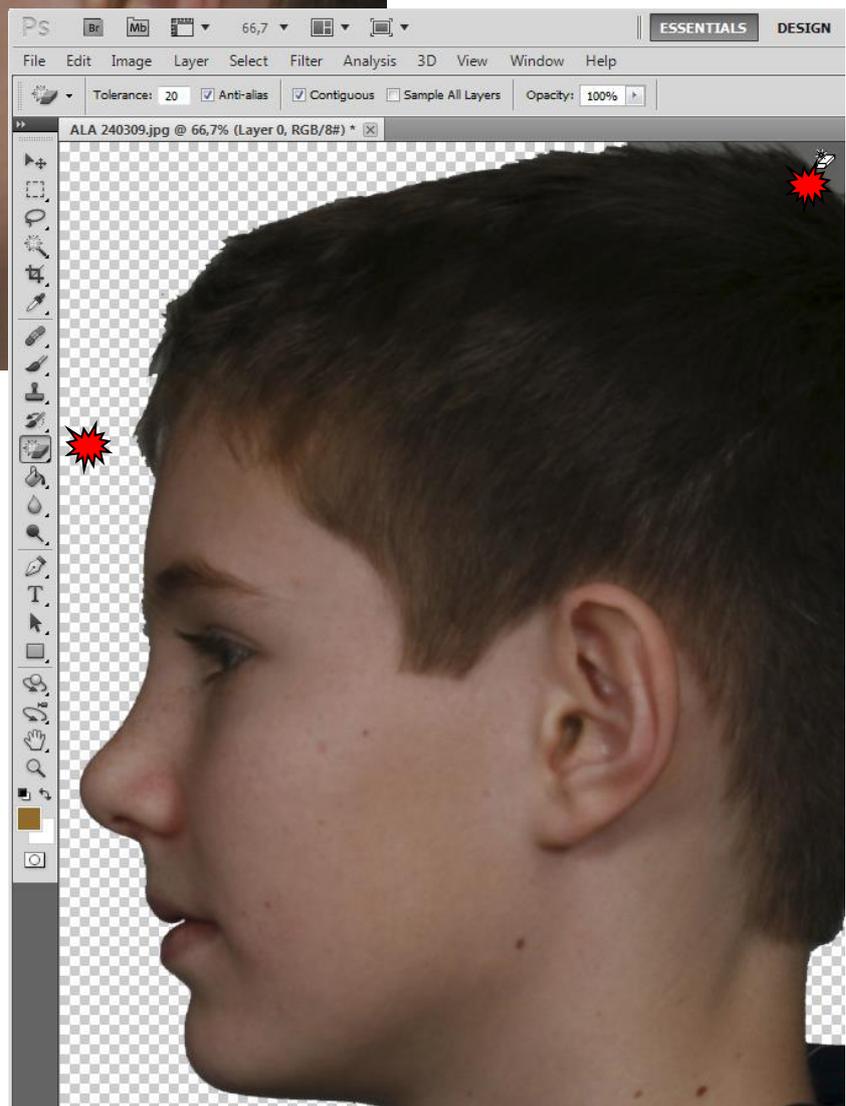
Lateral	
Date	13-12-07
+ Xray	
- Photo	
Filename	C:\TIOPSDOC\Analy4\Phot
Mirror	False
ResolutionX	335
ResolutionY	335
Enlargement	0
+ Filters	
+ Points	
- PhotoPoints	
+ re1	[-12125,12016]
+ re2	[-8535,-14641]
+ re3	[8311,14769]
+ cbr1	[-7515,0]
+ sa	[0,0]
+ ft	[-8633,4438]
+ sgs	[-8672,3609]
+ gs	[-8724,2183]
+ ns	[8232,-577]
+ dn	[-8485,-2503]
+ unt	[-9437,-4113]



Photoshop procedure



- Open the photo in Adobe Photoshop/Photoshop Elements
- Eventually select a suitable picture section and crop the picture
- Select the Magic Eraser Tool"
- Click on the background to be changed
- Repeat in other areas not included at first and not erased
- If necessary use the Eraser Tool for unerased small areas to be removed



- Select **Set foreground color**
- Chose a green color
- When clicking OK the foreground color is changed to green

- Paint the background with the **Paint Bucket Tool**
- Save the picture as a .jpg file in Maximum quality

