

Creating Radiology Line Art with Photoshop Tools and Filters

Introduction:

In the literature, there are several outstanding publications about image editing [1-6]. In 2006, Kirsch, et. al. published an article describing two methods to convert radiology images to line-art using Photoshop (Adobe Systems, San Jose, CA) filters (7). In this article, we will outline an additional method to convert radiology images into line-art. Our novel approach primarily utilizes a Stylizing filter and the Levels tool. We will present the steps as a detailed tutorial, complete with sample images, to guide the reader through the process. In addition, we have also included a Screencast (movie) showing all the steps and resulting effects.

All images in the tutorial are in Tagged Image File Format (TIFF), but the steps outlined below are equally valid for Joint Photographic Experts Group (JPEG) formats. If you plan to export images directly from a Picture Archiving and Communications System (PACS), we recommend using TIFF, as they can be saved with or without lossless compression. When exporting images, adjust the window width and level to obtain full dynamic range.

Step 1: Open Image and Convert to Grayscale

Open Image 1, an AP view of a knee. Convert the image to grayscale, by selecting *Image* → *Mode* → *Grayscale* from the menu bar. Converting images to grayscale simply removes color information, without diminishing its quality, sharpness or resolution. It also significantly reduces the file size, allowing for quicker uploads and downloads.

Step 2: Apply Filter

From the top menu bar, select *Filter* → *Stylize* → *Glowing Edges...* A preview image is displayed along with a dialog box to control the *Edge Width*, *Edge Brightness*, and *Smoothness*. Adjust the sliders until you are satisfied with the resulting preview image. Examine the video tutorial to see the values used by the authors.

Step 3: Invert Image

The resulting image after step 2 is a white sketch against a black background. To invert the image choose, *Image* → *Adjustments* → *Invert* from the top menu bar.

Step 4: Control Line Art Detail

We're almost done. The last step involves adding the "finishing touches" such as adjusting the blackness of the lines and controlling the amount of detail. From the top menu bar, choose *Image* → *Adjustments* → *Levels...* You are then presented with a histogram of the image. The left triangle (slider) controls the "black" areas, the right triangle controls the "white" areas, and the middle triangle controls the "shadow" (gray) detail. Again, adjust the sliders until you are satisfied with the image. Be sure the "preview" option is selected in the dialog box to see real-time changes to your image as the sliders are moved. Fig. 1 shows the original radiograph and the resulting line-art. The video tutorial demonstrates the values used by the authors.

We have also included 3 other images for the reader to examine and "play" with. They are an axial CT scan of the Temporal Bone, a coronal reconstruction of a body CT scan, and a mid-sagittal MRI slice of a brain. Follow the steps outlined above to convert these radiology images to line art. See Figs. 2-4. The video tutorial walks the viewer through all the steps for each image.

Figures

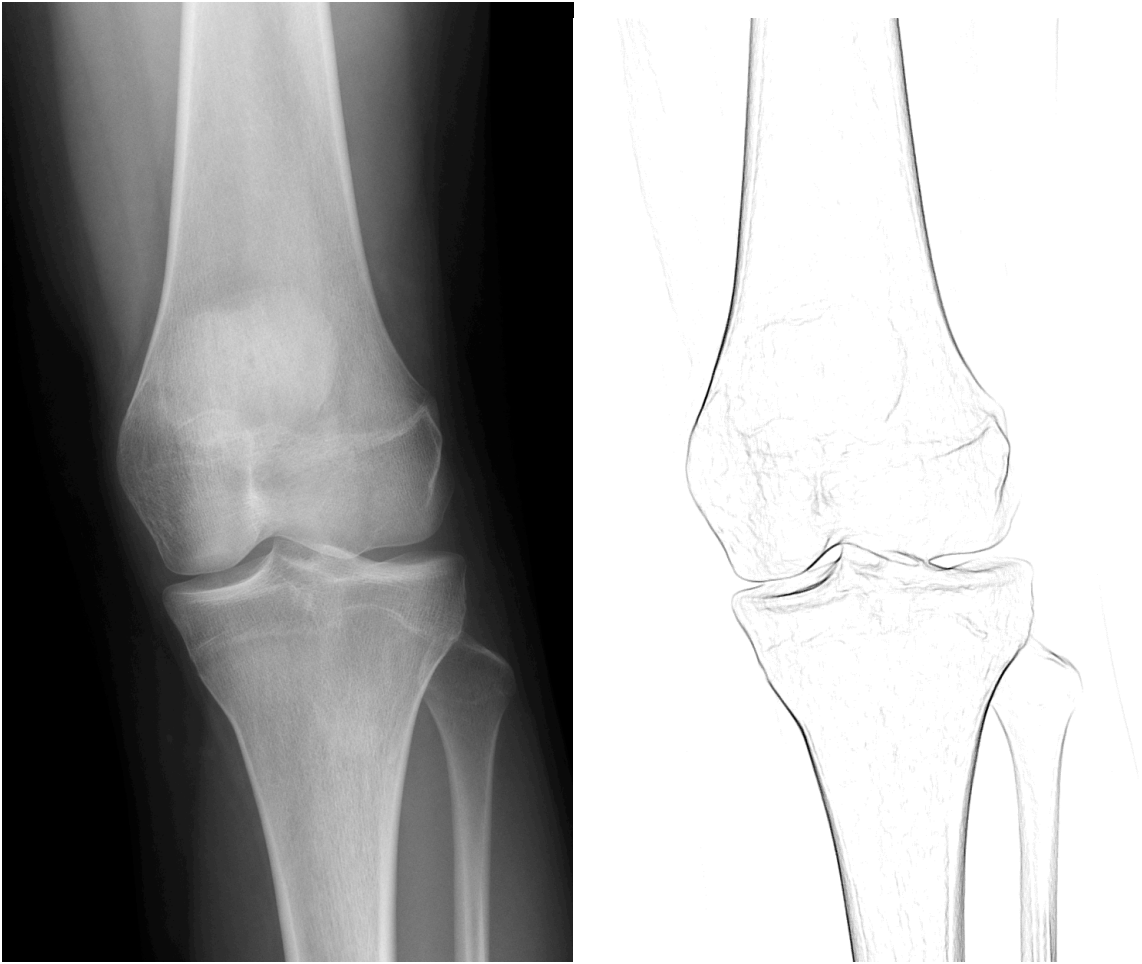


Fig. 1: Original radiograph (left) and the resulting line art diagram (right).

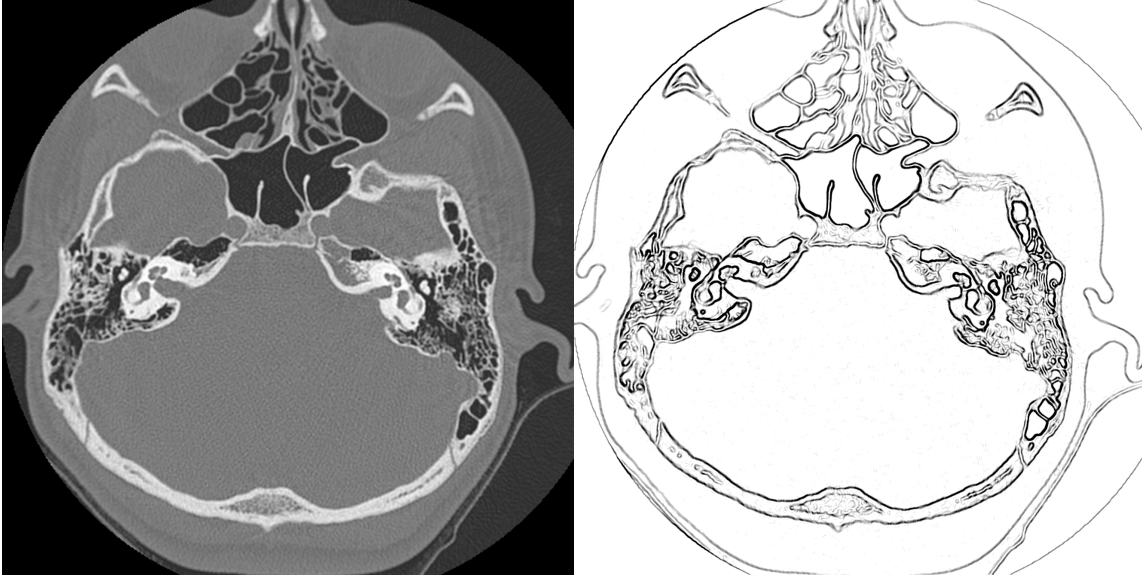


Fig. 2: Original Axial CT (left) and the resulting line art diagram (right).

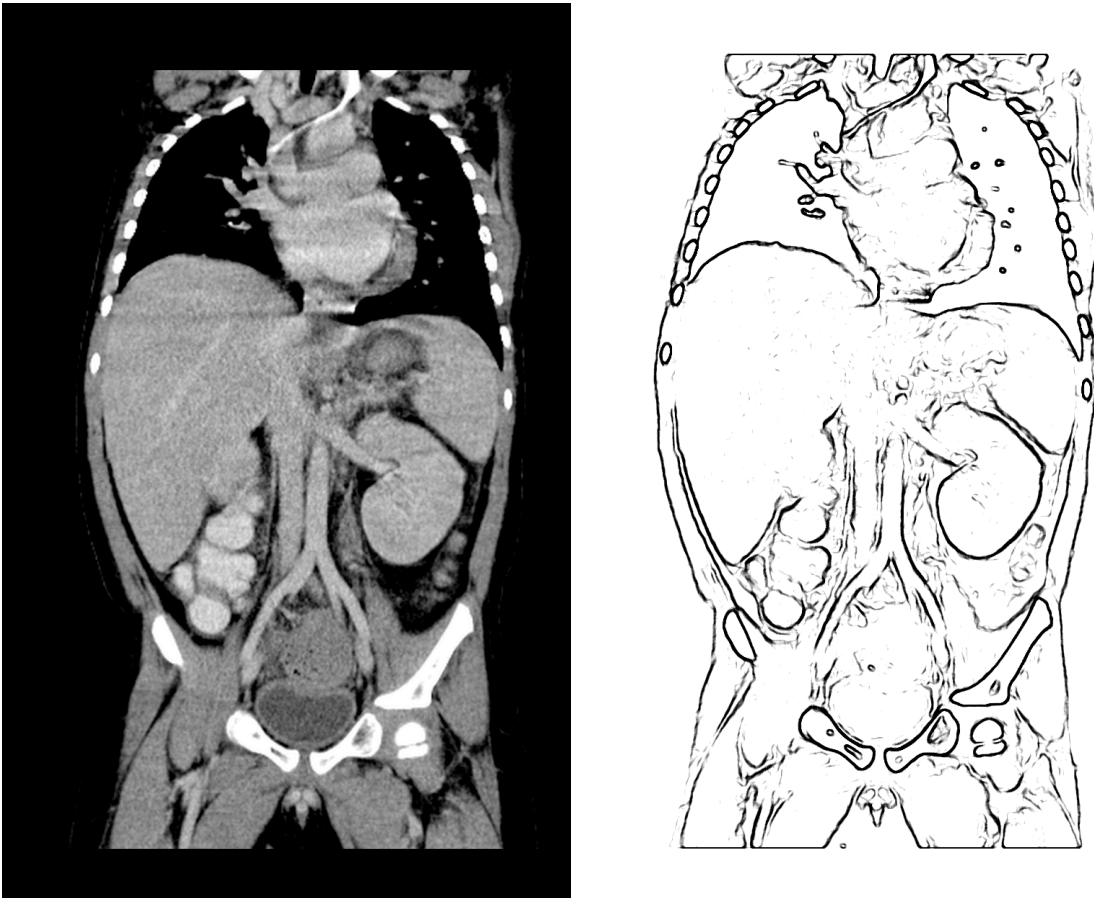


Fig. 3: Original coronal reconstructed CT (left) and the resulting line art diagram (right).

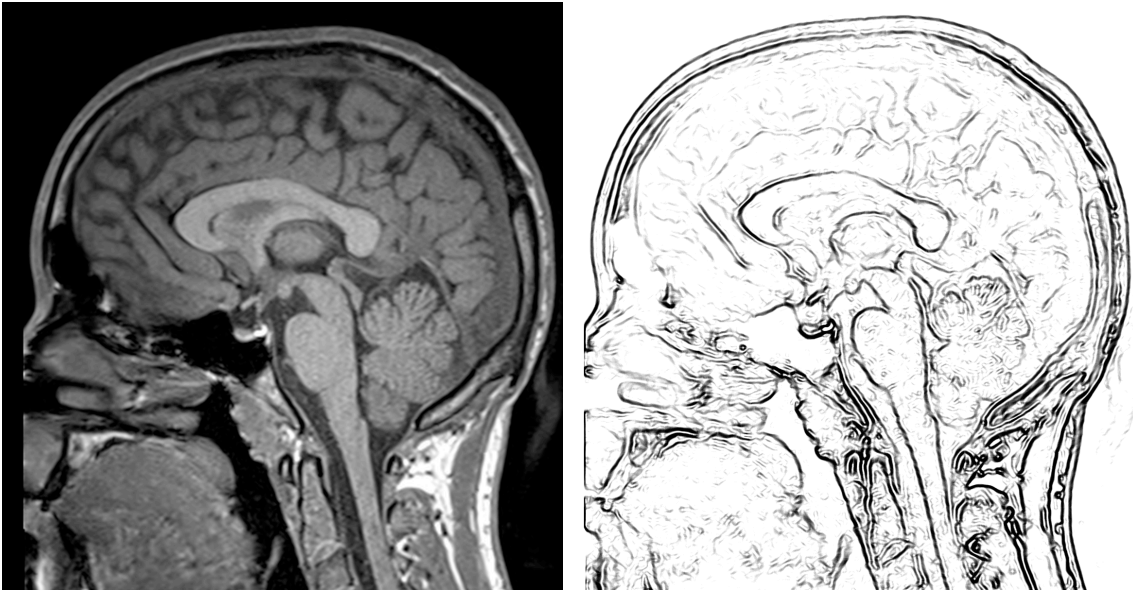


Fig. 4: Original sagittal T1 weighted MRI (left) and the resulting line art diagram (right).

References:

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5. Taylor GA. Initial steps in image preparation. *AJR* 2002; 179:1411-1413.
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7. Kirsch J, Geller B. Using Photoshop Filters to Create Anatomic Line-Art Medical Images. *Acad Radiol* 2006; 13: 1035-1037.