

Nasal Airway Model - Pre-Analysis & Start-Up

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Problem Specification

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Pre-Analysis & Start-Up

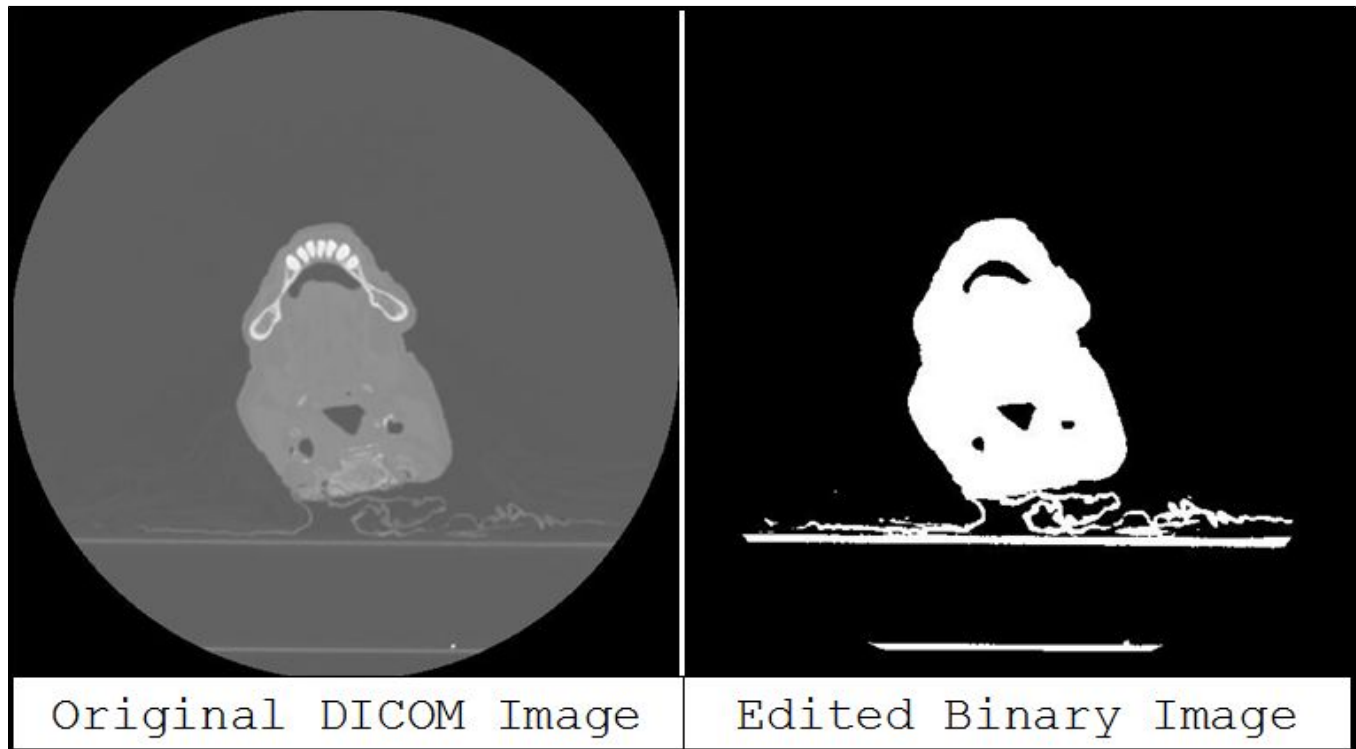
Image Processing

Attached is a set of original CT scan images, a set of edited binary images and the MATLAB code used to create the edited images. For simplicity using the edited set of images to proceed with the tutorial will be sufficient. Below is an explanation of how and why the images were edited.

[matlab_files.rar](#)

[Binary Images.rar](#)

CT scan images are called DICOM images, a file format that contains patient information, and require specific programs to read. MATLAB contains a image processing toolbox that can read the images. For a CT scan, a set of images are taken of the patient in slices across the transverse plane. Pixel size and slice thickness determine the resolution of the images and the quality of the model created. Smaller pixels and smaller slices result in more details, but this means more radiation to the patient and in conventional CT machines the smallest resolution is a pixel size of $(0.6 \text{ mm})^2$ and a slice thickness of 0.6 mm. The value of the pixel intensity is related to the density of the tissue, with air being black and cortical bone being white.



Noise removal- The included program removes the signal noise from each image in the set. Since every machine contains some electronic noise, there is a variation in the pixel intensities of the pure air in the images. By removing the average and one standard deviation of a large sample of air pixel from each image, it will remove the noise and equalize most the backgrounds and air of the images to zero intensity.

Binary images- Since we want to extract the cavity and are not concerned with the different tissues scanned, it is beneficial to create binary images. These contain only two pixel values, black for air and white for any tissue. Since the features in the nose have small sizes compared to the pixel size, like the septum has a thickness of about 0.8 mm, this creation of binary images will ensure that the cavity geometry stays separated. The binary images also help ease geometry extraction process in the next step.

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