E1-19: Identification of obstructions in an artery by extracting edges of an X-ray image

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Locating an exact position and type of obstruction in an artery is very important in medicine. Arteriograms which are X-ray images obtained after injecting a high molecular weight radio contrast into an artery are used to detect these obstructions. Examination of these arteriograms is sometimes difficult because of the lack of quality of these images due to reasons such as limitation in light and out of focusing.

The objective of this study was to use digital image processing techniques to enhance the quality of an arteriogram and to extract the edges of the artery to give more visible representation to facilitate the examination process. Once the image had been captured with the computer in digital form using a video camera and frame grabber system, the image was enhanced using image processing techniques such as histogram equalization, noise removal and sharpening. Then the edges of the objects in the image were located using the Sobel operators. However, this method had a drawback since a thresholding operation had to be applied to detect the edge points. A high threshold would lose some important artery edges while a low threshold would detect unnecessary edges due to other objects and noise. To overcome this problem low and high thresholds were applied and using the non-maxim suppression technique the edge boundaries were thinned to a single pixel. Then the edges of the high threshold image were linked and the gaps of the artery boundary which occurred due to the high threshold were filled by using the additional edge information available with the low threshold image. This resulted in image artery boundary superimposed on the original image.