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# Blockage Analysis and Detection in CT Angiography using Image Processing

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***Abstract: It is Important to visualization angiography and quantification of an angiography image Grading of stenoises is important in diagnosis of vascular diseases since it determine the treatement theorapy. Bypass operation and interventional procedures such as the placement of prosthesis in order to prevent aneurysm rupture require an accurate insight into the vessel architectures different techniques such as CTA, MRA ,are employed for this purpose.CTA and MRA provide volumetric dada but images are noisy and having a maximum intensity projection. The main drawbacks of maximum intensity projections are the overlap of non – vascular structures and the fact that small vessels with low contrast are hardly visible. The second order derivatives are implemented to detect or extract the vessels structure in an image. Morphology is used to extract features based on shape and blockage is analyzed from the output images.***

**Keywords:** Angiographic image, Frangi 2D filter, Hessian matrix, Morphology, Segmentation.

**I. Introduction**: In human body vessel structure is most important and complex structure. Anatomy provides important insight into the circulatory anatomy, helping us to understand the causes, evolution and outcome of several vascular diseases. Nowadays, vascular diseases are the most vital problem for human health. Heart and cerebro vascular diseases are the cause of death respectively.

Now a day, Medical imaging technology which provide high resolution image of the vessel structures for the generation of accurate patient specific geometric is possible. Image based vessel analysis provides important information for planning and navigation during surgical procedures, both to avoid damaging vital stuctures as well as to use vessels as anatomical landmarks for orientation and localization of structures of intrest. In past decades, a measureless variety of methods and approaches has emerged which deals with vascular extaction, analysis and modeling with increasing complexity. The detection of block aged vessel is very important to find out any blockage in flow of blood within blood vessel Angiography is used.

The angiography image is of high intensity which contain shadows, noise and object boundaries. Hence, it may be distinguish the exact structure of vessels from the noise. And practically it is very difficult to detect the edges and noise as these images. So the segmentation is used to separate out or partitioning of image into non-overlapping region that mean it is used to find edge of blood vessels. Morphology is used to extract features based on shape and size of blockage it give prediction about heart attack.

**II. Material and Methodology:** The algorithm consist of three main step, namely:
Step1: Pre processing
Step2: Segmentation
Step3: Post processing

Pre processing

An image in acquisition time is noisy. To remove the noise first wavelet denoising present to preserving characteristics. In wavelet denosing acquired image is decomposed into horizontal, vertical, and diagonal component. These component denoised by using Bayes thresholding. But result may be still noisy. The Bayesian threshold strategy is consistent with human visual system which is less sensitive to presence of noise in vicinity of edges. Finaly these decomposed components are reconstructed using wavelet reconstruction.

After denosing image it is important to improve the visual quality of image, to improve it histogram equqlization is performed and gray level in an image are spread out cross their range so that brightness value of image are reassigned.

Segmentation

In segmentation we perform the enhancement of the image so to enhancement of angiography image and to extract the vessels use frangi 2D and Hessian matrix. There are many techniques to enhancement prosses for improve the visual appearance of image. The objective of enhancement prosses is to make input image better for looking and more sutaible than original image.

The Hessian matrix is used a simple second order derivative function these function is used to find the vessel structures of angiography image. The Eigen value of Hessian are the principal curvatures and their product is the Gaussian curvature, which is the determinant of the Hessian matrix. This matrix shows the direction of curve of the vessel structure.

1. Local minima-When both Eigen values are positive.
2. Local maxima-When both Eigen values are negative.
3. Saddle point-When Eigen values mixed sign.

Firstly calculate the Eigen values and vector using Hessian matrix and sorted their absolute values. These Eigen vector compute the likeness of an image region to vessels by frangi 2D filter.

Secondly, Then maximum intensity of every pixel is found, minor eigen vector and the similarity measures are calculated.

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Frangi 2D filter gives the output image is an enhanced image

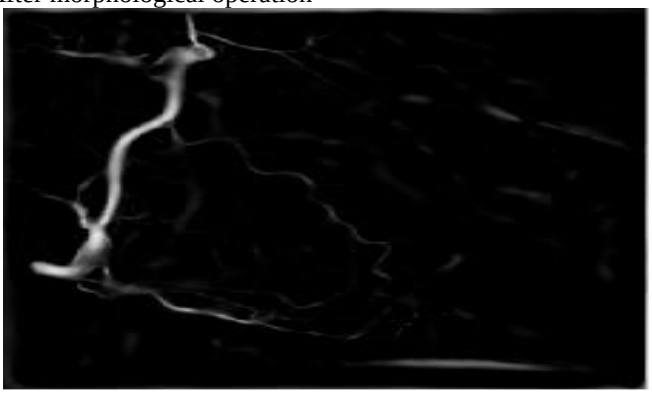
Post Processing

Morphology is a process and analysis of the image In these step is used to determine shape and structure. After segmentation by using Erosion and Dilation operations width of extracted vessels is expanded. By using Erossion grayscale image converted whole in binary image are filled .from this operation the edges of the angiography image is detected and the denoise the image .these image looks better visibility and we detect the blockage width , length using image tools.

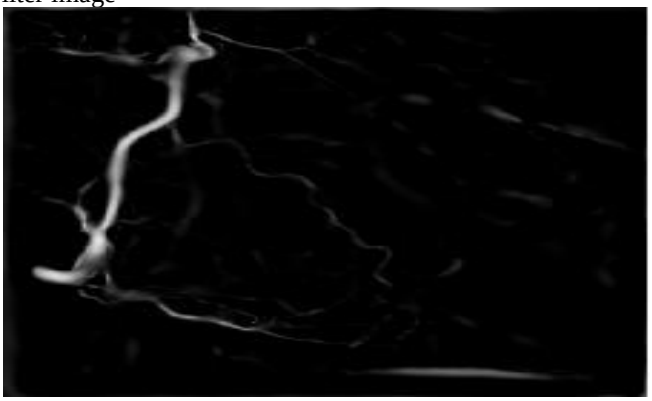
**III. Results and Tables:**

Original Image

After morphological operation



Filter image



After Segmentation

**IV. Conclusion:**

In Image processing, help of angiography we detect and analysis of the blockage and also measure the length of this blockage .

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