Medical Images Edge Detection Based on Mathematical Morphology

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Problem Identification:

- The problem is that in general edge detectors behave very poorly. While their behaviour may fall within tolerances in specific situations, in general edge detectors have difficulty adapting to different situations. The quality of edge detection is highly dependent on lighting conditions, the presence of objects of similar intensities, density of edges in the scene, and noise.

- While each of these problems can be handled by adjusting certain values in the edge detector and changing the threshold value for what is considered an edge, no good method has been determined for automatically setting these values, so they must be manually changed by an operator each time the detector is run with a different set of data.

- In the presence of noise, detection of edges becomes very difficult because both edges and noise are characterized by high frequency. Erroneous edge detection may lead to artefacts in severe cases like medical, security and biometrics.

Motivation for edge detection:

- Produce a line drawing of a scene from an image of that scen Important features can be extracted from the edges of an image.
  (ex: corners, lines, curves).
- These features are used by higher-level computer vision algorithms
  (ex: recognition).
- Neurophysiological and psychophysical studies hint that locations in images, in which the image intensity changes sharply (significant edges), are important for visual perception.

Architecture:

Fig.1. Original lungs CT image with salt-and- pepper noise.

Fig.2. Lungs CT image processed by Laplacian of Gaussian operator.

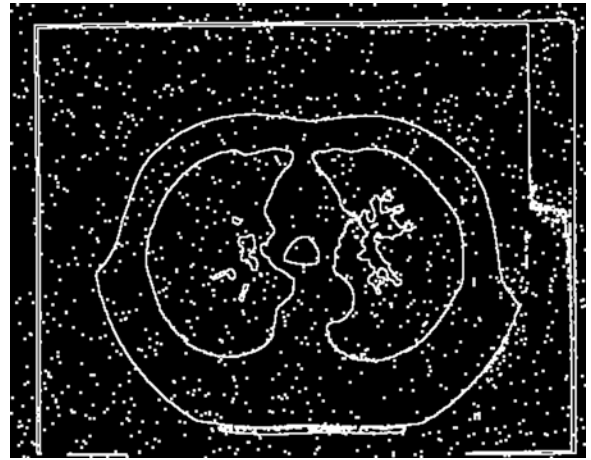Fig.3. Lungs CT image processed by Sobel detector.

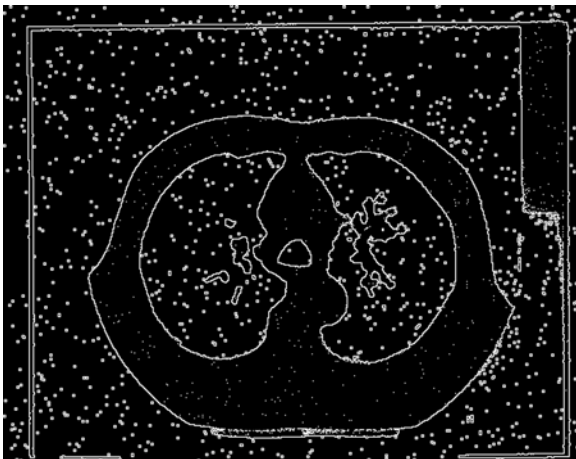Fig.4. Lungs CT image processed by morphological gradient operation.

Fig.5. Lungs CT image processed by dilation residue edge detector.

Fig.6. Lungs CT image processed by the novel morphological edge detector.

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References

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