Medical Image Processing: Stroke Detection

Detection of Ischemic Stroke

- For ischemic brain image the stroke region is extracted by using k-means clustering technique.
- Then texture features are extracted using gray level co-occurrence matrix for the left and right side of the brain.
- The derived features can used for training, which can automatically help to infer whether the image is that of a normal brain or an ischemic brain.

Procedure

- Input- Dataset of brain CT images from some hospital.
- Pre processing - The skull bone is removed. It is found that the skull bone has an exceptionally high attenuation value. It is removed by thresholding.
- The skull is the largest connected region with bone density in the whole imaging volume; while the brain is the largest connected region with brain density within the skull. The CT image is converted to binary image with pixel value (0, 1). The skull is removed using thresholding.
- To reduce noise, median filtering using a 3-by-3 square kernel is applied. Median filter is chosen because it is less sensitive to extreme values. The enhancement is needed to increase the contrast between the whole brain and the stroke region. Contrast between the brain and the lesion region may be present but it is below the threshold of human perception. Thus, to enhance the contrast between the normal brain and lesion region, a sharpening filter is applied to the digitized CT image resulting in noticeable enhancement in image contrast.

Procedure

- Segmentation - In the abnormal brain image, the ischemic stroke region is extracted using k-means clustering technique.
- Tracing midline of the brain is a good indicator for measuring the symmetry of the brain. The classification of the images into normal and abnormal depends on the features of left and right side of the image.
- Further, the left half and the right half of the brain is separated.

•Different texture features or distributions is planned to be applied on both the halves and the result can be then examined. (Future work)

Procedure: Stage 1

•Skull bone removed:- Global thresholding

•Noise suppression:- Median filtering
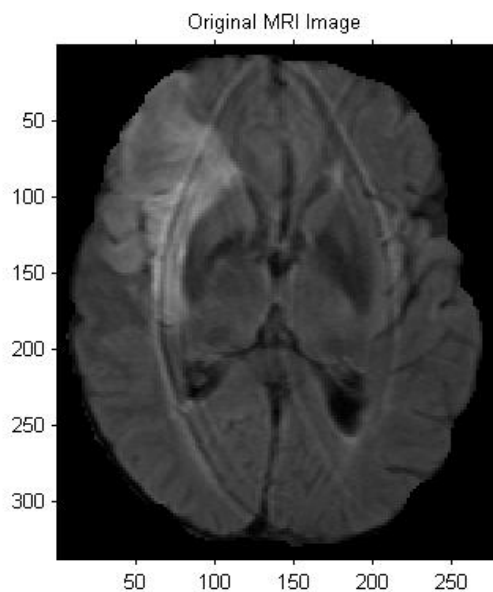
•Image enhanced:- Max filter

Procedure: Stage 2

•Midline shift of the brain is calculated

•Symmetry map is calculated in this stage

Procedure: Stage 3

•Texture features are extracted using gray level co-occurrence matrix for the left and right side of the brain
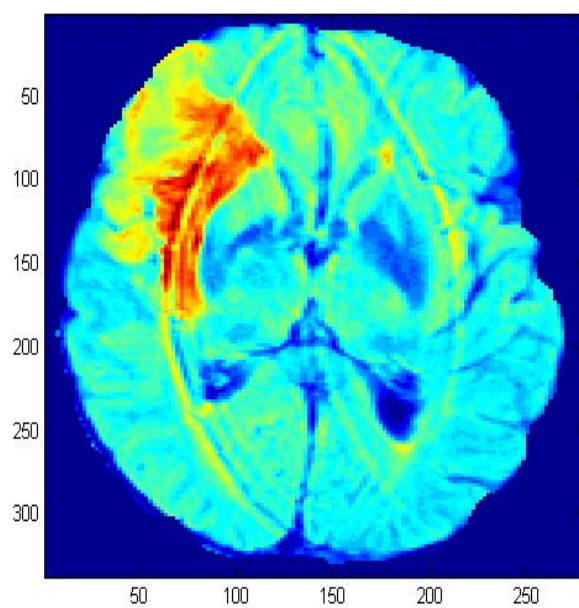
SCREEN-SHOT OF THE STEPS

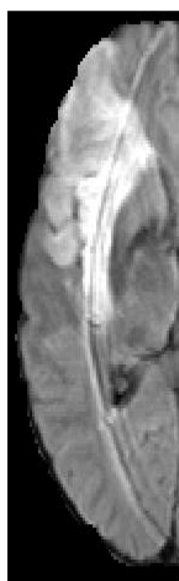Input image after skull removal

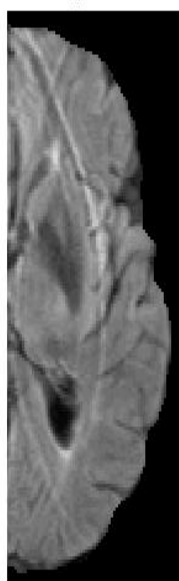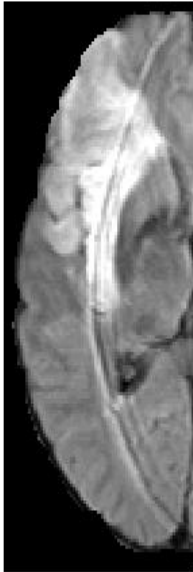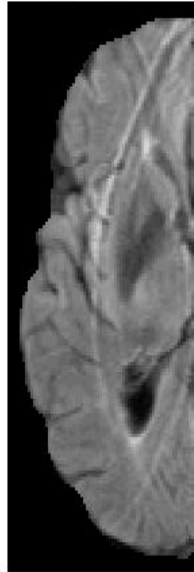Enhanced Image

Enhanced Image

Left Half   Right Half

Left Half

Flipped Right Half

Difference