Content Based Image Retrieval of MRI Scans of Brain on Hexagonal Sampled Grid

Under the Guidance of Prof. P.D. Desai

By:

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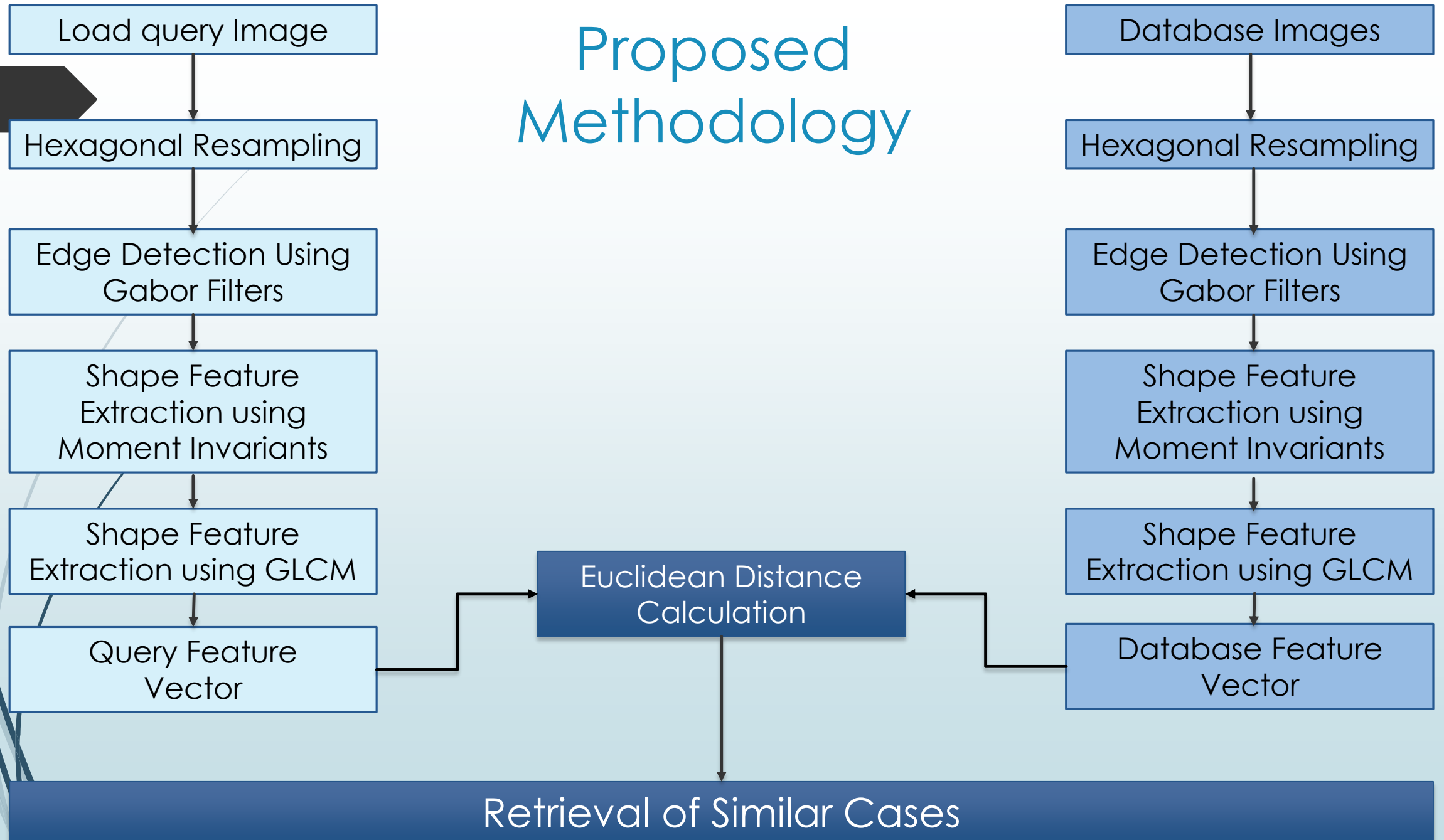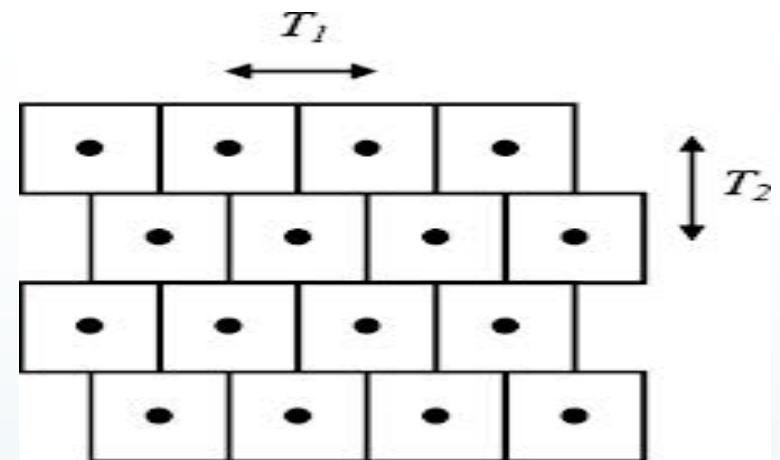**Suraj R. Prabhu**

Gagan Purad

Abstract

- Image processing is an expanding field with its applications spreading across several domains.

- There is extensive use of digital images for medical purposes which involves critical decisions to be made based on the elucidation of medical images such as MRI scan, CT scan, X-ray etc., and calls for substantial research.

- This paper is based on the project aimed at processing of MRI scans of brain.

- The proposed system performs content based retrieval of cases similar to the MRI scan loaded as query using Gabor wavelet based edge detection on hexagonal resampled grid.
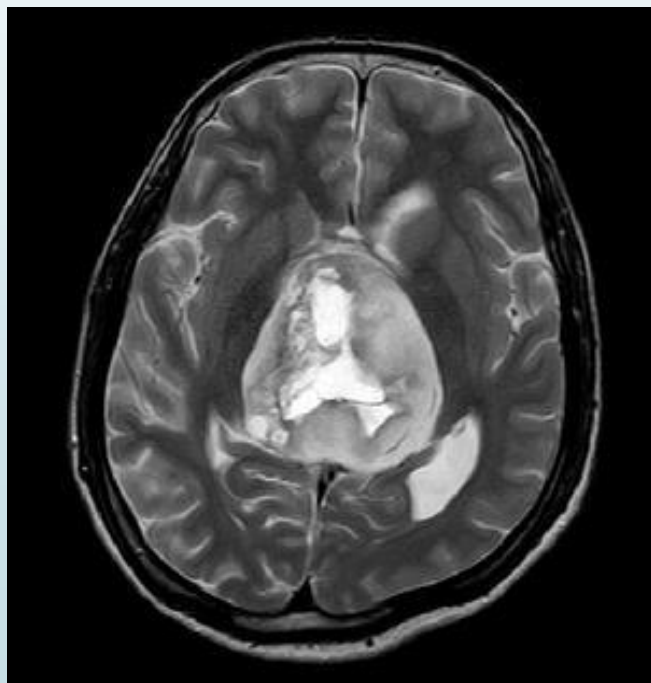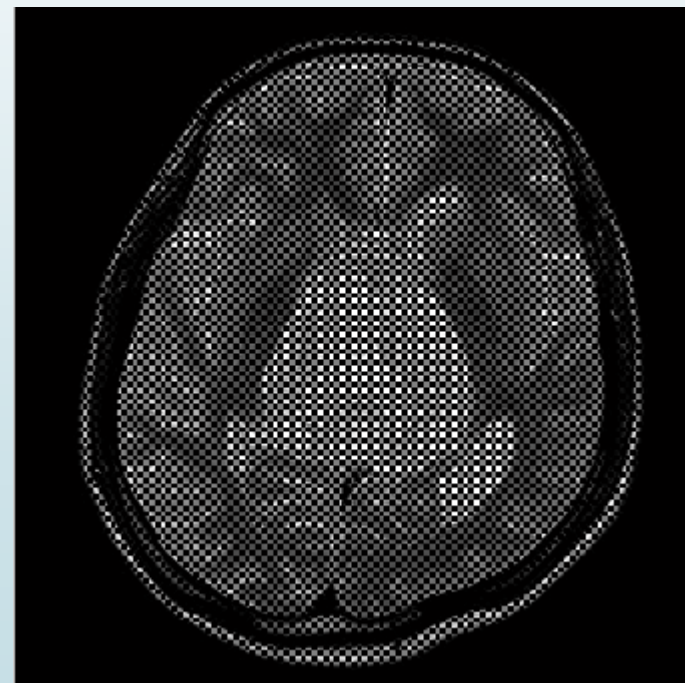
Proposed Methodology

Load query Image

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Hexagonal Resampling

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Edge Detection Using Gabor Filters

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Shape Feature Extraction using Moment Invariants

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Shape Feature Extraction using GLCM

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Query Feature Vector

Database Images

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Hexagonal Resampling

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Edge Detection Using Gabor Filters

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Shape Feature Extraction using Moment Invariants

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Shape Feature Extraction using GLCM

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Database Feature Vector

Euclidean Distance Calculation

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Retrieval of Similar Cases

# Hexagonal Sampled grid

Half Pixel Shift Method

Query image

Resampled Image

Shape Feature Extraction

- Shape can be described by simple geometric features such as moment of inertia, skew invariants, center of gravity etc.

- The extraction of shape features starts with detection of edges. For this purpose Gabor filter is applied on six scale values and three orientations – 0^0, 60^0, 120^0, resulting in 6x3 = 18 edge-maps. Out of these only those satisfying the threshold value are superimposed to get the final edge-map.
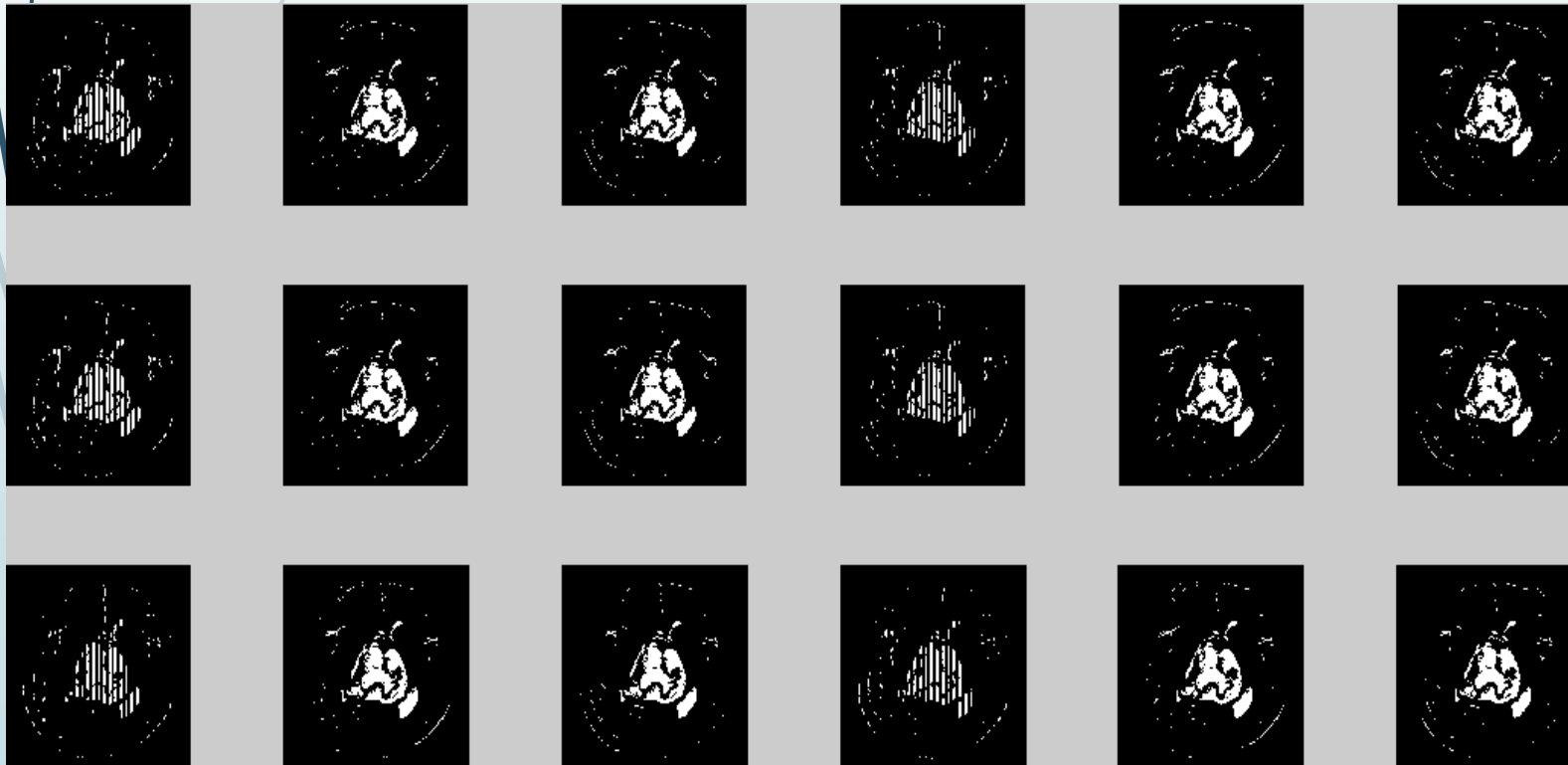
Gabor Responses

Final Edge-map

Texture Feature Extraction

- Important data regarding the structural arrangement of the surface is contained inside the texture features.

- Relationship between the surface and external environment can also be provided by them. For extraction of texture features, Grey Level Co-occurrence Matrix is used.

- The texture values are appended to the previously stored shape feature values in the same vector.

Feature vector table

- The texture values are appended to the previously stored shape feature values in the same vector.

Distance Calculation

- The database feature vector for all the images in the database is created in accordance with the above mentioned process of feature extraction so is the feature vector for the query image. The Euclidean distance between the query and each of the database feature vectors.
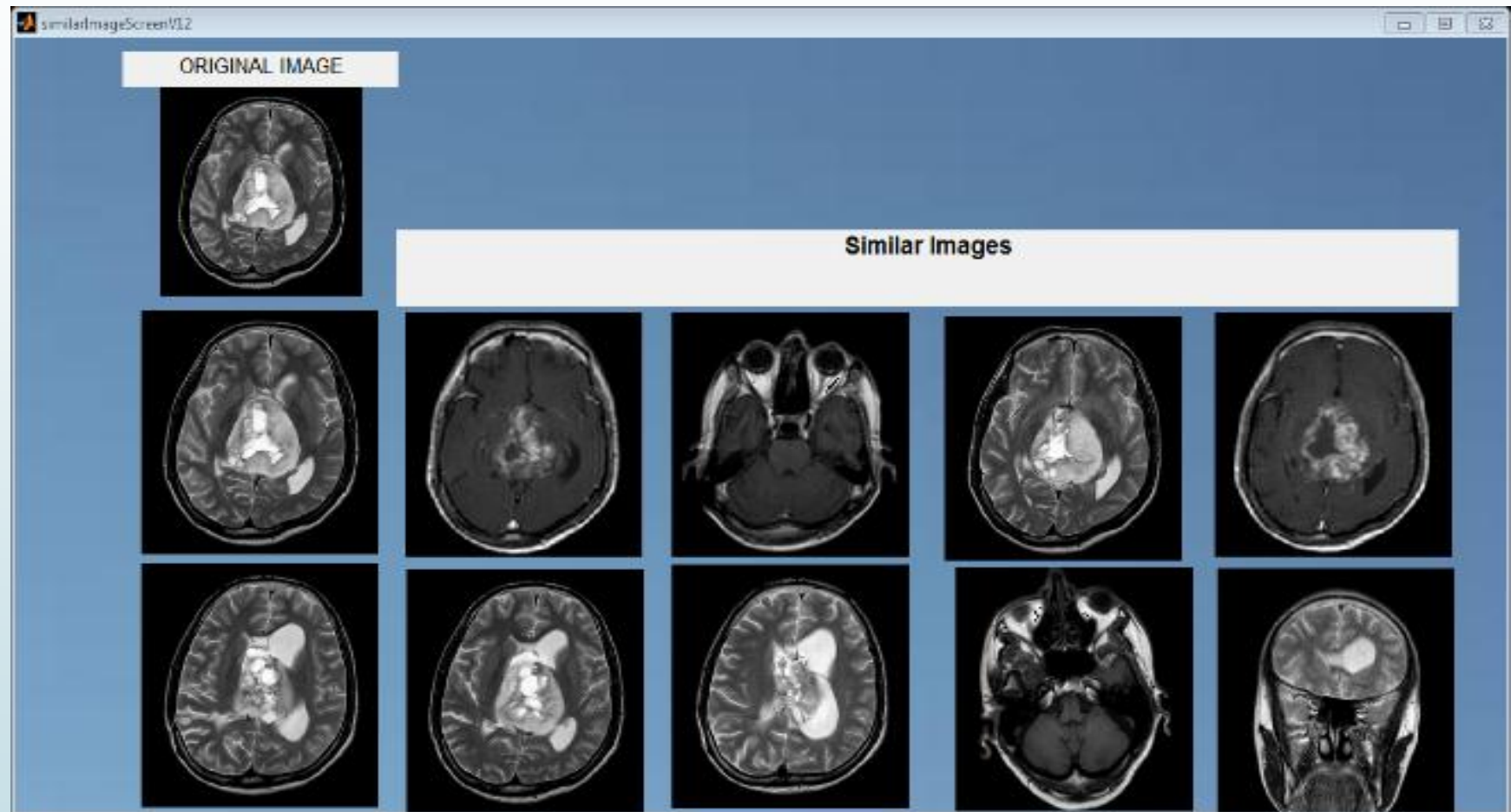
$$D_j = \sqrt{\sum_{i=1}^{n}(x_i - y_{ji})^2}$$

Retrieval Result
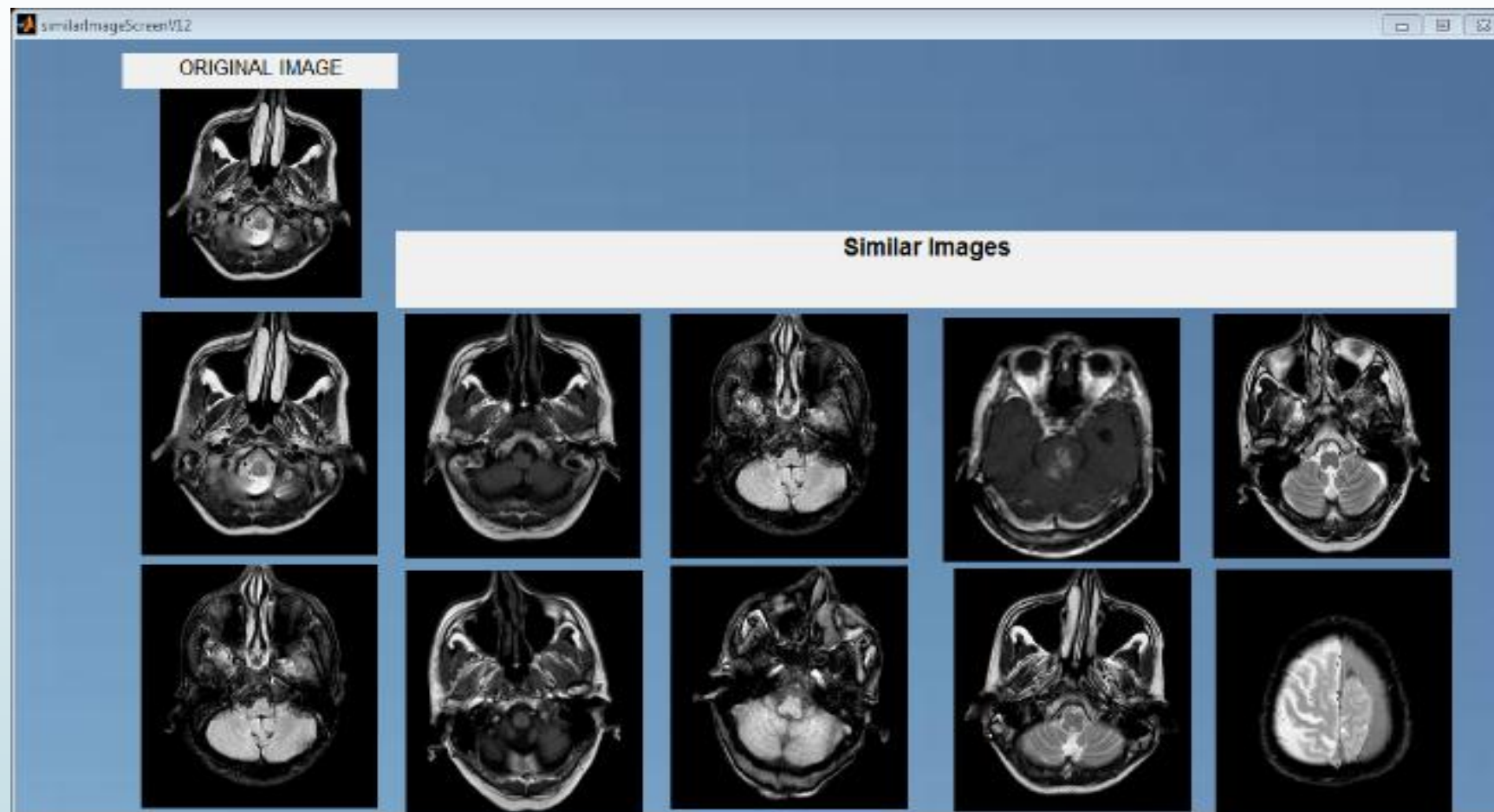
Retrieval result for sample 1

Contd..

Retrieval result for sample 2

Conclusion

- This study proposed a model for Content Based Image Retrieval by using shape and texture features of the images.

- Shape features are extracted from the hexagonal resampled image using Gabor Filters.

- Using GLCM the texture features, are computed.

- Final feature vector table contains both shape and texture features, resulting in improved retrieval.

- The measure of similarity between the query image and the database images is done by calculating the Euclidean distance.