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K MEANS CLUSTERING ALGORITHM BASED RETINAL HEMORRHAGE DETECTION IN FUNDUS IMAGES

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Abstract
Diabetic retinopathy is a serious eye disease that originates from diabetic mellitus and is the most common cause of blindness in the developed countries. In this project choose an appropriate algorithm is k means clustering algorithm.. It is one of the important image segmentation algorithms. It is widely used in medical imaging. And it is used to detect hemorrhages in retina. A novel splat feature classification method is presented with application to retinal hemorrhages detection in fundus images. Reliable detection of hemorrhages is important in the development of automated screening system. images are partitioned into a number of splats covering the entire image. Pixels with similar colour and close spatial location for each splat.

Keywords : Splats, Retinopathy, Fundus images.

1. Introduction

Diabetic retinopathy occurs in patients suffering from diabetes, which causes damage to the retina of the eye. This eventually leads to total vision loss. Usually there are no early visible symptoms of the disease and as the disease progresses the presence of micro aneurysms, exudates both hard and soft and new blood vessels can be observed. Diabetic retinopathy causes damage to the blood vessels in the retina, and this causes fluid to leak to leak into the macula region of the retina causing it to swell and leading to blurred vision. In order to improve blood circulation blood vessels form on the surface and these abnormal vessels leak and block vision.

Diabetic retinopathy is of two types namely non proliferative and proliferative type. Non proliferative is the early stage of the disease characterized by the presence of micro aneurysms. As the disease progresses the retina is deprived of oxygen and new blood vessels are formed in the retina. These vessels eventually leak and leads to clouding vision. Micro aneurysms are small red dots on the retinal surface, which occur due to capillary occlusion leading to lack of oxygen and progression of the disease. They are less than the diameter of the optic vein .Accumulation of proteins and lipids occur in the form of exudates. Vision loss occurs when they occur in the macula. Hemorrhages in the retina occur due to bleeding. Dot hemorrhages lie deep within the retina and reflect leakage of the veins and capillaries. Dot hemorrhages are an indication of diabetic retinopathy. Retina consists of a central area called the macula, that contains a high concentration of cones. It enables clear central vision to see fine details for such activities as reading or threading a needle. The macula is particularly

sensitive to circulatory changes, especially those that occur with aging, such as decreased blood flow. The retina contains a network of branching arteries, which supplies blood that carries the needed oxygen and nutrients to the retina, and a network of accompanying veins, which then carry the blood away together with the waste products of retinal metabolism.

The retina is composed of 10 layers, from the outside (nearest the blood vessel enriched choroid) to the inside (nearest the gelatinous vitreous humor)

- Pigmented epithelium
- Photoreceptors; bacillary layer (outer and inner segments of cone and red photoreceptors).
- External (outer) limiting membranes.
- Outer nuclear (cell bodies of cones & rods).
- Outer plexiform(cone and rod axons, horizontal cell dendrites, bipolar dendrites).
- Inner nuclear (nuclei of horizontal cells, bipolar cells, amacrine cells & muller cells).
- Inner plexiform (axons of bipolar cells & amacrine cells, dendrites of ganglion cells).
- Ganglion cells (nuclei of ganglion cells and displaced amacrine cells)
- Nerve fiber layer(axons from ganglion cells traversing the retina to leave the eye at the optic disc).
- Internal limiting membrane (separates the retina from the vitreous).

2. Related work and segmentation

i. Splat feature classification

Splat feature classification method is presented with application to retinal hemorrhage detection in fundus images. Reliable detection of retinal hemorrhages is important in the development of automated screening systems which can be translated into practice. Under this supervised approach, retinal color images are partitioned into non- overlapping segments covering the entire image. each segment, i.e., splat, contains pixels with similar color and spatial location. a set of features is extracted from each splat to describe its characteristics relative to its surroundings, employing responses from a variety of filter bank, interactions with neighboring splats, and shape and texture information. an optimal subset of splat features is selected by a filter approach followed by a wrapper approach. a classifier is trained with splat-based expert annotations and evaluated on the publicly available messidor dataset.

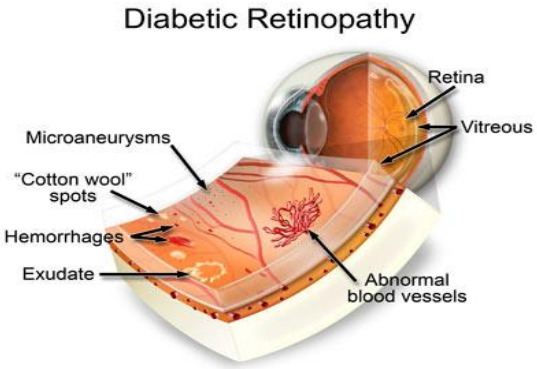


Fig 1.Signs of diabetic retinopathy

2. Image representation

Splat based representation is an image re-sampling strategy onto an irregular grid. Background regions, with gradual variations in appearance, tend to consist of fewer large splats while foreground regions consist of a larger number of smaller splats. At pixel level, the distributions of

hemorrhage pixels and non hemorrhage pixels are imbalanced, since hemorrhages usually account for a small fraction of the entire image.

3 . k means clustering algorithm

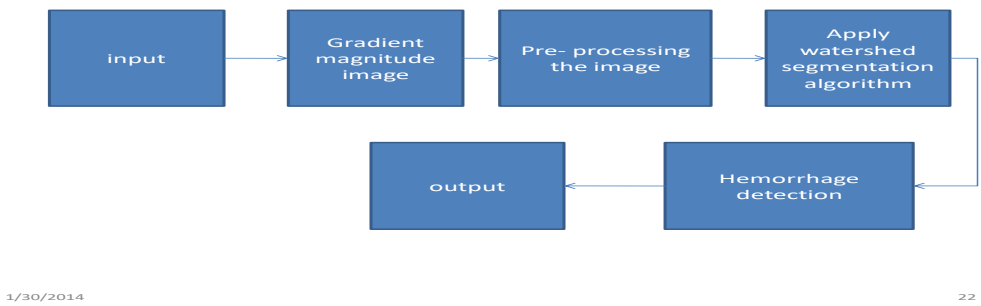
K-means (Mac Queen, 1967) is one of the simplest unsupervised learning algorithms that solve the well known clustering problem. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters) fixed a priori. The main idea is to define k centroids, one for each cluster. These centroids should be placed in a cunning way because of different location causes different result. So, the better choice is to place them as much as possible far away from each other.

4. Modules

This project, have classified into five broad categories of modules. They are listed out as follows

- Retinal image as input
- Convert it into gray image
- Preprocessing the image
- Segment the image using watershed segmentation algorithm
- Hemorrhage is detection

3. System models



i. Input image

Human eye can be divided into three principal sensing categories, corresponding roughly to red, green and blue. Approximately 65%of all cones are sensitive to red light, 33%are sensitive to blue. The absorption of light by the red, green, and blue cones in the eye. Due to these absorption characteristics of the human eye, colors are seen as variable combinations are called primary colors red(R) ,green(G),blue(B). The primary colors can be added to produce the secondary colors of light magneta (red plus blue),cyan(green plus blue),and yellow(red plus green). Mixing the three primaries, or a secondary with its opposite primary color, in the right intensities produses white light.

ii. Convert input image into gray image

Colors in an image may be converted to a shade of gray by calculating the effective brightness or luminance of the colors and using this value to create a shade of gray that matches the desired brightness. One of the simplest and most effective ways to get the color out of a color photo is converted it to grayscale a common option in image editing software when converting an RGB color image to grayscale to grayscale aii the color is replaced with shades of gray. The image is no longer in RGB.It represents an image as a matrix where every element has a value corresponding to how bright or dark the pixel at the corresponding position should be colored. there are two ways to represent the number that represents the brightness of the pixel.the double class (or data typwhite.es). This assigns a floating number(‘’a number with decimals”) between 0 and 1 to each pixel . The value corresponds to white. other class is called unit8which assigns an integer between 0 and 255 to represent the brightness of a pixel. The value corresponds to black and 255 to white. The class unit8 only requires roughly 1/8 of the storage compared to the class double. on the other hand ,many mathematical functions can only be applied to the double class.

.iii. Preprocessing the image

The input image contain noise in order to remove the noise in the input image by means of preprocessing. Here a median filter is using for the proper operation. And also histogram equalization is done in the end of this stage

iv. Apply algorithm

In this project we use watershed segmentation algorithm. This algorithm contain the following steps.

- Read in an image and convert it in grayscale
- Use the gradient magnitude as the segmentation function
- Mark the foreground regions
- Compute the watershed transform of the segmentation function
- Visualize the result

v. Hemorrhage detection

This is the final stage of the project, after the algorithm is applied, measure the presence of hemorrhages in a retina. The ultimate goal of the project is splat feature classification develop a hemorrhage detector. Indicating whether or not an image is normal. Free of hemorrhages or abnormal, or containing one or more hemorrhages.

4. Simulation result

Fig 2.input image

Human eye can be divided into three principal sensing categories, corresponding roughly to red, green and blue. approximately 65%of all cones are sensitive to red light, 33%are sensitive to blue. The absorption of light by the red, green ,and blue cones in the eye.

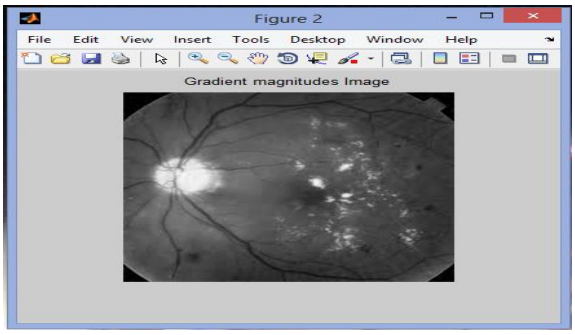


Fig 3.Gradient magnitude image

Colors in an image may be converted to a shade of gray by calculating the effective brightness or Luminance of the colors and using this value to create a shade of gray that matches the desired brightness.

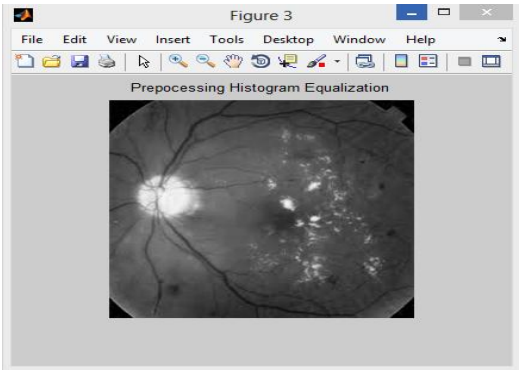


Fig. 4 Preprocessing image

The input image contain noise in order to remove the noise in the input image by means of preprocessing. Here a median filter is using for the proper operation. And also histogram equalization is done in the end of this stage

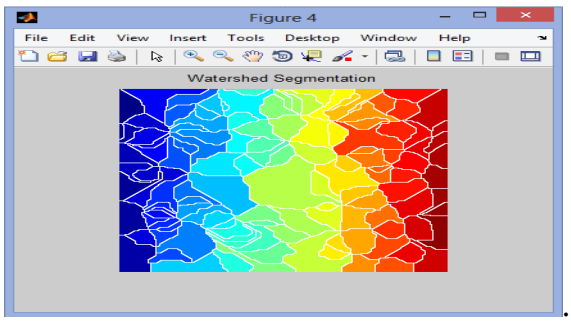


Fig. 5 Algorithm apply

this is the final stage of the project. after the algorithm is applied ,measure the presence of hemorrhages in retina.

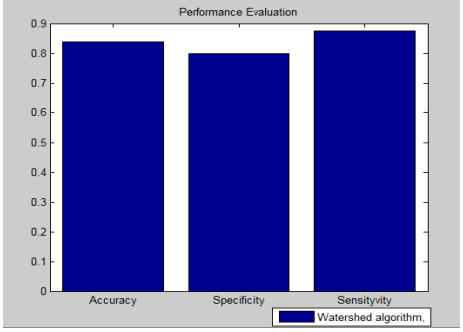


Fig 7 Perfomance evaluation

6. Conclusion

The aim of the project is to detect hemorrhages in retina. Diabetic retinopathy is one of the important retinal disease and this causes retinal hemorrhages. This project uses watershed segmentation algorithm to detect hemorrhages in retina. It is one of the important image segmentation algorithm. It is widely used in various medical imaging. The main purpose of the watershed segmentation algorithm is change the image into another image. And also it is used to detect hemorrhages retina. This project contain five modules to detect the hemorrhages.

This method is therefore resilient to shoulder surfing attacks. Active guessing attack is also ruled out by this method. Virtual money is a promising option for users who are running short of money or do not have their credit/debit cards. Thus, both Stegano PIN and Session key methods can be used to increase security wherever PIN based authentication is needed.

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