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Segmentation and Location of Abnormality in Cancer Images Using Distributed Estimation

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Abstract

Image segmentation is a technique which divides the image into different features of region and extracts out the interested target. To illustrate the level of the image segmentation in image processing, "image engineering"concept has been introduced which brings the involved theory, methods, algorithms, tools, equipment of image segmentation into an overall framework. With the improvement of computer processing capabilities and the increased application of color image, the image segmentation have become more tedious. This article proposes an image segmentation technique based on clustering algorithm. Image segmentation is a key step in the image processing and image analysis. It needs to extract and separate the features in order to identify and analyze an object. This new architecture includes a hierarchical memory structure to store the cluster centroids for distance calculations and binary-tree traversal are employed to compute the nearest centroid operations in pipeline. The advent of reconfigurable logic hardware in the form of Field-Programmable Gate Arrays (FPGAs) allows designs to be quickly developed and prototyped at relatively low cost. The ease of design associated with software and the performance associated with hardware can be achieved using FPGA.

Keywords: VHDL, MATLAB, impulse C, VB..

Introduction

The body is made up of trillions of living cells.

These cells grow, divide, and die in an orderly fashion. This process is a tightly regulated one that is controlled by the DNA machinery within the cell. When a baby is within his or her mother's womb, cells divide rapidly to allow for growth. After the person becomes an adult, most cells divide only to replace worn-out or dying cells or to repair injuries. When cells of the body at a particular site start to grow out of control, they may become cancerous. Cancer cell growth is different from normal cell growth. Instead of dying, cancer cells continue to grow and form new, abnormal cells. In addition, these cells can also invade other tissues.

One of the most dangerous cancers is breast cancer. Most of the women are affected by the breast cancer. A mammogram of the breast, along with a clinical breast exam (an exam done by your doctor) is the most effective way to detect breast cancer early. A mammogram is a safe test used to look for any problems with a woman's breasts. The test uses a special, low-dose x-ray machine to take pictures of breasts. The results are recorded on x-ray film or directly onto a computer for a radiologist to examine. In this process the clustering method is used to identify the affected area (cancer cells) .It is very useful to cure the cancer in early stage. The biggest advantage of this process is multiple clustering is possible to identify the affected area.

Methodology

This section gives the overview of methodology for image segmentation.

K-mean clustering

K means clusters are a very simple algorithm. First the user picks the number of centers. The centers are chosen randomly. After the centers have been established then check every other point with each of the centers and find the minimum distance. Each point is assigned to 1 cluster which it is closest. This makes sense that points that are closer to each other are normally together. After each point is assigned the cluster centers are then recalculated based on these assignments. So once the new centers have been processed the routine starts over and continues until it converges and the centers do not move.

A clustering algorithm is an approximation to an NP-hard combinatorial optimization problem. It is unsupervised. "K" stands for number of clusters; it is a user input to the algorithm. From a set of data points

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or observations (all numerical), K-means attempts to classify them into K.

Algorithm

The algorithm is iterative in nature

$x_1,\ldots\ldots,x_n$ are the data points or observations each observation will be assigned to one and only one cluster. C(i) denotes cluster number for the i^{th} observation-means minimizes within – cluster point scatter

were,

$W(c) = \frac{1}{2}\sum_{k-1}^{k} \times \sum_{c(i)-k} \times \sum_{c(j)-k} \|x_i - x_j\|^2$

$= \sum_{k-1}^{k} N_k \sum_{c(i)-k} \|x_i - m_k\|^2$

m_k is the mean vector of the k^{th} cluster.

N_k is the number of observation in the k^{th} cluster.

For a given assignment C,compute the cluster means m_k

$mk = \frac{\sum_{i:c(i)-k} xi}{N_k}, k = 1, \ldots., K.$

For a current set of cluster means, assign each observation as

$c(i) = \arg\min_{1 \le k \le K} \|x_i - m_k\|^2, i = 1, \ldots\ldots, N$NBBGM

Iterate above two steps until convergence

Step 1:

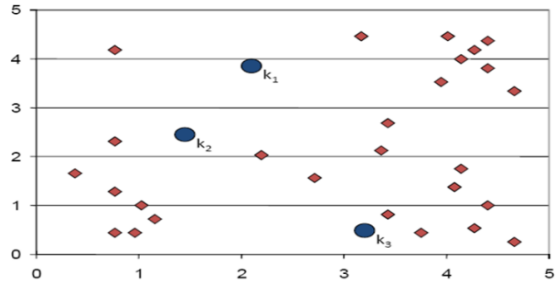

Fig 1: Choose the centers randomly

Step2

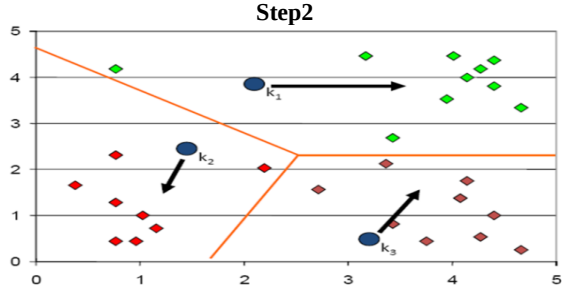

Fig 2: Find the minimum distance from the centers.

Step3

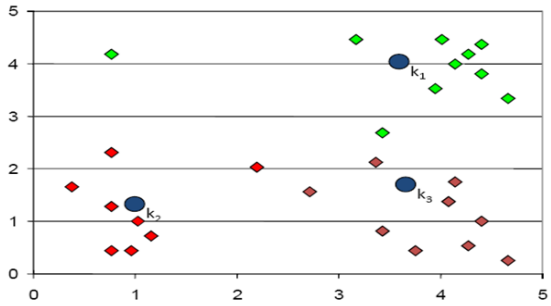

Fig 3:Step1 and 2 was repeated until there is no change in the membership (also the cluster center remains same).

Step4

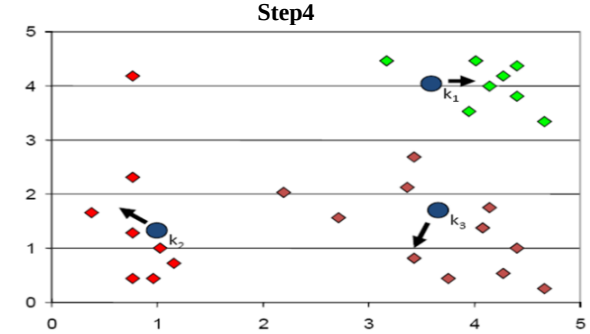

fig 4: Calculate the minimum distance.

Step5

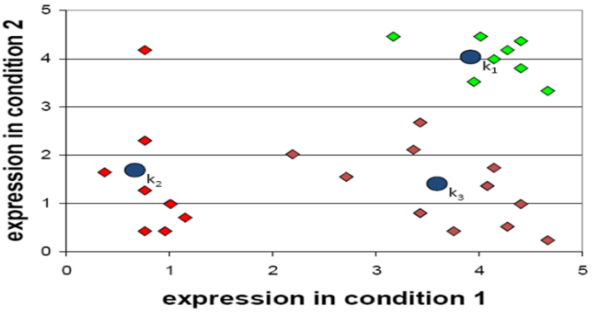

Fig 5: New clustering were selected

Tools Used

MATLAB: MATLAB (matrix laboratory) is a numerical computing environment and fourth-generation programming language. developed by math works, matlab allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including c, c++, java, and fortran. Although matlab is intended primarily for numerical computing, an optional toolbox uses the mupadsymbolic engine, allowing access to symbolic computing capabilities. an additional package, simulink, adds graphical multi-domain simulation and model-based design for dynamic and embedded systems. In 2004, matlab had

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around one million users across industry and academia. matlab users come from various backgrounds of engineering, science, and economics. matlab is widely used in academic and research institutions as well as industrial enterprises.

XILINX(IMPULSE C): Xilinx's FPGAs have been used for ALICE (A Large Ion Collider Experiment). Xilinx FPGAs can run a regular embedded OS (such as Linux or vxWorks) and can implement processor peripherals in programmable logic. Xilinx's embedded developer's kit (EDK) supports the embedded power PC 405 and 440 crores (in virtex-ll pro and some virtex-4 and -5 chips) and the microblaze core. Xilinx's system generator for DSP implements DSP designs on Xilinx FPGAs. A freeware version of its EDA software called ISE web PACK is used with some of its non-high-performance chips. Xilinx is the only FPGA vendor to distribute a native Linux freeware synthesis tool chain.

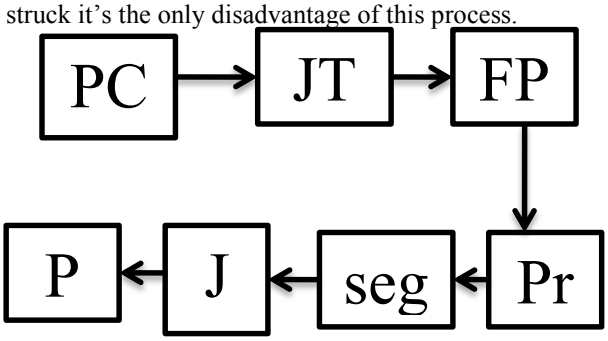
SPARTAN-3EDK: Board provides a powerful, self-contained development platform for designs targeting the new Spartan-3 FPGA from Xilinx. It features a 200k gate Spartan-3, on-board I/O devices, and 1MB fast asynchronous embedded processor core. The board also contains a platform flash JTAG – programmable ROM, so designs can easily be made non volatile. The Spartan-3 starter board is fully compatible with all versions of the Xilinx ISE tools, including the free Web Pack. The board ships with a power supply, and a programming cable.

Discussion

Mammography image is taken as an input. The input image could be segmented using clustering algorithm. In this algorithm the computational complexity to be reduced to segment the images.

Then the object could be recognized in next section and the tumor location will be identified and then output could be displayed in pc by using rs 232 cable.

Header file was created by the matlab program. Impulse C is written to call the header file by using loop in Xilinx software. This can be loaded into the FPGA trainer kit (Spartan 3EDK kit). After loading the data into the kit by using the executing commands in window. After that finally give a command as run. In the same time visual basic window will be in open. In this window create the 128 * 128 box or 64 * 64 box after completing the whole process the image will be scanned row by row by selecting disp-Reciimage. During scanning process the corresponding value of pixel is shown in window. Multiple clustering is also possible this is advantage of this process. During multiple clustering image may be struck it's the only disadvantage of this process.



JTAG is used to interface our personal computer to the Spartan3EDK kit. By interfacing the program were loaded into the trainer kit then the preprocessing is performed by comparing it with the data base. The image will be segmented it can be seen in pc window.

Result

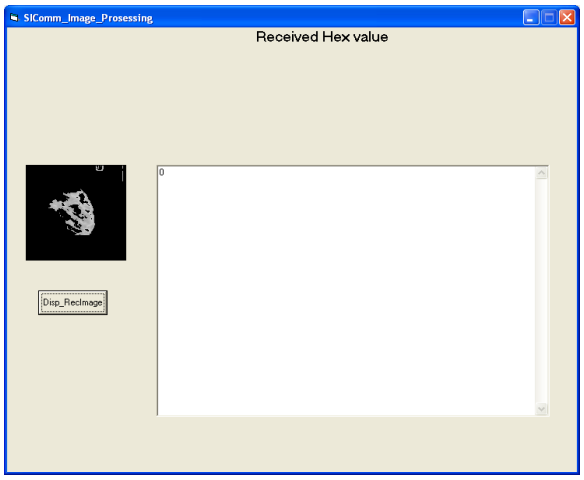


Fig 6: image segmentation

The result is shown in fig left side of a window shows the 64 * 64 window. When selecting the Disp-Reciimage the image is started row by row scanning. During scanning write side of a window shows the pixel value of an image.

Affected area can be finding by applying the clustering estimation and also find out the distance which would be affected. By using clustering the 45cm distance can be measure from the center of the affected area.

Conclusion

Affected area can be easily found out and also the distance can be measure. The affected area can be seen clearly by row by row scanning process. For clear image scanning 68 * 68 is used. Comparing with 124 * 124 it gives the better result.

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At a time multiple clustering is possible it can be shown in the same window. Four to five clustering is possible at a time. While doing multiple clustering in the same window the process will get slow some time it may be stop the process. Next challenging or scope is improved the clustering without any struck during scanning process.

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