Comparison between LTE and WiMAX
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Abstract: In this paper a comparative study between LTE and WiMAX, the two leading wireless broadband technologies, is introduced. The performance metrics used for the evaluation are the response time and the throughput derived from OPNET modeller release 16 system level simulator. To perform the comparison 4 scenarios were developed the first two are for 7 cell LTE and 7cell WiMAX networks while the second two are for 19 cell LTE and 19cell WiMAX networks. The numerical results are obtained for links between mobiles at fixed relative positions in the four scenarios. Through this analysis we found that LTE networks gave shorter response time than WiMAX. The throughput is also compared and results showed that WiMAX outperformed LTE in this respect.

Keywords: LTE, WiMAX, system level simulation, OPNET, response time, and throughput.

I. INTRODUCTION

In recent few years telecommunication authorities are busy deciding how to emerge to 4G environment motivated by the exponential increase in the demand for advanced telecommunication services which require wider spectrum and higher quality of service. On the other hand, telecommunication industry experts are trying hard to standardize new mobile wireless systems that can cope with the desires and ambitions of telecommunication users and pave the way for evolving new technologies. New applications required to be supported by new mobile systems include a variety; VoIP, video conference, multimedia messaging, multiplayer games, virtual private networks (VPN), etc. [9] All these application require higher
throughput, wider BW, smaller delay and innovative transmission methods that will
give higher spectral efficiency and good quality. Two leading emerging
technologies are: LTE (Long Term Evolution standardized by third generation
partnership project (3GPP)) and WiMAX (the IEEE802.16e, the worldwide
interoperability for microwave access) are considered able to fulfill the 4G
requirements announced by ITU-R which is known as international mobile
telecommunications advanced (IMTS) [9]. During the standardization process of
both technologies, computer simulations are necessary to test the validity of
proposed algorithms and procedures and to help improving them. [1], [2], [8], [10],
[12] Two classes of simulator are built and implemented. The first is the link level
simulation that is used to investigate physical layer issues such as multiple input
multiple output (MIMO), adaptive modulation and coding (AMC), channel
estimation and equalization, and channel modelling, [10], [12]. The second is the
system level simulation which investigates networking performance such as
scheduling, call admission control, mobility handling, interference management,
and power control. [1], [2], [8] This separation into link level and system level
simulation has a big benefit as it reduces the computation complexity that will
increase exponentially if the two types of simulation were merged together. As an
example modelling of the fast fading behaviour of the wireless channel for each
individual user requires high computational power and time. This computational
effort is mandatory in link level simulation issues but if it is added in the system
level the computational effort will be excessive [2] Therefore abstraction is used in
the simulation in the sense that some issues are modelled and simulated off line and
the results are included in the system level simulation run, as an assumption or
constant values or it is not included in the simulation at all. This method will lead to
system level simulation with valid performance results and low computational
complexity [2] Our main job in this paper is to perform system level simulation of
the two emerging technologies and compare between them. We use for this task the OPNET modeller releaseI6 [4]. We developed four scenarios the first two are for 7-cell LTE and 7-cell WiMAX networks while the second two are for 19-cell LTE and 19-cell WiMAX networks. The performance metrics that will be considered are: the response time and the throughput. The physical channel air interface effect is abstracted here (we assumed ideal channel or a pipeline air interface) for both systems; LTE and WiMAX.

II. METHODOLOGY
OPNET modeler version 17.5 simulator is a packet based event driven dynamic system level simulator which accurately and efficiently simulate the behavior of various types of real world networks. OPNET Modeler is a product of the OPNET Technologies Inc. It has a Graphical User Interface (GUI) with a "user friendly" sense. It has an enormous library at the service of the user. For the research to be done in this paper, "OPNET Modeler version 16" was available under license. We will use this simulator to simulate the two systems; LTE and WiMAX with the purpose to compare their performance. Using OPNET modeler 17.5 we developed four scenarios; two of them are for LTE networks (one for 7-cell network structure and the other for 19-cell networks structure). The other two scenarios are for WiMAX networks (one for 7-cell network structure and the other for 19-cell networks structure).

Figure 1 LTE 7-cell Model
Figure 2: LTE 19-cell Model

Figure 3: WIMAX 7-cell Model
III. RESULTS AND DISCUSSIONS

In this section simulation results will be presented. At first we will define the performance metrics that will be used for the comparison. The response time is the round-trip time taken for a response to get to the destination and return to the source. The second parameter is the throughput, for simulations done in OPNET Modeler the difference between the traffic sent from a source and traffic received at the intended destination is known as TRAFFIC DROPPED and could be due to mainly the fading wireless channel and also due to different network effects such as congestion, interference etc, which could occur at different layers. The throughput is traffic sent minus the dropped traffic divided by traffic sent. Fig. 5 shows the response time (The probability density function) for a sample of a set of links starting at workstation 3_2 during the simulation period for WiMAX 19-cell network. The average values for these curves are depicted in table 1. The same table
lists the results obtained for the four scenarios (LTE 7-cell, LTE 19-cell, WiMAX 7-cell and WiMAX 19-cell). The results show that LTE gave shorter response time than WiMAX. These results may be due the scheduling algorithms adopted by WiMAX standards. LTE readings do not exceed looms which satisfy the requirements of IMTs regarding the delay budget and the requirements stated in release 8 regarding the maximum Latency [21], [9]. The readings for WiMAX response time range from 50 ms to several seconds which might affect real time applications. Response time can mean various things. If we are using an FTP application, response will usually consist of just one direction. In contrast, for a VoIP, voice or video conference type application, response will match more closely to the round trip time. There are many factors in play, such as ARQ/HARQ retransmissions, TCP retransmissions etc, that can make all data to be received correctly albeit with higher delay.

Table1 summarizes the results obtained from the simulation for the four scenarios. The results show that WiMAX has better results regarding throughput. It is worth mentioning here that an abstraction is made in this simulation. It considered in WiMAX simulation that there is no dropped traffic due to network effects like The
results for simulated dropped traffic are zero all time which mean enhancement for the throughput result. For verification of these results we found that in [29] a similar

Table 1 simulation results for the four scenarios (throughput)

<table>
<thead>
<tr>
<th>Node</th>
<th>LTE 7 cell Throughput (packets/sec)</th>
<th>LTE 19 cell Throughput (packets/sec)</th>
<th>WiMAX 7 cell Throughput (packets/sec)</th>
<th>WiMAX 19 cell Throughput (packets/sec)</th>
</tr>
</thead>
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<tr>
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<td>43.667</td>
<td>41.553</td>
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<td>17.839</td>
<td>42.425</td>
<td>42.352</td>
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<td>UE_4_3</td>
<td>12.237</td>
<td>6.031</td>
<td>41.557</td>
<td>41.523</td>
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<td>2.65</td>
<td>43.380</td>
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<tr>
<td>UE_6_4</td>
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<td>42.697</td>
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IV. V. CONCLUSION

In this paper we presented a comparison between LTE and WiMAX networks; the two leading wireless broadband technologies. The metric used for the comparison is the throughput. We presented the standard models of the two systems in compliance with their respective standards, and then we discussed the methodologies adopted by OPNET modeler while building the simulation models of the two competing systems. Simulation results using OPNET modeler were presented; they showed that LTE always gave better performance. We noted that this is a problem for WiMAX because its standards focused on the performance of the physical and MAC layers leaving aside the networking and application aspects as it without customization. We noted, also, that a large number of research papers dealt with this aspect. Regarding the throughput results, we showed that WiMAX outperformed LTE in this respect On the other hand, we noted that an earlier paper compared between UMTSIHSPA + and WiMAX IEEE802.16e in throughput and coverage and the results were in favour of UMTSIHSPA+. 
V. REFERENCE

[1] Xing Zhang, Rinshui Zhu, Shiming Liu, Wenbo Wang, "system level performance analysis of OFDMA.


[8] "LTE system level simulator documentation v1.0r295"a documentation on how to use the Long Term Evolution (LTE) System Level simulator [Online]. Available: at http://www.nttuwien.ac.atltlesimulator/ as well as some insight on its structure and the assumptions that were made while developing it, Institute
Brain Tumor Detection Using Support Vector Machine

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Abstract- One of the most dynamic researches in the field of medical image processing is using an "MRI" which stands for magnetic resonance image for the detection of a brain tumor. Identification of the tumor is the primary target of the system. Detection plays a critical role in biomedical imaging. In this research, "MRI" brain image is used to utilized to tumor recognition process. This system includes test the brain image process, image filtering, segmentation, classification and delineation of the tumor area, the detailed procedures are implemented using “MATLAB”. The proposed strategy removes the tumor region precisely from the "MRI" brain image. The test results show that the proposed technique proficiently recognized the tumor region from the brain image. Afterwards, the condition of the tumor region in the system is viably applied in any shape of the tumor region.

Keywords: Image Processing, “MRI”, Segmentation, ““SVM””

I. Overview

Human system is consist of several organs, the brain is main controller of it. Tumor is an extra cells increasing in a controlled method at the brain [1]; brain tumor is a very serious disease
amongst children and adults, it is the most deadly and obstinate diseases [2]; the location of the brain tumor and quickly spreading of the tumor make a critical problem in treatment [3]; Image of the brain tumor can be shown by computer tomography “CT -Scan”, “MRI-Scan”, “Ultrasound” and so done.

In this research, “MRI” scan is used to implement the system [4]; In the medical field, magnetic resonance image “MRI” is widely used [5]; “MRI” techniques is a noninvasive method and uses powerful magnet and radio waves to make the image of the body It is suited for examining soft tissues of the human body such as Ligament and tendon injury, spinal cord injury and brain tumors,…etc.[4];

A brain tumor occurs when abnormal cells form within the brain and there are two main types of tumors, malignant or cancerous tumors and benign tumors. Cancerous tumors can be isolated into essential tumors that being inside the cerebrum, and optional tumors that have spread from elsewhere, known as brain metastasis tumors. [5] This article deals mainly with tumors that start within the brain. All brain tumors may produce side effects that depend on which part of the brain is involved [6] These may include headaches, seizures, problem with vision, vomiting, and mental changes.[6][7] The headache is classically worse in the morning and goes away with vomiting.[5] More specific problems may include difficulty in walking, speaking and with sensation.[6][7] As the disease progresses unconsciousness may occur.[4]

The cause of most brain tumors is unknown.[5] Risk factors that may occasionally be involved include a number of inherited conditions known as neurofibromatosis as well as exposure to the industrial chemical vinyl chloride, the Epstein-Barr virus, and ionizing radiation.[5][6][8] While concern has been raised about mobile phone use, the evidence is not clear.[8] The most common types of primary tumors in adults are: meningiomas (usually benign), and astrocytomas such as gliobl-astomas.[6] In children, the most common type is a malignant medulloblastoma.[8] Diagnosis is usually by medical examination along with computed tomography or magnetic resonance imaging.[5] This is then often confirmed by a biopsy.
Based on the findings, the tumors are divided into different grades of severity.[6] The brain imaging analysis is main objective in the field of medical image analysis. Magnetic resonance (MR) imaging have many benefits over the medical imaging modalities such as a useful noninvasive technique for assisting in clinical diagnoses, the high level of contrast resolution, multispectral characteristics and ability to provide rich information about human soft tissue. "MRI" gives usedful data in the surgical work, radiotherapy treatment, setting up stereo tactic brain surgery.

II. Project Objectives

The project aims and objectives represented into two categories:

A. General objective:
   - To identify the location, geometry and type of tumor based on segmentation and classification algorithms in order to achieve the following goals:
   - Provide a simple training program to increase the Doctors knowledge on the tumor detection.
   - Improve the Eye diagnosis and decrease the mistakes.
   - Reduce time consumed for diagnosis.
   - Provide high accuracy of detection and classification based on computerized method.

B. Specific objective
   - To make a computer algorithm this can find the details of tumor and delineation the region of the tumor.
   - Study and analysis the brain tumor.
   - Study and analysis of brain tumor detection methods.
   - Study and analysis of brain tumor delineation algorithms.
   - Study and analysis Support Vector Machine classification method.
III. Problem statement

Eye detection and diagnosis is the traditional method in detecting brain tumor and classification of region is usually done on (“MRI”) image, this method based on tumor area and shape and here begins the problem

- Doctors vary in their knowledge.
- Eye diagnosis can lead to mistakes.
- Time consumed for diagnosis.
- Low Accuracy of detection and classification.

But the computer technique is used to solve the problem, reduce the time, and will give more accuracy for classification and detection.

The proposed work principally gives a survey to which steps are performed all through the whole procedure to recognize a tumor from "MRI" of the brain. The framework is for the most part which comprises of two stages. In the first phase features extraction are extracted from “MRI” and in the second phase tumor is classified as cancerous or non-cancerous. All that done by MATLAB software. The steps of Brain cancer detection shown in figure 1.

![Figure (1): The proposed model Support Vector Machine (“SVM”) ](image)

Support vector machines ("SVM"s, also support vector networks [1]) are supervised learning models with associated learning algorithms that analyze data used for classification and
regression analysis. Given an arrangement of preparing precedents, each set apart to have a place with one of two classifications, a "SVM" preparing calculation manufactures a model that doles out new models into one class or the other, making it a non-probabilistic parallel straight classifier. A "SVM" show is a portrayal of the precedents as focuses in space, mapped with the goal that the models of the different classifications are separated by a reasonable gap that is as wide as possible. New models are then mapped into that equivalent space and anticipated to have a place with a classification dependent on which side of the gap they fall on.

Support Vector Machines are based on the idea of choice plan that characterize choice boundaries. A choice plane is one that isolates between a set of objects having different class memberships.
IV. Computer Model

V. Mathematical Model

- Mean Value

The mean gives the normal power estimation of a picture. “MRI” images that contain miniaturized scale calcifications have a higher mean that those with a typical image. The mean calculates using the following equation.
Where ‘i’ demonstrates the rows of the image, ‘j’ shows the columns of the image and P (i, j) is the cell indicated by the row and the column of the image.

- **Standard Deviation**

The standard deviation is a parameter intently connected with the mean. It alludes to the scattering of qualities in a “MRI” image around the mean. Standard deviation is given as:

\[
SD = \sqrt{(\text{mean})^2}
\]

VI. **Results & Discussion**

The results for normal and abnormal DICOM images and the steps through extracted.

A-Normal

1-Original image

The following image represent a normal case; this sample was selected to represent normal.
2- Filtered image

![Original Image](image1) ![Filtered Image](image2)

Figure (2) (a) Original Image (b) Filtered Image

3- Segmentation and boundaries

![Filtered Image](image3) ![Segmentation Boundary](image4)

Figure (3) (a) Filtered Image (b) Segmentation

4- Tumor detection

![Boundary](image5) ![Segmentation Boundary](image6)

Figure (4) (a) Boundary of tumor (b) selected area
5- Extracted area

![Figure (4.5) (a) selected area (b) extraction of tumor area](image)

Measures for Performance:

A number of distinctive measures are generally used to access the performance of the proposed technique. These measures including classification, sensitivity, specificity, Mathew’s correlation coefficient (MCC) are calculated from confusion matrix. It restores a value from -1 (inverse prediction) to +1 (perfect prediction). The confusion matrix analyses genuine and anticipated classes of the proposed strategy. Table 2 shows that actual and predicted classes of the proposed method. True positive (TP) – tallies of all samples which are accurately called by algorithm as being cancer. False positive (FP) – tallies of all samples which are mistakenly called by the algorithm as being cancer while they are normal. Normal negative (TN) – tallies of all samples which are accurately called by the algorithm as being normal. The performance of the classification algorithms was assessed by processing the rates of Sensitivity (SE), Specificity (SP), Accuracy (AC) and Mathews Correlation Coefficient (MCC),

The respective definitions are as follows:

\[
SE = \frac{TP}{(TP+FN)} \times 100 \tag{1}
\]

\[
SP = \frac{TN}{(TN+TP)} \times 100 \tag{2}
\]

\[
AC = \frac{(TP+TN)}{(TN+TP+FN+FP)} \times 100 \tag{3}
\]
MCC = \frac{(TP\times TN - FP\times FN)}{\sqrt{(TP + FP) \times (TP + FN) \times (TN + FP) \times (TN + FN)}} (4)

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Accuracy of Results

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VII. Conclusion

After study and analysis to brain tumor detection techniques a software was developed based on MATLAB has the capability to identify the location, geometry and type of tumor based on segmentation and classification algorithms in order to provide a simple training program to increase the Doctors knowledge on the tumor detection, improve the Eye diagnosis and decrease the mistakes, reduce time consumed for diagnosis and provide high accuracy of detection and classification based on computerized method. To help improve the detection method compared to Eye detection and diagnosis which was the only traditional method in detecting brain tumor and classification of region from (“MRI”) image, this method based on tumor area and shape and here begins the problem.

But the computer technique is used to solve the problem, reduce the time, and will give more accuracy for classification and detection.

VIII. Reference


[16] Rajesh C. Patil, Dr. A. S. Bhalchandra "the brain tumor extraction from “MRI” images using MATLAB"
[17] V S Khoo, FRACRFRCRMD 1 2 x V S KhooSearch for articles by this author, and D L Joon, FRACR 3 V S, "new development in “MRI” for target volume delineation in radiotherapy " x D L JoonSearch for articles by this author 1Royal Marsden Hospital, Institute of Cancer Research, Fulham Road, London SW3 6JJ, 2University of Manchester, Manchester, UK, 3Austin Health Radiation Oncology Centre, Heidelberg Repatriation Hospital, Victoria, Australia DOI:http://dx.doi.org/10.1259/bjr/41321492 February 13, 2014.


An overview of Image Segmentation Algorithms

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Abstract- in this paper an explanation of the importance of image segmentation in medical image processing, face recognition pedestrian detection, etc. The current techniques of image segmentation include regional segmentation, edge detection segmentation, cluster segmentation, segmentation based on weakly supervised CNN learning, etc. This paper analyzes and summarizes these image segmentation algorithms and compares the benefits and disadvantages of various algorithms.

Keywords: Image segmentation; Region-based; Edge detection; Clustering; weakly-supervised; CNN

I. Introduction

An image is a means of information transfer and the image contains a lot of useful information. Understanding the image and extracting information from the image to accomplish some works is an important area of application in digital image technology, and the first step in understanding the image is the image segmentation.

In practice, it is not often interested in all parts of the image, but only in certain areas with the same features [1]. Image segmentation is one of the hotspots in image processing and computer vision. It is also an important basis for the identification of images. It is based on certain criteria that an input image should be divided into a number of the same nature of the category to extract the area of interest to people. The basis for image analysis and understanding of the
extraction and recognition of image features. There are many commonly used image segmentation algorithms. This paper mainly describes the following five algorithms for simple analysis. The first is the threshold segmentation method. Threshold segmentation is one of the most commonly used segmentation techniques in region-based segmentation algorithms [2]. Its essence is to determine the optimum threshold automatically according to a certain criterion and to use these pixels in gray to achieve clustering. Followed by the regional growth segmentation.

The basic idea of the regional growth algorithm is to combine the pixels with similar properties to form the region, i.e. to divide each region first to find a seed pixel as a growth point and then to merge the surrounding area with similar properties of the pixel in its area. Then is the edge detection segmentation method. The segmentation algorithm for edge detection refers to the use of various regions of the edge's pixel gray or color discontinuity detection area to achieve image segmentation [3]. The next is the segmentation based on clustering. The clustering algorithm is based on the similarity of things as the class division criterion, i.e. it is divided into several subclasses according to the internal structure of the sample set, so that the same sample type is as similar as possible and the different samples are not as similar as possible.[4]. Lastly, segmentation based on weakly monitored CNN learning. It refers to the problem of allocating a label to each pixel in the image and comprises three parts..

1) Give an image which contains which objects.
2) Give the border of an object.
3) The picture object area is marked with a partial pixel. [5].

At present, from the international image segmentation method, the specific operation of the process of segmentation method is very diverse and complex, and there is no recognized a unified standard. This paper discusses and compares the above four methods, and learns from the shortcomings to analyze better solutions and make future forecasts.
II. Analysis

2.1 Region-based Segmentation

2.1.1 Threshold Segmentation

Threshold segmentation is the simplest method of image segmentation and also one of the most common parallel segmentation methods. It is a common segmentation algorithm which directly divides the image gray scale information processing based on the gray value of different targets. Segmentation of the threshold may be divided into the local threshold and the global threshold method. The global threshold method divides the image into two regions of the target and the background by a single threshold [6]. The local threshold method needs to select multiple segmentation thresholds and divides the image into multiple target regions and backgrounds by multiple thresholds. The most commonly used threshold segmentation algorithm is the largest interclass variance method [7], which selects a globally optimal threshold by maximizing the variance between classes. In addition, entropy-based threshold segmentation methods, minimum error methods, co-occurrence matrix methods, moment preservation methods, simple statistical methods, probability relaxation methods, fluid set methods and threshold methods are available. [8].

The threshold method has the advantage that the calculation is simple and the operating speed is faster.

The segmentation effect can be obtained especially if the target and the background have a high contrast the disadvantage is that it is difficult to obtain accurate results for image segmentation problems where there is no significant difference in gray scale or a large overlap between image gray scale values. [9]. Since it only takes
into account the gray information of the image without considering the spatial information of the image, it is sensitive to noise and grayscale unevenness, leading it often combined with other methods [10].

2.1.2 Regional Growth Segmentation

The regional growth method is a typical serial region segmentation algorithm, and its basic idea is to have similar properties of the pixels together to form a region [11]. The method requires first selecting a seed pixel, and then merging the similar pixels around the seed pixel into the region where the seed pixel is located. Figure 1 illustrates an example of a known growing region seed point. Figure 1 (a) illustrates the need to divide the image. Two seed pixels (marked as gray squares) are known to be prepared for regional growth. The criterion used here is that if the absolute value of the gray difference is considered to be less than a certain threshold T between the pixel and the seed pixel, the pixel is included in the region where the seed pixel is located. Figure 1 (b) shows the regional growth results at T = 3, and the whole plot is well divided into two regions. Figure 1 (c) shows the results of the region growth at T = 6 and the whole plot is in an area. Thus the choice of threshold is very important [12].

\[
\begin{bmatrix}
10475 & 11555 & 11111 \\
10577 & 11555 & 11111 \\
01555 & 11555 & 11111 \\
20565 & 11555 & 11111 \\
22564 & 11555 & 11111 \\
\end{bmatrix}
\]

(a) (b) (c)

Fig. 1 Examples of regional growth
The advantage of regional growth is that it usually separates the connected regions with the same characteristics and provides good boundary information and segmentation results. The idea of regional growth is simple and clear and requires only some seed points. And the growth criteria in the growing process can be freely specified. Finally, it can choose multiple criteria simultaneously. The drawback is that the overall cost of computing is massive [13]. Noise and grayscale irregularities can also lead to voids and over-division. The last thing about the image is that the shadow impact is often not very good [14].

2.2 Edge Detection Segmentation

The edge of the object is in the form of discontinuous local features of the image, that is, the most significant part of the image changes in local brightness, such as gray value of the mutation, color mutation, texture changes and so on[15]. To observe the edge using discontinuities in order to accomplish the function of image segmentation.. There is always a gray edge between two adjacent regions with different gray values in the image, and there is a case where the gray value is not continuous. This discontinuity can often be detected using derivative operations, and derivatives can be calculated using differential operators [16]. Parallel edge detection is often done by means of a spatial domain differential operator to perform image segmentation by convoluting its template and image. The detection of parallel borders is usually used as an image preprocessing method.

The widely first-order differential operators are Prewitt operator, Roberts’s operator and Sobel operator [17]. The second-order differential operator has nonlinear operators such as Laplacian, Kirsch operator and Wallis operator.

2.2.1 Sobel Operator
The Sobel operator is mainly used for edge detection, and it is technically a discrete differential operator used to calculate the approximation of the gradient of the image luminance function. The Sobel is a typical edge detector based on the first derivative. As a result of the operator introducing a similar local average operation, the noise has a smooth effect and the impact of noise can be effectively eliminated. The influence of the Sobel operator on the position of the pixel is weighted, which is better than the Prewitt operator and the Roberts operator. The Sobel operator consists of two sets of 3x3 matrices, which are transverse and longitudinal templates, and are plotted with the image plane, respectively, to obtain the difference between the horizontal and the longitudinal difference. In actual use, the following two templates are used to detect the edges of the image.

$$G_x = \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix}$$

Detect horizontal edge (transverse template)

$$G_y = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{bmatrix}$$

Detect vertical edge (longitudinal template)

The horizontal and vertical gradient approximations of each pixel of the image can be combined to calculate the size of the gradient using the following formula:
The gradient can then be calculated using the following formula:

\[ G = \sqrt{G_x^2 + G_y^2} \]

\[ \Theta = \arctan\left(\frac{G_y}{G_x}\right) \]

In the above example, if the above angle \( \Theta \) is equal to zero, that is, the image has a longitudinal edge, and the left is darker than the right.

III. Conclusion

As you can see from the paper, it's hard to find a way to adapt segmentation to all images. Currently, the research on the theory of image segmentation is not perfect and there are still many practical problems in application research. The development of image segmentation techniques can show the following trends by comparing the advantages and disadvantages of the different image segmentation algorithms:

1) The combination of multiple segmentation methods. Because of the diversity and uncertainty of the image, it is necessary to combine the multiple segmentation methods and make full use of the advantages of different algorithms on the basis of multi-feature fusion, so as to achieve better segmentation effect.

2) In the parameter selection using machine learning algorithm for analysis, in order to improve the segmentation effect. Such as the threshold selection in threshold segmentation and the selection of \( K \) values in the \( K \)-means algorithm.

3) The CNN model is used to frame the ROI and then segmented to improve the segmentation effect using a non-machine learning segmentation method. It is
believed that in the future research and exploration, there will be more image segmentation method to be further developed and more widely used.

IV. References


The Advantages of Cloud Computing Over Cluster and Grid Computing

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Abstract: cloud computing is a practical method that gives a wide-scope rising model of internet-base enterprise application and service.

Recently the world has witnessed a great migration of enterprise applications to the cloud. One of the difficulties imposed by cloud application is quality of service management, which is the problem of allocating resource to the application so as to ensure a service level along dimensions such as performance availability and reliability. In this field we will introduce a survey on the QoS in cloud computing concerning the techniques used, advantage and disadvantage.

Keywords: cloud computing, cluster computing and grid computing.

I. Introduction

cloud computing predicts a major transformation in field of how to save and store information and run applications. Here we can host everything in the cloud where a cluster of computers and servers can be accessed through the internet instead of running programs and information on computer and you can apply this from everywhere in the world in spite of many advantages of cloud computing, there are many complication concerning the QoS which shows availability, performance and reliability.
To solve the problems of QoS, this promoted the appetite of researchers to find solutions for managing QoS.

Research methodology: a comparison between cloud computing and cluster cloud computing by clearing the differences and excellences between different kind of cloud computing. Cloud computing, cluster computing, and grid computing

In this paper we are going to discuss all the above kinds of computing and define them mentioning their characteristics, architecture, and advantages and disadvantages and then make comparison between them.

II. Cloud computing

the term cloud is very associated internet, this term depends on cloud drawing which in mainly joined telephone – network.

The cloud computing is a term goes back to sources and systems. Series of computers are headed to provide a number of services without any constrains so as to enable the user to benefit from the resources including space for data saving, and backup and synchronization, also include processing, capabilities, programming and scheduling of the function and push e-mail and remote printing which the user control when connected to the network.[1]

*Figure(1) show cloud computing*
III. Cloud architecture:

cloud computing architecture compose of two major component ‘fronted’ and ‘backend’ both are combined together through network – usually the internet.

3.1 The front end: consist of customers electronic system (computer network). Some applications are urgent for entering the cloud computing system.

3.2 The background: trace back cloud itself which may cover many computer parts, data storage, system and servers[2].

4. Advantages of cloud computing:

1) Lower computer costs: you can lower powered and priced computer to run cloud computing’s web based application.

2) Improved performance: computer in cloud computing system boot and run faster, because of nearly empty memory.

3) Reduced software cost: software are very cheap and most of them are free.

4) Instant software update: if the applications conducted on internet, the update happen automatically, and you have latest version.

5) Improve format compatibility, the papers you create on your machine are harmony with other users’ application or operating system.

6) Ultimate storage capacity: has limitless capacity to store.

7) Increased data reliability, that mean if your computer has been spoiled, the information still found in the cloud.

8) Universal document access that mean your documents are saved in the cloud, and you need not take it with you.
9) Latest version availability: your document is being updated and you can find the latest version updated.

10) Easier group collaboration: you are cooperating because all information are hosted in the cloud not on an individual computers.

11) Device independence: you need not have to attach to single computer. Move to another computers, application and document accompany you through the cloud.[3]

IV. The disadvantages of cloud computing

1) Connecting to internet is needed: you cant reach the cloud computing unless you have a connection to internet.

2) Can be low: the slower than your computer when you want to access a similar software program.

3) Features might be limited: the prominent attribute of cloud computing applications are less than that of the desktop.

4) General concerns: each cloud system applies different protocol and APLs, so its hard to operate applications between cloud based system.

There are different services introduced by the cloud supplies:

DAAS (Data As The Service) customer lines versus providers data base.

PAAS (Platform As The Service) network – hosted software development platform.

IAAS (Infrastructure As The Service) provider nests clients VMs or suppliers network storage.[5]

V. Cloud development models

1) Public cloud computing infrastructure is hosted at the vendor’s premises: that means the customer doesn’t see the site of the of the cloud computing infrastructure. The computing infrastructure is shared between organizations.
2) Private cloud computing architecture: is devoted to the client and it doesn’t take part with other institutions, high cost and considered more secured that public clouds. It’s externally hosted and premise hosted either.

3) Hybrid cloud institutions host: some interesting, well kept application in private clouds.

There are not so many critical applications are kept in the public cloud. The combination is called Hybrid Cloud. Cloud bursting is a term to show where the institution applies its own infrastructure for normal usage but cloud is used for top load.

4) community cloud: the cloud infrastructure is shared by the institutions of the same community. E.g the government and its private agencies can only share the same cloud but not the private agencies[4].

VI. Cluster computing;

a group of computers work together as if they are going to form one computer: the element of cluster is joined to each other through fast local area network.[6]

VII. Architecture of cluster computing

There are many elements concerning the architecture of cluster computing:

1) Multiple high performance computers (PLs, work station SMP, Services)

2) Operating systems

3) High performance network.

4) Cluster middleware (system availability infrastructure)

5) Paralleled programming environment.

6) Applications.[7]
VIII. Advantages of cluster computing:

Especially in the field of internet service distribution, three benefits have been realized:

1) **Incremental scalability**: clusters are fitted to internet services workloads for which the bean size is typically send to at most a few CPU – seconds on a commodity P.E. The ability to develop clusters increasingly over time is a great advantage in the fields like internet service deployment, where capacity planning rely on a considerable number of fugue variables. Incremental scalability takes place of capacity planning with relatively fluid reactionary scaling.

2) **High availability**: clusters have natural availability concerning the independence of the nodes every node has busses, power supplies and disks, so it’s a matter of software to cover passing mistakes. A natural extension of this capability is to temporarily in capacitate a suspect of node and then upgrade them in place. Such capabilities are necessary for network services.

3) **Commodity Building Block**: the last group of advantage comes from the use of commodity building block rather than high end, low volume machines.

The clear benefits are cost / performance. Since memory, disks and nodes can attract the leading edge[8].
IX. **Disadvantages of cluster computing:**
It’s difficult to any one to run without experience. When the size of cluster is so enormous its
difficult for any one to find out something, another disadvantage: programming environment
still be difficult as software on some node is different from the other.[9]

X. **Grid computing:**
is a term trace back to the combination of computer resource from too many different
administrative fields to realize a common purpose and coordinate resources that are not subject
to centralized control, Such as Ethernet. This is in comparison with traditional concept of a
supercomputer, which has a lot of processors combined together by local, high speed computer
bus.

The grid can be seen as a distributed system with un coherent work loads that contain a great
number of fields.

What differentiate grid computer from traditional high performance computing system such
as cluster computing, is that it’s more likely to be heterogeneous and geographically scattered.

Although a single grid can be devoted to a certain application, generally a grid is applied for
different purposes.

Grads normally are built up with general middleware purposes software libraries.

The grid size differ a remarkable amount. Grids are form of dispersed computing whereby; a
super practical computer is comprised of different computing network freely couple computers
working together to conduct large functions.

For some applications distributed or grid computing can be look at as a certain kind of parallel
computing that depend on perfect computers (with onboard CPUS, storage, power supplies
and network interface, … etc) joined to a network (private, public, internet) by traditional
network interface.
The need for grid computing come to being because of quick rate of core network technology quicker than the development in microprocessor speeds. Also to do actual resources and virtual institution to cooperate beside the need to access to additional resources.

The grid computing is normally used in prognostic modeling and simulations engineering design, automation, energy resource exploitation, medical, military basic research and visualization.[5]

XI. Architecture of grid computer:

it a matter of layer and each layer has specific work to do. The higher layers are normally user centric, on the other side lower layers are more hardware centric, centered on computers and networks.

The lower layer is a network which connects grid resources. Above the network layer located the resource layer which is actual grid resources such as, computers, storage systems, electronic data catalogues, sensors, and telescopes that are related to the network.

The middleware layer gives instruments that enable the various elements (servers, storage, and network to contribute in a grid. The middleware layer is often act as (a brain) behind computing grid.

The highest of the structure is application layer which contains application of different elements in sciences, engineering, business finance in addition to portals and development kits to provide the applications.

The application layer often contains the what we call service-ware which conduct out general controlling tasks like tracking which is supplying grid resources and suing them.[5]

XII. Advantages of grid computing:

there is no need for large SMP servers application that disunited and changed to smaller and more effective use of idle resources. Grid environment are more modular and reliable with no
failure. Policies can be directed by the grid software moreover upgrading can be done. And jobs can be fulfilled in parallel speeding performance[5].

XIII. Disadvantages of grid computing:

Interconnect between compute resources (gigabit Ethernet at minimum) may be needed and some applications may need to be rolled to take full advantage of the new model.

Licensing may stand as constrains for some applications[1]

Table(1) shown differentiations between cluster, grid, and cloud computing[10]:

<table>
<thead>
<tr>
<th>characteristics</th>
<th>advantages</th>
<th>disadvantages</th>
<th>comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster</td>
<td>1\ Easy to deploy &lt;br&gt; 2) Complete &lt;br&gt; 3) Open &lt;br&gt; 4) Easy to manage &lt;br&gt; 5) Flexible &lt;br&gt; 6) Optimized &lt;br&gt; 7) Expandable &lt;br&gt; 8) Supported</td>
<td>1\ no need to experience &lt;br&gt; 2\ difficult to find failure &lt;br&gt; 3\ Programming is hard to be improved when software is different between the nodes</td>
<td>1\ More than two computers are connected to solve a problem &lt;br&gt; 2\ One of the standard OSs (Linux, Windows, etc) &lt;br&gt; 3\ Capacity is stable and guaranteed &lt;br&gt; 4\ Limited (often failed tasks/applications are restarted)</td>
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<tr>
<td>characteristics</td>
<td>advantages</td>
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<tr>
<td>Grid</td>
<td>1\ Loosely coupled (Decentralization)</td>
<td>1\ No licensing across many servers for some applications</td>
<td>1\ A large project is divided among multiple computers to make use of their resources</td>
</tr>
<tr>
<td></td>
<td>2\ Diversity and Dynamism</td>
<td>2\ More efficient use of idle resources</td>
<td>2\ Any standard OS dominated by Linux</td>
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<tr>
<td></td>
<td>3\ Distributed Job Management &amp; scheduling</td>
<td>2\ Its environments are more modular and don’t have much points of failure</td>
<td>3\ Capacity varies, but high</td>
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<td></td>
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<td>3\ Policies can be managed by the grid software</td>
<td>4\ Limited (often)</td>
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<td></td>
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<td>4\ Upgrading can be done without scheduling downtime.</td>
<td>5\ Failed tasks/application are restarted</td>
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<td>6\ Jobs can be executed in parallel speeding performance</td>
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<td>Cloud</td>
<td>1\ On-demand self-service.</td>
<td>1\ Requires a constant internet connection.</td>
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<td></td>
<td>2\ Broad network access.</td>
<td>2\ Doesn’t work well with low-speed connections.</td>
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<td>3\ Resources pooling</td>
<td>3\ Can be slow even with a fast connection</td>
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<td></td>
<td>4\ Rapid elasticity</td>
<td>4\ Features might be limited</td>
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<td></td>
<td>5\ Measured service</td>
<td>5\ Stored data might not be secure</td>
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<td></td>
<td>1\ Lower computer costs.</td>
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<td>2\ Improved performance.</td>
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<td>3\ Reduced software costs</td>
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<td>4\ Instant software updates.</td>
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<td>5\ Improved document format compatibility</td>
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<td>6\ Unlimited storage capacity.</td>
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<td>7\ Increased data reliability.</td>
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<td>8\ Universal document access.</td>
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XIV. Conclusion:

Cloud computing is a quicker growing part of IT because it has a great deal of savings like lessening the high cost of computers and applications therefore you pay little money to buy devices, there are many benefits to customers concerning improving performance, and authentications. However, the cloud faces many difficulties and challenges such as using the internet to reach it. It difficult to ensure the data wasting, and the most important issues are security and privacy.

XV. References


3. Cloud Computing Modified from Mark Baker, Keith Dobson, B. Ramamurthy

4. JOURNEY TO THE CLOUD Venubabu Kunamneni ‘11G* M.S. Program in Computer Science, Rivier College InSight: RIVIER ACADEMIC JOURNAL, VOLUME 7, NUMBER 2, FALL 2011


7. Cluster Computing Architectures, Operating Systems, Parallel Processing & Programming Languages


8. Cluster-Based Scalable Network Services Armando Fox Steven D. Gribble Yatin Chawathe Eric A. Brewer Paul Gauthier University of California at Berkeley Inktomi Corporation

{fox, gribble, yatin, brewer}@cs.berkeley.edu gauthier@inktomi.com


10. A comparative Study Between Classical, Distributed, Cluster, Grid, Utility, and Cloud Computing _Amin Babiker A/Nabi Mustafa* Osama Abdallah Mohammed Enan* Yaseen
Muhammad Tom Yusif * Department of Communications, Faculty of Engineering, Al-Neelain University