VAGUENESS ANLAYSIS TOWARDS ADENOIDS INSPECTIONS

Md.Sarwar kamal*

Sonia Farhana Nimmy*

Linkon Chowdhury*

ABSTRACT:

Children are the most beautiful and innocent part of our life irrespective of any cast and religion. But they are the most vulnerable to be affected by any kind of diseases as well as harm due to their natural immaturity. One of the vital suffering for the kids is Adenoid**.** Adenoids (or pharyngeal tonsil, or nasopharyngeal tonsil) are a mass of lymphoid tissue situated posterior to the nasal cavity, in the roof of the nasopharynx, where the nose blends into the throat. Normally, in children, they make a soft mound in the roof and posterior wall of the nasopharynx, just above and behind the uvula. In this paper, a priori knowledge about information for certain feature classes is used in order to classify image in fuzzy logic classification procedure. Here first we have to supervised image classification and then use the logic based on fuzzy logic. Based on similarities supervised membership function is used. Results of the procedure, based on pixel-by-pixel technique, were compared and certain encouraging conclusion remarks come out.

Keywords: Nasopharynx, lymphoid tissue, uvula, feature selection, Fuzzy Logic

* Lecturer, Computer science and Engineering, BGC Trust University, Bangladesh.

1. INRODUCTION:

While we made the size of nasopharyngeal tonsil larger we can easily identify infected symptoms among various aged people, most commonly between the Kids, ages of 3 and 7 years. There is some misconception on Tonsillectomy and adenoidectomy. Tonsillitis indicates to irritation of the pharyngeal tonsils (glands at the back of the throat, visible through the mouth). The irritation may involve other areas of the back of the throat, including the adenoids and the lingual tonsils (tonsil tissue at the back of the tongue). There are several variations of tonsillitis: acute, recurrent, and chronic tonsillitis and peritonsillar abscess. Conducting sleep studies of children before removing their adenoids (adenotonsillectomy) may help identify those at increased risk for postoperative respiratory complications.

The very general problems influences the adenoids are isochronal contagiousness of the nose and throat and compelling amplification that creates nasal obstruction and/or breathing, swallowing, and sleep problems. Carbuncle around the adenoids, chronic tonsillitis, and influences of small pockets within the adenoids that result foul-smelling white deposits can also affect the adenoids, making them sore and swollen. Cancers of the adenoids, while uncommon, require early diagnosis and aggressive treatment. You should see your doctor when you or your child experiences the common symptoms of infected or enlarged adenoids. Your physician will ask about problems of the ear, nose, and throat and examine the head and neck. He or she may use a small mirror or a flexible lighted instrument to see these areas. Other methods used to check adenoids and tonsil and adenoids are:

- Medical history
- Physical examination
- Throat cultures/Strep tests - helpful in determining infections in the throat
- X-rays - helpful in determining the size and shape of the adenoids
- Blood tests - helpful in diagnosing infections such as mononucleosis
- Sleep study, or polysomnogram-helpful in determining whether sleep disturbance is occurring because of large tonsils and adenoids.

Tonsillitis and its symptoms

Tonsillitis is an infection of the tonsils. One sign is swelling of the adenoids. Other symptoms are:

- Redder than normal tonsils
- A white or yellow coating on the adenoids
- A slight voice change due to swelling
- Sore throat, sometimes accompanied by ear pain.
- Uncomfortable or painful swallowing
- Swollen lymph nodes (glands) in the neck
- Fever
- Bad breath

Enlarged adenoids and/or adenoids and their symptoms

If a child's adenoids are enlarged, it may be hard to breathe through the nose. If the adenoids and adenoids are enlarged, breathing during sleep may be disturbed. Other signs of adenoid and or tonsil enlargement are:

- Breathing through the mouth instead of the nose most of the time
- Nose sounds "blocked" when the person speaks
- Chronic runny nose
- Noisy breathing during the day
- Recurrent ear infections
- Snoring at night
- Restlessness during sleep, pauses in breathing for a few seconds at night (may indicate sleep apnea).

1.1. **How are Tonsil and Adenoid diseases treated**

Bacterial infections of the tonsils, especially those caused by streptococcus, are first treated with antibiotics. Removal of the adenoids (tonsillectomy) and/or adenoids (adenoidectomy) may be recommended if there are recurrent infections despite antibiotic therapy, and/or difficulty breathing due to enlarged tonsils and/or adenoids. Such obstruction to breathing causes snoring and disturbed sleep that leads to daytime sleepiness, and may even cause behavioral or school performance problems in some children. Chronic infections of the adenoids can affect other areas such as the Eustachian tube–the passage between the back of the nose and the inside of the ear.

This can lead to frequent ear infections and buildup of fluid in the middle ear that may cause temporary hearing loss. Studies also find that removal of the adenoids may help some children with chronic earaches accompanied by fluid in the middle ear (otitis media with effusion).In adults, the possibility of cancer or a tumor may be another reason for removing the adenoids and adenoids. In some patients, especially those with infectious mononucleosis, severe enlargement may obstruct the airway. For those patients, treatment with steroids (e.g., prednisone) is sometimes helpful.

2. ABOUT FEATURE EXTRACTION:

The increase in computing power and electronic storage capacity has lead to an exponential increase of digital content available to users in the form of images which form the bases of many applications [1]. Consequently, the search for the relevant information in the large space of image databases has become more challenging. How to manage appropriate extracted outcome is still difficult problem and it is a proper field to make experiment. A typical image retrieval system includes feature extraction usually in conjunction with feature selection [2]. We can depict any image as a collection of color, texture and shape features. While several image retrieval systems rely on only one feature for the extraction of relevant images, but exact collection of relevant features can yield better retrieval performance [3]. The process of determining the combination of features that is most representative of a particular query image is called feature selection. In case of analyzing real-world maps, the images shown there may not distinctly identify accurate and comprehensible information; rather lots of knowledge may be embedded in the domain in a hidden and unexplored form.

3. THE MODEL:

In this work we first collect the images which are identified as Adenoids detected by the medical inspections techniques or investigations. But for machine we have to go through the following ways:

1. Support Vector Machines (SVM) classify the images from a lot of unclassified images. We have had diagnose the infected images implementing the true Maximum Margin Hyperplane
2. (MMH). Here we denote capricious images as R_{image} (Random Images) and after being classification the resultant images named as F_{Image} (Final Images).
3. Our proposed Fuzzy Algorithm to scrutiny the blowoff the trial..

4. SUPPORT VECTOR MACHINES:

Support Vector Machine (SVM) is one of the latest clustering techniques which enables machine learning concepts to amplify predictive accuracy in the case of axiomatically diverting data those are not fit properly. It uses inference space of linear functions in a high amplitude feature space, trained with a learning algorithm. It works by finding a hyperplane that linearly separates the training points, in a way such that each resulting subspace contains only points which are very similar. First and foremost idea behind Support Vector Machines (SVMs) is that it constituted by set of similar supervised learning. An unknown tuple is labeled with the group of the points that fall in the same subspace as the tuple. Earlier SVM was used for Natural Image processing System (NIPS) but now it becomes very popular is an active part of the machine learning research around the world. It is also being used for pattern classification and regression based applications. The foundations of Support Vector Machines (SVM) have been developed by V.Vapnik.

Two key elements in the implementation of SVM are the techniques of mathematical programming and kernel functions. The parameters are found by solving a quadratic programming problem with linear equality and inequality constraints; rather than by solving a non-convex, unconstrained optimization problem. The flexibility of kernel functions allows the SVM to search a wide variety of hypothesis spaces. All hypothesis space help to identify the

Maximum Margin Hyperplane (MMH) which enables to classify the best and almost correct data the following figure shows the process of SVMs selection from large amount of SVMs.

5. FUZZY LOGIC:

The logic which works with approximation instead of exact and constant value is called fuzzy logic. The logic has been used from long back to solve various problem domains. The working value of fuzzy logic can be any value in between 0 and 1.Although the fuzzy logic is relatively young theory, the areas of applications are very wide: process control, management and decision making, operations research, economies and, for this paper the most important, pattern recognition and classification. An idea to solve the problem of image classification in fuzzy logic manner as well as comparison of the results of supervised and fuzzy classification was the main motivation of this work.

6. PROPOSED ALGORITHM:

In this paper, *a priori* knowledge about information for certain feature classes is used in order to classify image in fuzzy logic manner. More specifically,

(a) input (image channels) and output variables (feature classes) are introduced in the working environment.

b) Membership functions are defined using results from supervised classification.

c) Several Fuzzy Logic Toolboxes was used in definition of fuzzy logic inference rules,

d) These rules are examined by using simulation of classification procedure at random sample areas.

And at the end,

e) Image classification was conducted.

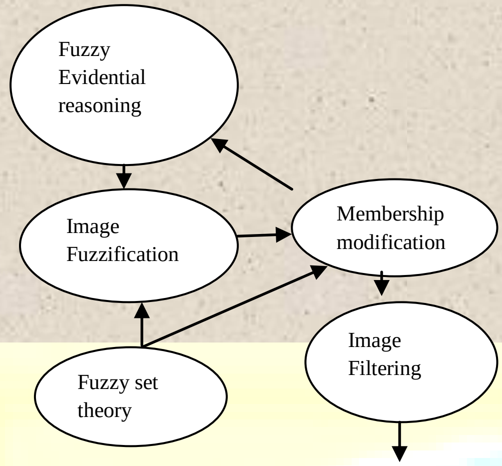

Fig: Proposed algorithmic Steps

In our previous work we have had accomplished Spatial Feature Extractions Using Supervised classification using the algorithm cited here. In this work we have encroach the algorithm in contradistinctive fashion which is delineate in figure 1.

6.1. Fuzzy Evidential Reasoning

One important steps of this algorithm is evidential Fuzzy reasoning which classify the problem domain in multiple factors. This multiple analysis brings the problem domains more and more flexible and realistic. We infringe Interval grade Evidential Reasoning (IER).In IER approach we can easily portray the problem in a specific set. Suppose H is total set for the given problem then in IER it may be H= {H1, H2, H3, H4…Hn}.In a matrix it will be as follows:

$$H = \begin{cases} H_{11}, H_{12}, H_{13}, H_{14}, H_{14} \ldots\ldots, H_{1N} \\ H_{21}, H_{22}, H_{23}, H_{24}, H_{25} \ldots\ldots\ldots, H_{2N} \\ H_{31}, H3_{2}, H_{33}, H_{34}, H_{35} \ldots\ldots\ldots, H_{35} \end{cases} \quad \ldots\ldots\ldots\ldots(4)$$

Where Hpp (p =1,..., N) in equation (4) represents an individual grade. Hpq (p =1,..., N , $q = p$ +1,...,N) narrates the interval grade which is the summation or union of individual grade Hpp ,,H (p +1)(p+ 1) H + + ,…, Hqq .

6.2. Image Fuzzification

Image Fuzzification is the process where crisps input are transformed into fuzzy input. Crisps inputs are the exact inputs those are measured by the Sensors, Automated System, Machines and crawled into the control system for processing.

In the process of image Fuzzification gray scale image can be easily delineate by using its intensity function as follows:

$$P : H \rightarrow M$$

Where

P = Intensity function

H=Mapping result from Space level set M

M=Space Level set by considering Gray level M=(-11)

Again $H \subset R^2$ is the image foundation. Without loss of abstract principal, the rectangle $H = [x_0, x_1] \times [y_0, y_1]$ can be assent to image foundation. The coordinates of a pixel within the foundation H will be noted as (x,y) .By considering these we get fuzzy partition $Q = \{W_{ij} \mid (i, j) \in [0, m] \times [0, n]\}$

Now when we will consider the image as polynomial fashion we will get the following computation:

$lx_i : [x_0, x_1] \to [0,1]$ Where

$$lx_i(x) = C_m^i \frac{(x - x_0)^i (x_1 - x)^{m-i}}{(x_1 - x_0)^m}$$

$ly_j : [y_0, y_1] \to [0,1]$ Where

$$ly_j(y) = C_n^j \frac{(y - y_0)^j (y_1 - y)^{n-j}}{(y_1 - y_0)^n}$$

$p_{ij} : H \to [0,1]$ Where

$$p_{ij}(x, y) = qx_i(x) \cdot qy_j(y)$$

Where,

$$C_m^i = \frac{m!}{i!(m-i)!}, C_n^j = \frac{n!}{j!(n-j)!}$$

And $(i, j) \in [0, m] \times [0, n]$

6.3. Fuzzy Set Theory in Image processing

Fuzzy sets are widely using in image processing in current era. Basically a fuzzy set of a associating set is set of engage pairs such as H = {<x, μH (x)> | x ε X}

Where $\mu H : X \to [0,1]$.

We here concentrate on following fuzzy operation:

1. Area
2. Perimeter
3 And Compactness

The Area of a fuzzy set H on X $\subseteq R$ is

Area (H)= $\int$ H(x) dx

For digital fuzzy set Area(H)= Σ H(x)

Similarly the perimeter of the set H will as follows:

Perim (H)=Σ Perim($^{\alpha}$H). to accomplished the computation properly and smoothly we have to have calculate the Compactness of given image as follows:

$$\text{Comp(H)}=\frac{4\pi.area(H)}{Perim_{2(H)}}$$

6.4. Membership Function Modification

In this work we have contemplate to figure out the membership values of each operation for the point (x,y) € H to the fuzzy window

Wij=[0,1],

$$w_{ij}(x,y)=\frac{\left(p_{ij}(x,y)\right)^{\gamma}}{\sum_{j=0}^{n}\sum_{i=0}^{m}\left(p_{ij}(x,y)\right)^{\gamma}}$$

The membership degree Wij(x,y) narrates the position of the points (x,y) in total space H. Consequently it is very important to keep tracks on Fuzzy Cardinality, Fuzzy mean and Fuzzy variance. The cardinality = $card(W_{ij}) = \sum_{(x,y)\in D} w_{ij}(x,y)$,

the Fuzzy mean=

$$\mu_{\varphi}(H, W_{ij}) = \langle + \rangle_{(x,y)\in D} \left(\frac{w_{ij}(x,y)}{card(W_{ij})} \langle \times \rangle f(x,y) \right)$$

The variance=

$$\sigma_{\varphi}^{2}(f, W_{ij}) = \sum_{(x,y)\in D} \frac{w_{ij}(x,y) \| f(x,y) \langle - \rangle \mu_{\varphi}(f, W_{ij}) \|_{E}^{2}}{card(W_{ij})}$$

7. FUZZY MATCHING:

Let us consider the fuzzy matching for the mixing images on the input images [10]. .The degree to which the input target images satisfy the conditions of fuzzy rules and conditions .Suppose IMAGE X is defined by rules R_1 and IMAGES Y is defined by rules R_2.In this case the matching degree will be represented by as follows:

Matching Degree (IMAGE X,R_1)=µ(IMAGE X)

Matching Degree (IMAGE Y,R_2) =µ (IMAGE Y)

Where µ is the fuzzy membership function.

The fuzzy matching determines the actual outcome for fuzzy optimization which is accomplished here by fuzzy matrix. Here is a graphical view of fuzzy matching degree for IMAGE Y as follows:

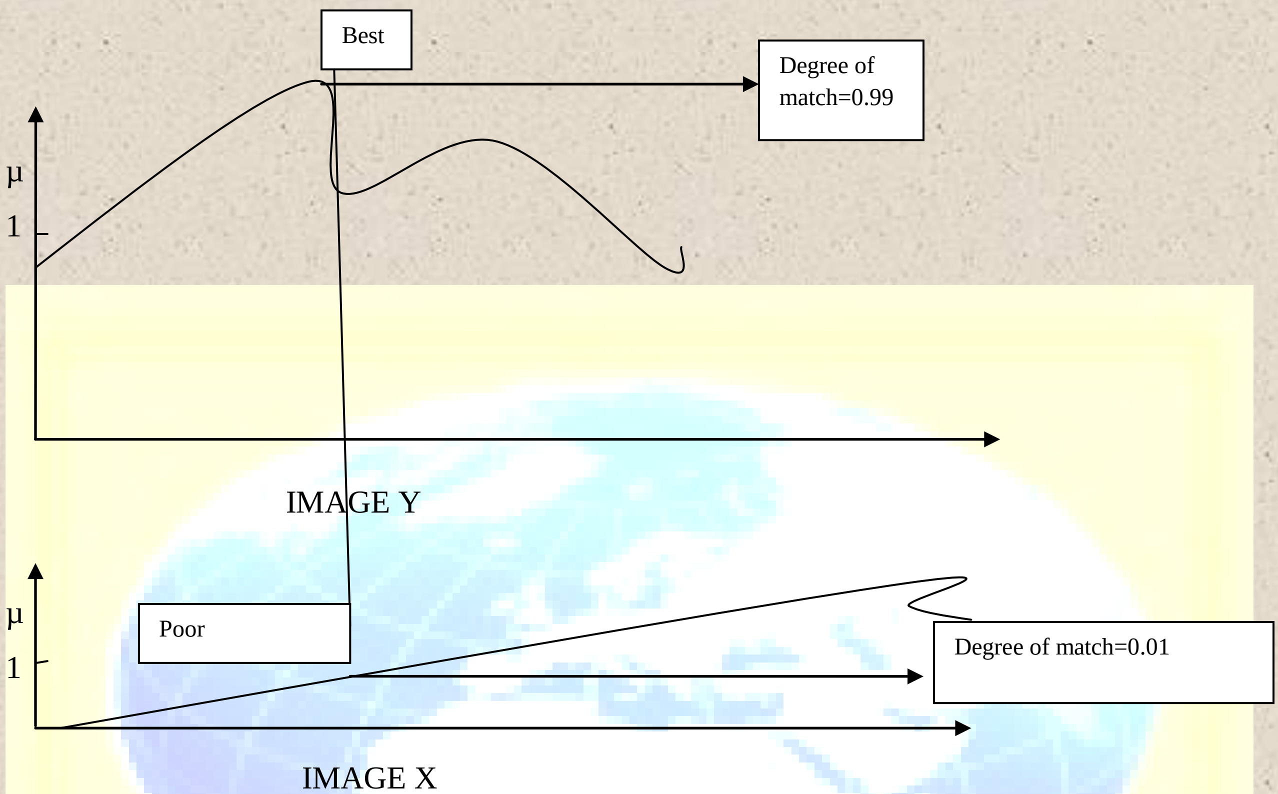

Fig 2: The matching degree of fuzzy images

8. CLASSIFICATION PROCEDURE:

In our previous work we have done the classification by projecting the maximum classifier without NULL classifier is used. We implied a normal distribution and evaluate the variance and correlation of spectral response during the classification of the unknown pixel.

Here we have had fixed the partitioning as follows:

Let we have a data set $X = \{x_1, x_2, \ldots, x_n\} \subset R^p$ and A classification of X is a $c \times n$ matrix $U = [\mathbf{U_1 U_2} \ldots \mathbf{U_n}] = [u_{ik}]$, where $\boldsymbol{U_n}$ denotes the k-th column of U. We have found three classifications efficient and suitable for our research activity. The labeled vectors for these classifications are:

1. $\mathbf{N}_{pc} = \{ \mathbf{y} \in R^c : y_i \in [0\ 1]\ \forall i, \quad y_i > 0\ \exists i \}$ Possibility Label
2. $N_{fc} = \{y \in N_{pc} : \Sigma y_i = 1\}$ Fuzzy Label
3. $N_{hc} = \{y \in N_{fc} : y_i \in \{0, 1\}\ \forall i \}$ Hard Label

The Fuzzy classification = $M_{fcn} = \{U \in M_{pcn} : \mathbf{U}_k \in N_{fc} \forall k\}$

9. EXPERIMENTS WITH REAL-WORLD DATA:

Here we have collected data from Chittagong Medical College Hospital, Bangladesh, Dhaka Medical college Hospital Bangladesh, and Appolo Private Hospital Bangladesh. After than we have selected one best image by using SVM stated in section three.

Fig 3: The Sampled image

The will go to under various operation according to the desired output and experiments. After performing thresholding [5] based on color intensities defined for each and every feature, the features are highlighted with individual colors. Therefore, the highlighted feature area is clearly distinguished from the background. The thresholding process finally extract number of zones of the infected images.

The figure 4 below shows the High pass –Median value effect that is caused by the image Fuzzification process described at section 6.2.2.

Fig 4: High pass –Median value done by Fuzzification

But there are no clear indications of finding the result based on the Fuzzification mechanism.

Similarly we have taken the view on Low pass- Median computation shows in the figure 5 below:

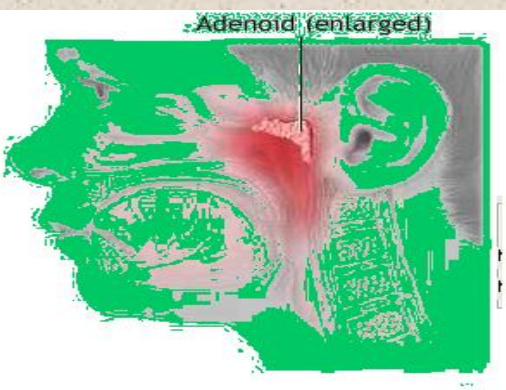

Fig 5: Low pass-Median Fuzzification narrated according to the section 4.2.2

Here we have found that the little better solution than High pass-Median Solution.

From here we have extracted the infected area by introducing the idea depicted at section 4.2.1 and 4.2.3.

Fig 6: The extracted infected image

Then we made the images in gray scale format so that to reducing the extra cost in some extent.

Fig 7: Gray scale modification

From this Gray Scale conversion we fixed the pixel values using the concepts of fuzzy set Theory described at section 4.2.3.The figure 8 below shows the outcomes

Fig 8: The pixels result of the image

Finally by using the Fuzzy Matching techniques cited at section 5 we have reached the successes as follows as figure 9 which is the real infected area.

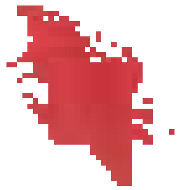

Fig 9: The enlarge outcome of actual infected Adenoids

10. FUZZY MATRIX OPTIMIZATION:

Comparing between two given matrix and finding out the optimum values between them.

Steps To Solve the Problem:

1. Taking values of first matrix as input into the first array from a file for iterative comparisons.
2. Taking values of second matrix as input into the second Array from a file for iterative comparisons.
3. The values of both arrays will be compared than.

11. PSEUDO CODE FOR OPTIMIZATION PROCESS:

```
Fuzzy optimization (x.finput1 [], y.finput2 [])
for the value i,j where i ≠ j
float matrixone[][] = new float[][];
float matrix two[][] = new float[][];
iteration up to the i=n and j=n
{matrix one[k][i]=finput.nextInt();
matrix two[k][j]=finput.nextInt();
(matrixone[m][n]>=matrixtwo[m][n])
System.out.print(" "+matrixone[m][n]);}
```

12. FUZZY REASONING:

Based on the descriptions of the input (green, red and blue channels) and output variables (water, agriculture, forest, buildings, and roads), the rule statements can be constructed:

Rules for image classification procedure in verbose format are as follows:

IF (GREEN is a1) AND (RED is a1) AND (NIR is a1)

THEN (class is Outer Area)

IF (GREEN is a2) AND (RED is a2) AND (NIR is a2)

THEN (class is Boundary Detections)

IF (GREEN is a3) AND (RED is a3) AND (NIR is a3)

THEN (class is Pixel based Area)

IF (GREEN is a4) AND (RED is a4) AND (NIR is a4)

THEN (class is Inner area)

IF (GREEN is a5) AND (RED is a5) AND (NIR is a5)

THEN (class is actual infections)

13. RESULT EVALUATIONS FOR FUZZY CLASSIFICATION:

One way of the result evaluation was through the accuracy assessment. The classification results are compared to the raw image data and the report is created. This process is done during the random sample selection. The idea of the accuracy assessment is: point is highlighted in the sample list and observation [9] was done where it is located on the image.

The following table shows the mean and standard deviation for the classified classes**:**

Channel	Mean	Standard Deviation
Outer Area (from 50 samples)		
Green	75.53	10.32
Red	42.47	7.53
Blue	62.64	13.71
Boundary Detections (from 75 samples)		
Green	173.12	27.12
Red	88.77	15.12
Blue	54.12	11.11
Pixel Based Area (from 50 samples)		
Green	129.77	25.50
Red	72.47	23.53
Blue	55.45	19.31
Inner Area (from 50 samples)		
Green	72.23	33.21

Red	33.12	18.56
Blue	34.12	20.11
Actual Area (from 75 samples)		
Green	73.35	06.00
Red	19.37	0.12
Blue	51.12	22.19

Table 1: Random Fuzzy Image Classification (RFIC)

Creation of the membership functions for the output variables is done in the similar manner. Since this is Sugeno-type inference, constant type of output variable fits the best to the given set of outputs. When the variables have been named and the membership functions have appropriate shapes and names, everything is ready for writing down the rules.

Class	Output variable
Outer Area	1
Boundary Detections	2
Pixel Based Area	3
Inner Area	4
Actual Area	5

Table 2: Level selection of the image

14. ACCURACY ASSESSMENTS BASED ON OUR PROPOSED FUZZY LOGIC CLASSIFICATION:

Idea for accuracy assessment of fuzzy logic classification results comes from the manner the maximum likelihood accuracy assessment was performed: select random sample areas with known classes and then let fuzzy logic ‘say’ what these samples are. With 100 random selected samples, results were as following:

Correctly classified samples: 87

Misclassified: 13

Accuracy: 87%

15. CONCLUSION:

From the above experimental analysis we have circumspect the outright process so that it can smoothly identify the contaminated segments for better investigations. Adenoids disturb the kids at their early stages. Here we attempt to design a machine readable process which will help to catalog the victim’s images accurately. Though we have found that our work have achieved accuracy till 87% it may possible to attain more accuracy.

16. REFERENCES:

- Rob J. Decker. Texture analysis and classification of ERS SAR images for map updating of urban areas in the Netherlands. *IEEE. Trans. Geo. Rem. Sen.*, 41(9):1950-1958, 2003.
- R.M. Haralick, Statistical and structural approaches to texture, *Proceedings of the IEEE*, 67(5): 786-804, 1979.
- B. Solaiman, R. Fiset and F. Cavayas.Automatic road extraction using fuzzy concepts. IGARSS’98, Seattle, USA. 1998.Sunnyvale, CA, 2004.
- A.K Shackelford, and C.H. Davis. A hierarchical fuzzy classification approach for high-resolution multispectral data Over urban areas. *IEEE Trans. Geo. Rem. Sen.* 41(9): 1920-1932. 2003.
- Stefanakis, E.; Sellis, T.- Enhancing a Database Management System for GIS with Fuzzy Set Methodologies, Proceedings of the 19th International Cartographic Conference, Ot- tawa, Canada, August 1999.

- R.O. Duda and P.E. Hart. *Pattern classification and scene analysis*. John Wiley & Sons. NY. 1973.
- M. Törmä. Introduction to neural networks and their use in remote sensing. Photogrammetric Journal of Finland. 13(1): 87-102. 1992.
- Liu, H., Li. J., Chapman, M. A.;- Automated Road Extraction from Satellite Imagery Using Hybrid Genetic Algorithms and Cluster Analysis, Journal of Environmental In- formatics 1 (2) 40-47 (2003)
- Guesgen, H.;Hertzberg, J.; Lobb, R.;Mantler, A. { Bu_ering Fuzzy Maps in GIS, Spatial Cognition and Computation, 2003
- W.K. Pratt. *Digital Image Processing*. John Wiley & Sons. NY. 1991
- Eastman, R { Idrisi 32 Release 2, Guide to GIS and Image Processing, Volume I- II, Clark University, May 2001
- Benz, U.; Hofmann, P.; Willhauck, G.; Lingenfelder, I.; Heynen, M. - Multi-resolution, object-oriented fuzzy analysis of remote sensing data for GIS-ready information, Journal of Photogrammetry & Remote Sensing, 2004
- Samy Sadek, Ayoub Al-Hamadi, Axel Panning, Bernd Michaelis, Usama Sayed, "A New Approach to Image Segmentation via Fuzzification of Rènyi Entropy of Generalized Distributions***"***, World Academy of Science, Engineering and Technology 56 2009.
- Roman Friˇc and Martin Papˇco, "FUZZIFICATION OF CRISP DOMAINS, KYBERNETIKA" VOLUME 4 6 (2 0 1 0) , NUMBER 6 , PAGES 1 0 0 9 – 1 0 2 4.
- Min Guo, Jian-Bo Yang, Kwai-Sang Chin, and Hongwei Wang, "The Evidential Reasoning Approach for Multi-attribute Decision Analysis***"***
- Prof. Dr Kamrul Hassan Tarafder MBBS, FCPS, FICS," Adenoid***s***",in Health Magazine, The independent Bangladesh Monday, 30 January 2012.