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GLCM and Multiclass Support Vector Machine Based Automatic Detection and Analysis of Types of Cancer and Skin Allergy

Amruta M.Gajbar.

ME(2nd Year)Student,
Department of Electronics & Telecommunication Engg.,
(Signal processing) JSPM Wagholi,Pune,Maharashtra

Prof.A.S.Deshpande.

Assistant Professor,
Department of Electronice &TelecommunicationEngg.,
(SignalProcessing)JSPM,Wagholi,Pune,Maharashtra

Abstract *:**Currently it\\\'s really very important to watch and analyse the malignant neoplastic disease automatically at intervals the first stages. Irregular streaks square measure one in every of the foremost very important features(included in most of dermoscopy algorithms) that show high association with carcinoma and basal cell malignant growth malady. The diagnostic test technique for the detection is most painful and harmful.So we have a tendency to tend to square measure going for the machine-driven detection.Here we have a tendency to tend to square measure practice the GLCM choices for the detection . the choices of skin lesions square measure extracted normalized symmetrical grey Level Co-occurrence Matrices GLCM.GLCM based texture choices square measure extracted from each of the four classes and given as input to the Multi-Class Support vector machine that\'s utilized for c1assification purpose.***

Index Terms -Dermoscopy, Irregular streaks, Gray level, grey Level Co-occurrence Matrices, melanoma,Multi-class Support Vector Machine , Texture choices.

I. INTRODUCTION

Type Of malignant neoplastic disease:

Skin cancers square measure named for the type of cells that become malignant (cancer). the three commonest kinds are:

Melanoma

Melanoma begins in melanocytes (pigment cells) [3]. Most melanocytes square measure at intervals the skin.See the figure one.1 of a skin cell and various skin cells. malignant melanomacer} will occur on any skin surface. In men, it's usually found on the skin on the highest, on the neck, or between the shoulders and so the hips. In women, it's usually found on the skin on the lower legs or between the shoulders and so the hips. carcinoma is rare in people with dark skin. once it\'ll develop in people with dark skin, it's usually found beneath the fingernails, beneath the toenails, on the palms of the hands, or on the soles of the feet. The figure one.2 shows academic degree uneven carcinoma with irregular and crenate borders.

Basal cell malignant neoplastic disease

Basal cell malignant neoplastic disease begins at intervals the basal cell layer of the skin. it continually happens in places that area unit at intervals the sun. for example, the face is that the most typical place to hunt out basal cell malignant neoplastic disease. In people with truthful skin, basal cell malignant neoplastic disease is that the most typical variety of malignant neoplastic disease.

Risk issue

once you're told merely|that you just} simply have malignant neoplastic disease, it's natural to surprise what might have caused the malady. the foremost risk issue for malignant neoplastic disease is exposure to sunlight (UV radiation), but there are various risk factors. A risk issue area unit some things which is able to increase the prospect of getting a malady. people with sure risk factors square measure extra in all probability than others to develop malignant neoplastic disease. Some risk factors vary for the assorted forms of malignant neoplastic disease.The following square measure risk factors for the three commonest forms of skin cancer:

1.Sunlight

Sunlight is also a offer of actinic ray radiation. It's the foremost very important risk issue for any variety of malignant neoplastic disease. The sun's rays cause skin damage that will lead to cancer. Severe, blistering sunburns: those that have had a minimum of 1 severe, blistering sunburn square measure at raised risk of malignant neoplastic disease. although those that burn merely square measure extra in all probability to possess had sunburns as a baby, sunburns throughout adulthood to boot increase the possibility of malignant neoplastic disease. life sun exposure: the general amount of sun exposure over a life is also a risk issue for malignant neoplastic disease. Tanning: although a tan slightly lowers the possibility of sunburn, even those that tan well whereas not sunburning have succeeding risk of malignant neoplastic disease thanks to extra life sun exposure. daylight is also reflected by sand, water, snow, ice, and pavement. The sun's rays can get through clouds, windshields, windows, and lightweight vesture. at intervals the u. s., malignant neoplastic disease is extra common where the sun is powerful. for example, extra people in province than variable star State get malignant neoplastic disease. Also, the sun is stronger at higher elevations, like at intervals the mountains. Doctors encourage people to limit their exposure to sunlight. Sunlamps and tanning booths: Artificial sources of actinic ray radiation, like sunlamps and tanning booths, can cause skin damage and malignant neoplastic disease. Health care suppliers powerfully encourage people, notably children, to avoid practice sunlamps and tanning booths. the possibility of malignant neoplastic disease is greatly raised by practice sunlamps and tanning booths before age thirty. Personal history-People World Health Organization have had carcinoma have academic degree raised risk of developing various melanomas. Also, those that have had basal cell or somatic cell malignant neoplastic disease have academic degree raised risk of developing another malignant neoplastic disease of any kind. Family history- carcinoma usually runs in families. Having two or extra shut relatives (mother, father, sister, brother, or child) World Health Organization have had this malady is also a risk issue for developing carcinoma. various forms of malignant neoplastic disease to boot usually run in families. Rarely, members of a family will have academic degree hereditary condition, like xeroderma or nevoid basal cell malignant growth malady syndrome, that produces the skin extra sensitive to the sun and can increase the possibility of malignant neoplastic disease. Skin that burns simply: Having truthful (pale) skin that burns at intervals the sun simply, blue or gray eyes, red or blond hair, or many freckles can increase the possibility of malignant neoplastic disease. sure medical conditions or medicines: Medical conditions or medicines (such as some antibiotics, hormones, or antidepressants) that make skin extra sensitive to the sun increase the possibility of malignant neoplastic disease. Also, medical conditions or medicines that suppress the system increase the possibility of malignant neoplastic disease.

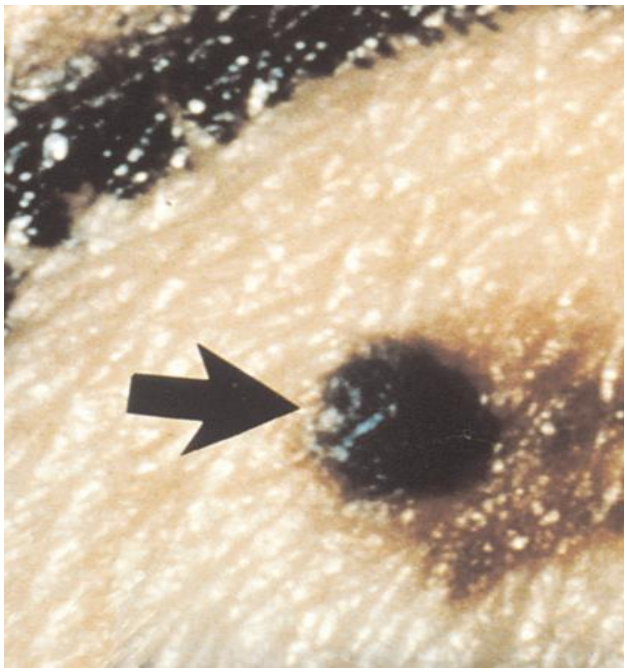
2 Other Risk Factors for Melanoma

The following risk factors increase the possibility of melanoma:

Dysplastic defect: A condition birthmark is also a kind of mole that seems fully completely different from a typical mole. A condition defect might even be larger than a typical mole, and its color, surface, and border might even be fully completely different. It's usually wider than a pea and will be longer than a peanut. A condition defect can have a mix of the many colors, from pink to dark brown. Usually, it's flat with a sleek, slightly scaly or pebbly surface, associate degreed it\\\'s associate irregular edge

which is able to fade into the encircling skin. A condition defect is extra in all probability than a typical mole to indicate into cancer. However, most don\\\'t change into carcinoma. A doctor will remove a condition defect if it\\\'s am keen on it\'s going to want become carcinoma.Image acquisition

The first step in carcinoma detection is that the skin scrutiny to search out skin cancer and in laptop power-assisted diagnostic system it involves acquisition of the digital image of affected skin.



a dysplastic nevus

II LITERATURE REVIEW

In 1991, Scott E.Umbaugh et. al proposed Applying Artificial Intelligence to the Identification of Variegated Coloring in Skin Tumors,here used automatic induction to generate classification rules.

In 1993, F.Ercal, M.Moganti, V.Stoecker, and R.H.Moss[1] proposed general procedure for extracting border detection of color image data. There for removing noise median filter used. Furthermore , using histogramming, and an approximate color fostrnsegmentation strategy. They found that spherical transformations and chromaticity transformations provided the highest diagnostic accuracy. Thresholding is a widely used tool in image segmentation for identifying the different homogeneous components of the image.they presents a simple yet effective borderfinding algorithm targeted to color image of skin tumors. The technique is based on segmentation algorithm that used an adaptive transformation function followed by thresholding.

In 1994, Fikret Ercal et al. studied the diagnose melanoma from color skin images using an artificial neural network. Present a novel neural network approach for the automated separation of melanoma from three bening categoies of tumors which exhibit melanoma-like characteristics.there approach uses discriminant features, based on tumor shape and relative tumor color, that used for artificial neural network for classification.

In 1999, Philippe Schmid, proposed a color-based segmentation scheme applied to dermatoscopic images. A two-dimensional histogram is computed with the two principal components and then smoothed with a Gaussian low-pass filter. Segmentation used Fuzzy C-Means clustering technique.

In 2000, Do Hyun Chung et al, proposed segmenting skin lesions with partial-differential-equations-based image processing algorithms. A partial-differential equations-based system for detecting the boundary of skin lesions in digital clinical skin image is used. Segmentation done by the geodesic active contoures model or the geodesic edge tracing approach.

In 2001, Harald Ganster et al, proposed Automated Melanoma Recognition. Asystem for the computerized analysis of images obtained from ELM has been developed to enhance the early recognition of malignant melanoma. Segmentation , mainly region-based segmentation methods are applied, and within this category the thresholding operation is most often used. Feature calculated by ABCD-rule.

In 2005, Tim K. Lee et al, proposed Counting moles automatically from back images. Develop an unsupervised algorithm for segmenting.

In 2006, Xiaojing Yuan et al, proposed SVM-Based texture classification and application to early melanoma detection. They explore texture information, one of the criteria dermatologists use in the diagnosis of skin cancer, but found very difficult to utilize in an automatic manner. The objective is to use texture information only to classify the benign and malignancy of the skin lesion. A thre-layer mechanism that inherent to the support vector machine methodology.

In 2008, Liu Jianli et al, proposed the segmentation of skincancer image based on genetic neural network. Proposed the genetic neural network to used to segment the skin cancer images. Optimization of weights and thresholds in neural network based on genetic algorithm is executed to improve the convergence speed of the BP neural network.

In 2009, Jose Fernandez alcon et al, proposed Automatic imaging system wiyh decision support for inspection of pigmented skin lesions and melanoma diagnosis, they describe an automatic system for inspection of pigmented skin lesions and melanoma diagnosis, image used by digital camera. System includes a decision support component, which combines the outcome of the image classification with context knowledge such as skin type, age,gender,and affected body part. They Found that our system classified image with an accuracy of 86%, with a sensitivity of 94%, and specificity of 68%.

In 2009, B. Garcia Zapirain et al, proposed Skin cancer parameterisation algorithm on epiluminiscence image processing. The algorithm is based on the standard ABCD dermatologic protocol. The database used consists of 65 images already catalogued by dermatologists and the results are successful according to the assessment of medical experts.

In 2009, Ho Tak Lau et al, proposed Automatically early detection of skin cancer : study based on nueral network classification. Different type of neural network are studied with different types of preprocessing. Useful information can be extracted from these images and pass to the classification system for training and testing. Recognition accuracy of the 3-layers back-propagation neural network classifier is 89.9% and auto-associative neural network is 80.8% in the image database that include dermoscopy photo and digital photo.

In 2009, Margarida Silverira et al, proposed Comparison of segmentation methods for melanoma diagnosis in dermoscopy images. Many segmentation methods are used adaptive thresholding , adaptive snake , EM level set, Fuzzy-based split-and-merge algorithm. The best results were obtained by the AS and EM-LS methods. The best fully automatic method was FBSM, with results only slightly worse than AS and EM-LS.

In 2009, Ilias Maglogiannis et al, proposed overview of advanced computer vision systems for skin lesion characterization. The extract features through digital image processing methods,i.e.,segmentation, border detection, and color and texture processing, and prominent techniques for skin lesion classification.

In 2009, Huiyu Zhou et al, proposed anisotropic mean shift based fuzzy c-means segmentation of dermoscopy images. Image segmentation is important task in analysing dermoscopy images as the extraction of the borders of skin lesions. Fuzzy c-means clustering algoritham used. They introduce a new mean shift based fuzzy c-means algorithm that requires less computational time than others.

In 2009, Sookpotharom Supot,et al, proposed border detection of skin lesion images based on fuzzy c- means thresholding. As the first step of image analysis, pre-processing median filtering. In next fuzzy c-means thresholding technique is used to segment and localize the lesion.

In 2010, Shang Keke et al, proposed study on skin color image segmentation used by fuzzy-c-means arithmetic. Compared RGB, HSV and Lab color spaces and found that HSV color space as segmentation feature parameter has the advantage. Here used improved fuzzy c- mean arithmetic in skin color image segmentation.

In 2011, Azadeh Noori Hoshyar et al, proposed review on automatic early skin cancer detection. Feature extract by pattern analysis, the ABCD-rule of dermatoscopy, The ELM 7-point checklist, Menzies Method, texture analysis.

In 2012, Lucia Ballerini et al,proposed non-melanoma skin lesion classification using colour image data in a hierarchical k-nn classifier. The accuracy of theproposed hierarchical scheme is higher than 93% in discriminating cancer and pre-malignant lesions from benign lesions, and it reaches an overall classification accuracy of 74% over five common classes of skin lesion.

In 2012, R. Subash Chandra Boss et al, proposed mammogram image segmentation using fuzzy c-means clustering algorithm. The median filter is used for preprocessing of image. The 14 haralick feature are extracted from mammogram image using gray level co-occurrence matrix for different angles.

III BLOCK DIAGRAM

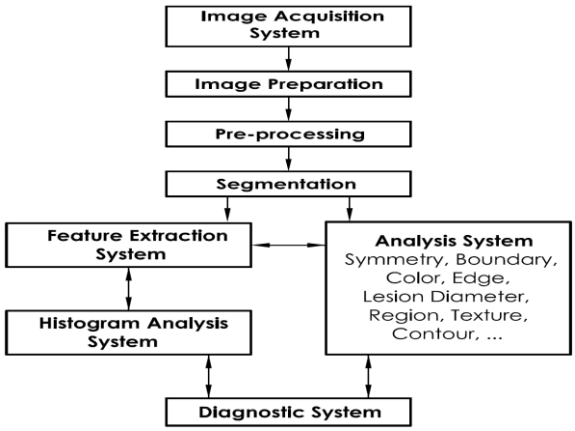


Fig: Proposed scheme of skin cancer detection and analysis

Image Pre-processing

Digital pictures of carcinoma area unit collected in image or JPEG format from completely different sources. usually indexed pictures with linear

monotonic color maps area unit used so RGB pictures area unit regenerate to indexed pictures.

Image Segmentation

It is a method of image partitioning into multiple segments or regions or structures of interest, so the contents of every region have similar characteristics.

Feature Extraction

Feature extraction may be a sub-division of improved image into constituent elements or isolation of some aspects of a picture for distinctive or decoding meaningful object forms, which has finding lines, circles or specific shapes and distinctive pimples, white heads or black heads, etc.

Feature Analysis

Image analysis techniques involves the measuring of extracted image options. measuring of image options for identification of skin cancer needs that initial, the lesions be detected and localized in a picture.

Histographic Analysis

Wavelet analysis is employed for moldering the skin lesion image and utilizing ripple coefficients for its characterization.

IV ALGORITHMS

For preprosessing skin cancer image

1. Read image.

2. Separate R,G and B plane from color image.

3. Apply median filter on each of above 3 planes separately.

4. Combine above 3 planes to form noise filtered color image.

5. Increase contrast of image using Imadjust function.

For Segmentation skin cancer image

1. Convert above image into vector.
2. Apply FCM algorithm on this image vector to form two different clusters. One of these clusters corresponds to background skin and other corresponds to cancer region.
3. If number of pixels corresponding to cluster 1 is more than of cluster 2 then cluster 1 is background and cluster 2 is cancer region.
4. Above result may contain some unwanted small region which are not corresponding to actual cancer. To remove those, areas of all isolated regions is calculated. Only the object that is corresponding to maximum area is kept and all other small areas are removed.
5. Result of FCM is BW image and it contains background as black and cancer region as white pixels. Pixels those are black in this image are also made black in original gray image. This will remove skin part and keep only part that corresponding to cancer.

For Feature extraction

1. Get GLCM feature of gray image above.
2. Find centroid of cancer region using graycomatirx and graycoprps function/
3. Find edge boundary pixels of cancer region by using canny edge detection method.

4. Find distances between centroid and peripheral point lying along 36 angles
Separated.
5. Find standard deviation of contour signature.

Contour Signature

Shape of image is nothing but distance of all the point on its boundary from some reference point. Its also called contour signature [5] [13]. This reference point is centroid of image. Center of circle is its centroid and distances of all points from center are equal. For square it will be different. In this case we have considered points on the boundary of the image which are separated by angle of 10 degrees. All the angle are measured from center of image. Thus we have calculated 36 distance corresponding to 36 different angles separated by 10 degrees. This angle separation can be reduced in

Co-Occurrence Matrices

A co-occurrence matrix contains the frequency of a certain pair of pixels repetition in an image. In order to compute a co-occurrence matrix it is necessary to know the following values:Number of grey levels: a greyscale image contains 256 grey levels, which means a high computational cost because all possible pixel pairs must be taken in account. The solution is to generate the matrix reducing the number of greyscales, and so the number of possible pixel combinations. The co-occurrence matrix is always square with the same dimensionality as the number of grey-levels chosen. This value is often set to eight.Angle. Similarly to the distance it is necessary to define the direction of the pair of pixels. The most common directions are 0, 45º, 90º, 135º, and its symmetric equivalents[19].

Distance between pixels: the co-occurrence matrix stores the number of times that certain pair of pixels is found in the image. Normally the pair of pixels are jus neighbours, but it could also be computed the matrix analysing the relation between non consecutive pixels. Thus a distance between pixels must be previously defined. Example of a co-occurrenc matrix with eight grey levels, computed using one for distance between pixels and zero degrees for the direction.

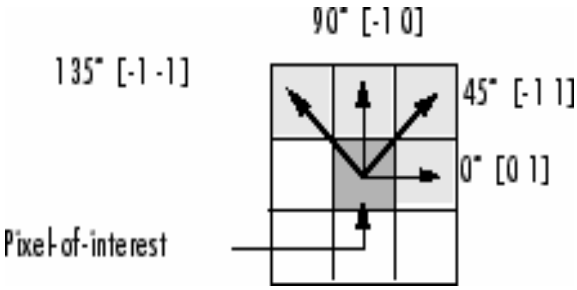


Figure Co-Occurrence Matrix [21]

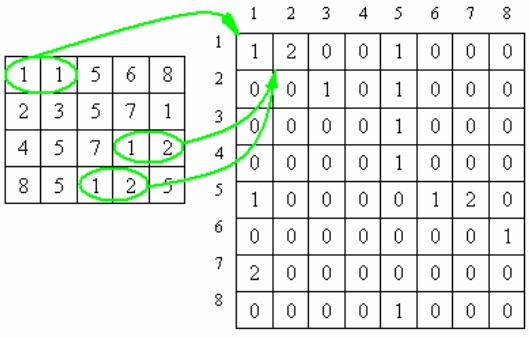


Figure Example of co-occurrence matrix process. [21]

The idea is to calculate the co-occurrence matrix for small regions of the image and then use

this matrix to find statistic values, for instance homogeneity, contrast, correlation and energy.

Property	Description	Formula
'Contrast'	Returns a measure of the intensity contrast between a pixel and its neighbor over the whole image. Range = [0 (size(GLCM,1)-1)^2] Contrast is 0 for a constant image.	$\sum_{i,j} \lvert i-j \rvert^2 p(i,j)$
'Correlation'	Returns a measure of how correlated a pixel is to its neighbor over the whole image. Range = [-1 1] Correlation is 1 or -1 for a perfectly positively or negatively correlated image. Correlation is NaN for a constant image.	$\sum_{i,j} \frac{(i-\mu i)(j-\mu j)p(i,j)}{\sigma_i \sigma_j}$
'Energy'	Returns the sum of squared elements in the GLCM. Range = [0 1] Energy is 1 for a constant image.	$\sum_{i,j} p(i,j)^2$
'Homogeneity'	Returns a value that measures the closeness of the distribution of elements in the GLCM to the GLCM diagonal. Range = [0 1] Homogeneity is 1 for a diagonal GLCM.	$\sum_{i,j} \frac{p(i,j)}{1+\lvert i-j \rvert}$

Table: property of GLCM

V SVM FOR CLASSIFICATION

The machine learning algorithm is used as the classifiers trained using the image features as dataset and play a vital role in image classification. The classifiers are categorized either as supervised or unsupervised learning algorithms. In supervised learning algorithms, the classes are finite predetermined sets that are labeled and are classified into different groups carrying similar features. Thus a mathematical model is constructed in the training phase and is applied to predict the pattern during the testing phase.

In unsupervised algorithm, the classifications are not provided initially and the labels are developed automatically. This algorithm seeks a similarity between a set of Type equation here.data called clusters in order to form a classification group. It is apparent that the supervised learning algorithm classifies better incorporating the additional knowledge obtained during the training process. SVMs are one of the supervised learning algorithms and are considered to be a popular classification tool for pattern recognition. SVM is a useful technique for data classification. Even though it's considered that Neural Networks are easier to use than this, however, sometimes unsatisfactory results are obtained.

A classification task usually involves with training and testing data which consist of some data instances . Each instance in the training set contains one target values and several attributes. The goal of SVM is to produce a model which predicts target value of data instances in the testing set which are given only the attributes [8].Classification in SVM is an example of Supervised Learning. Known labels help indicate whether the system is performing in a right way or not. This information points to a desired response, validating the accuracy of the system, or be used to help the system learn to act correctly.

A step in SVM classification involves identification as which are intimately connected to the known classes. This is called feature selection or feature extraction. Feature selection and SVM classification together have a use even when prediction of unknown samples is not necessary. They can be used to identify key sets which are involved in whatever processes distinguish the classes .

Support Vector Machines

SVMs are supervised learning algorithms developed by Vapnik employed for both classification and regression analysis. SVMs work on statistical learning theory and can produce robust, accurate and effective results with less number of training samples. In general, the standard binary classifier is trained with the set of data belonging to two different categories and the SVM training algorithm builds a training model that predicts the class for the new given data. However, recently the multiclass problems are also solved by decomposing the multiclass into several binary classes to design a multiple binary SVM classifiers.

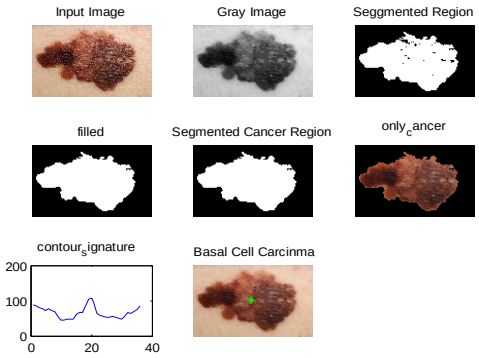
SVM performs structural risk minimization i.e., a classifier is created with minimized VC (Vapnik and Chervonenkis) dimension. Hence, the upper bound of generalization error is predominantly reduced by the low VC dimension. Generalization error is termed as bounds on the error rate of a learning machine on unseen data. These bounds are a function of the training error rate and the terms that measure classifier complexity. To minimize the bounds on the generalization error rate, both the sum

of the training error rate and the classifier complexity must be minimized.

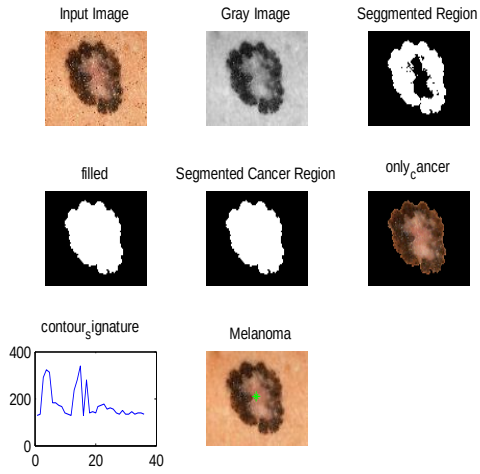
Algorithm : For Support Vector Machine

1. For feature vector using above features Contrast, Correlation, Energy, Homogeneit, std_dev , eccentricity, perimeter .
2. Pass these features to svm classifier.
3. If resulting class is '1' then it skin cancer type is melanoma. If resulting class is '2' then its basal cell carcinoma.

VI RESULT



Result of Basal Cell Carcinoma



Result of melanoma

VII DISCUSSION

Partial results of 50% are derived here i.e upto the feature extraction process.In above Output matlab window, In that first figure input image shown, next is gray image which is filtered by using median filter. After that Segmentation result shows sapres cancer by skin using FCM. Next is filled image by removing small spot in cancer. Next is Segmentation cancer region which is black n white image white denote cancer region. Next color cancer image. After that Contour Signature of only cancer image. Next image denote which type of cancer by SVM Classifier and also show center of cancer image.

VIII CONCLUSION

The segmentation method presented in this paper is one of the flexibly methods for segmentation. Fuzzy C-Means segmentation is comparatively more clear than thresholding segmentation. The results

obtained in segmentation images are taken by national cancer institute. In this case also we find infected area. Cancerous region is separated from healthy skin by the method of segmentation. The unique features of the segmented images were extracted using GLCM.

Features are contrast, correlation, Energy, Homogenity, Std Deviation. On that features Support vector Machin Clasiffier used to classify. This is different in other learning machines, such as standard Neural Networks trained using back propagation . In short the development of SVM is an entirely different from normal algorithms used for learning and SVM provides a new insight into this learning

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