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# Biometric Identification using Dental Radiographs

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***Abstract: In this paper used to improve detection precisions, we propose three post-processing techniques to supplement the baseline faster R-CNN according to certain prior domain knowledge. Filtering system was developed to delete overlapping filters detected by CNN compared with same teeth. In this paper already defined for labels in teeth image. The module based on a teeth is proposed to matching for training image and Testing images of detected teeth boxes to modify detected results that violate certain intuitive rules. The proposed system uses Deep learning method in artificial intelligence to develop a convolution Neural Network (CNN) with Tensor Flow tool package to detect teeth structure in the OPG image. The work burden of a forensic researcher we proposed this model for specifically identifying each human through their unique dental structure. It helps to solve the criminal case with in short span of time and identify person in natural disasters.***

***Keywords: Convolution Neural Network(CNN), Deep Learning, Orthopantomogram, Dental Radiographs, Acquisition, Filtering.***

## I. INTRODUCTION

The dental radiograph is viewed during comparison, system will under gone multiple computational process and provide better accuracy. Classification of teeth structure using the pixel value difference over filter that are considered for manipulation in the dental X-ray film and comparing with features of the other datasets in the system. Because the film reading work is primarily conducted by dentists, it occupies several valuable working hours. We can improve the accuracy percentage of prediction of image by using the maxpooling scheme over the neural network. In their previous studies, morphological active colour contour system is used as specifying for identifying the dental image of human and by using Bayesian techniques, linear models, or binary support vector machines were used to perform the classification. Computer vision and image identification. The development of biometric system using the X-ray to human teeth, this may seem a bit difficult but recent development in fields like neural networks, computer vision has paved a way for accurately identifying images.

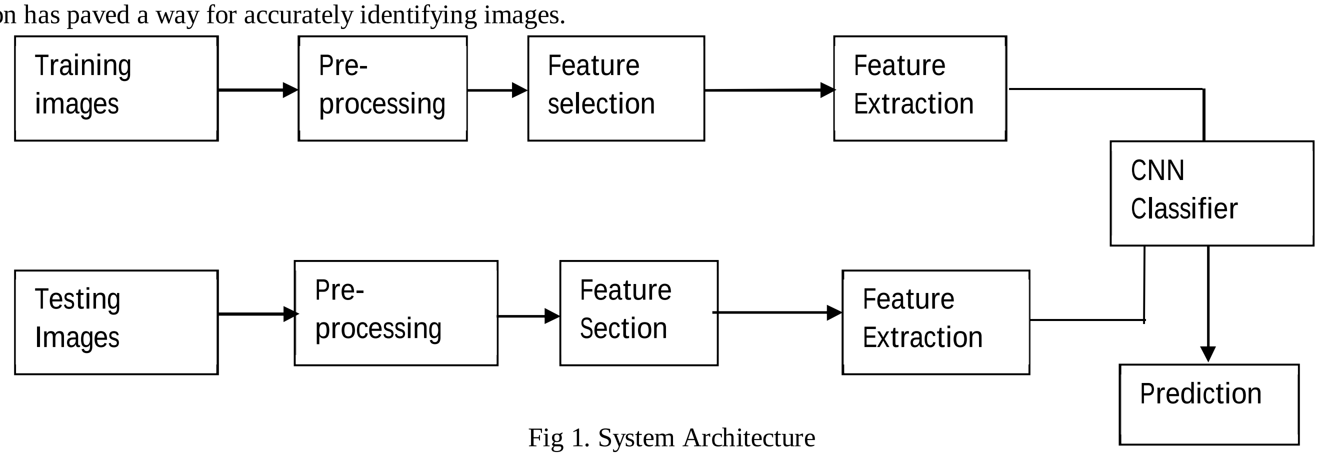


Fig 1. System Architecture

## II. DIGITAL IMAGE PROCESSING

The identification of objects in an image would probably start with image processing techniques such acquisition, compression, noise reduction and other operations over the image. There are various types of multimedia images such as colour, black and white, binary images etc., these are categorized on basis of the pixel representation of images such as 2 or 3-dimensional image.

Grey scale image has 2D pixel value representation over it has colour variance from black to white crossing over grey layer of colour palette. Thus, it has 256x256 pixel values from one colour to another.

Colour images has 3D pixel value representation over it has RGB colour variance from three different colour over it combinations. Thus, it has 256x256x256 pixel values form a colour value matrix for manipulations.

Thus, image processing occurs three different phases in this system. They are briefly described as below:

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### *A. Training Part*

The preprocessing of image aims at selectively removing the redundancy present in captured images without affecting the details that play a key role in the overall process. It mainly deals with datasets and training those image for future process.

### *B. Features Matching And Classification*

The input is converter for Gray scale images. DWT decomposes a sign into a set of sub-bands through consecutive excessive-bypass and coffee-pass filtering of the time domain.

### *C. Testing*

In this phase image comparison will take place by using the GLCM (Grey-Level Co-Occurrence Matrix) and the prediction of the desired input image is done.

In past studies it is shown that the generic behaviour of line segments and ellipses affords them an innate ability to represent complex shapes and structures. We do not constrain a combination to have a fixed number of shape-tokens, but allow it to automatically and flexibly adapt to an object class. This number influences a combination’s ability to represent shapes, where simple shapes favour fewer shape-tokens than complex ones. Consequently, discriminative combinations of varying complexity can be exploited to represent an object class Structural constraint enforce possible poses/structures of an object by the relationships (e.g., XOR relationship) between shape-tokens.

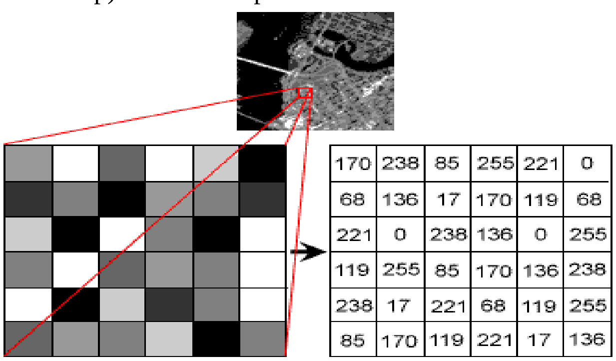

Fig.2 Example of an image pixel value detection


Fig. 3 Example of Dental radiograph

## III. METHODOLOGY

### *A. Feature Selection-Discrete Cosine Transform (DCT)*

In digital image processing, numerical analysis and functional analysis is of Discrete Wavelet Transform (DWT). Wavelets have both frequency and location information of pixel from 256*256 of grey scale image. Thus, cosine wavelet is used over this system for calculations over GLCM of the image.

In this lab we use the DCT block from the Processing Library in Simulink. Still, it is useful to understand the various steps in computing a DCT on an image as given below.

*1)* First divide the image (N by M pixels) into blocks of 8x8 pixels as shown in Fig 4.

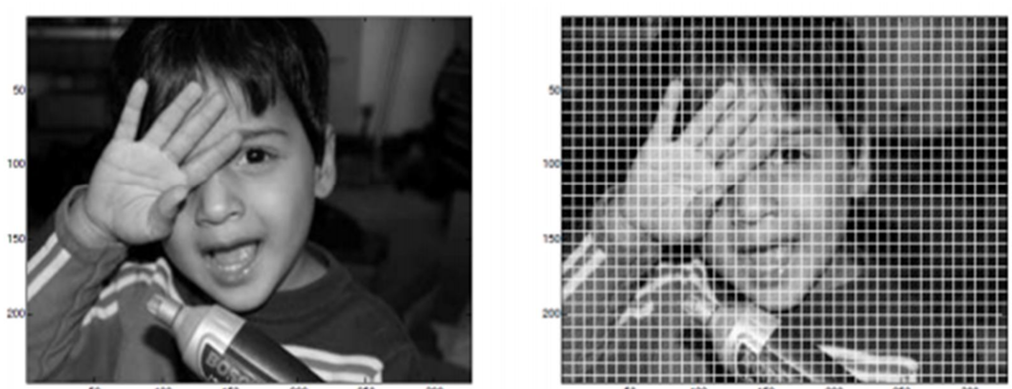
Fig 4. Original Image and Image divided into 8x8 blocks.

2) Compute the DCT on the 8x8 blocks using the formula given below. Please note that in this lab we use the DCT block from Video Processing Library in Simulink and not the formula given below.

$$\mathcal{I}^{B}_{DCT}(k,l) = \sum_{m=0}^{7}\sum_{n=0}^{7} I^{B}(m,n)\cos\left[\frac{\pi}{8}\left(n+\frac{1}{2}\right)k\right]\cos\left[\frac{\pi}{8}\left(m+\frac{1}{2}\right)l\right]$$

Formula to calculate DCT on an 8x8 block image.

3) Select the high-frequency components via RxR mask. Please note that both the images are displayed in a log-amplitude scale in Figures 5 and 6 below.

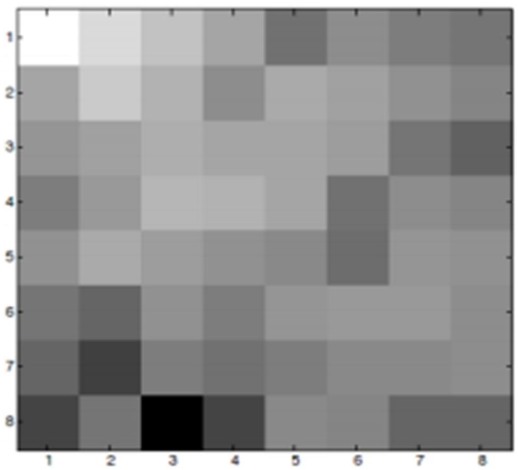

Fig 5. 8x8 block image in log amplitude scale

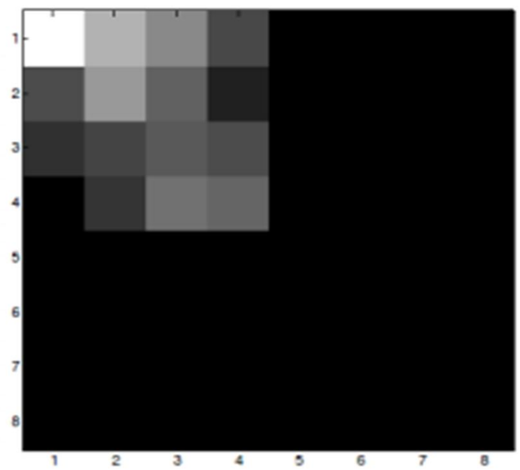

Fig 6. After applying RxR mask on the image where R=4

### B. *Convolutional Neural Networks*

The CNN is one type of neural network that was used for image processing and there are few additional features over neural network such as regional, deep schemes. This method is a type of artificial intelligence scheme which makes manipulations in multimedia files, in which we use open computer vision for acquisition of testing images and TensorFlow package for implementation of neural network and some other python packages for implementation.

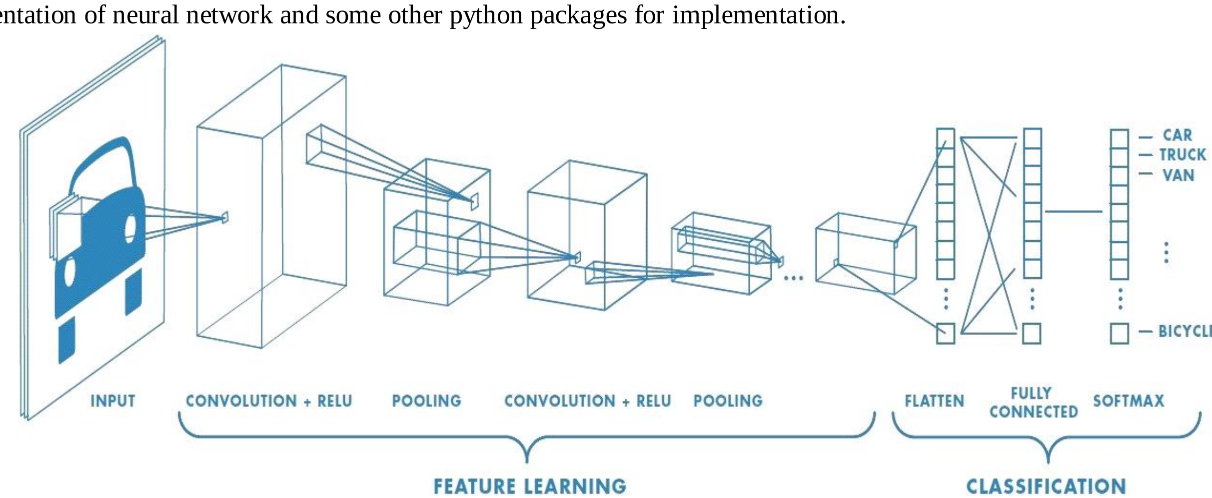


Fig 9. CNN Architecture

1) *Convolution Layer:* In this system, we use 2D single layer neural network that uses black and white grey scale images only. The CNN architecture involves rectifier for stabilizing the GLCM matrix value of it, thus we use pooling scheme for getting more accuracy in classification and prediction.

## IV. CONCLUSIONS

In this study, CNN provide more accurate result than comparing with the probability model and machine learning algorithms such as random forest algorithm, K-Means algorithm, Support Vector Machine, and Bayesian algorithm which uses the probability for prediction analysis. This system has automated all the user work such as training of datasets, classification and testing of images over it. Thus, we get more accuracy and in short span of execution with least lines of coding using python which has lots of privilege in the digital image processing domain.

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