



A Spiking Neuron Based Feature Model for Real Time Object Recognition

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Abstract— The object recognition is one of the major applications of image processing. In this work, work an effective feature based matching approach is defined to perform the object recognition. To perform this recognition, a spiking neuron based model is presented. The presented work is divided in two main stages. In first stage, the object feature is analyzed and this feature form is represented in the form of feature curve. To generate this feature curve, the spiking neuron based model is presented in this work. Once the feature identification is done, in second stage, the PCA approach is defined to perform the feature based matching on input object with object database. In this work, the recognition process is performed on real time image dataset. The obtained results from the system show the effective recognition of object.

Keywords— Featured Analysis, Spiking Neuron, Real Time Object

I. INTRODUCTION

The image processing is having the greatest contribution to represent the real time objects in digital form. As the information objects are collected, the digitized objects are processed under vision and image processing. There are number of associated applications for vision processing. These applications are defined to extract the information from these real time objects. The image processing is associated with these applications in direct or indirect way. Number of image processing processes is combined to define an individual application on real time objects. These processes include the pre-processing stage, main process and the post processing stages. The preprocessing stages are defined to perform the basic filtration and to convert the input object to some normalized form. Once such form objects are obtained, the network work is to apply the main application process over it. At the final stage, the post processing is applied over it to obtain the results in actual form that is required to represent the information object.

Image processing is the core area of computer science that deals in the pictorial information processing. Today, images is the most used and convenient form of information representation. In daily life, the quality of human being is its visual system that actually able him to recognize and identify various objects. The computer-human interaction is one of the most innovative research area that is been increasing its domain in various fields. One of such area is recognition of real time objects over the image. These real time objects are recognition exist in different form such as digital character recognition, gait recognition etc. These kind of recognition system itself combine three main branches of image processing called image segmentation, classification and recognition. These process stages are shown in figure 1.

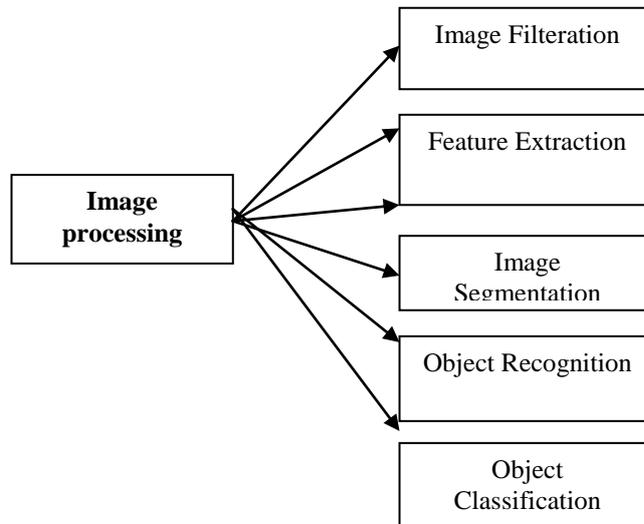


Figure 1 : Real Time Object Processing

The presented work is focused on real time recognition that itself is used to perform the effective communication between the human and computer system. This kind of system improves the system applicability respective to human. This kind of system improves the human talents by considering the coordinated complex moving objects so that the effective recognition of objects will be obtained.

The real time object recognition can be defined in different ways, the classification of these real time objects can be defined in different categories. The most common and general categorization is the static and moving objects. The static objects are present in image form, in this the image segmentation is applied to perform the object identification and recognition. These objects can be any entity available in this real world. In this work, the real time object recognition is defined.

In this paper, an exploration to the different aspects of the object Recognition is defined. The paper has defined a new feature extraction approach for effective recognition process. In section II, the work defined by earlier researchers on object recognition is defined. In section III, the exploration of proposed model is defined. In section IV, the results obtained from the work are presented and discussed. In section V, the conclusion obtained from the work is presented.

II. EXISTING WORK

Lot of work is already defined by different researchers on real time object segmentation and recognition. Some of the work defined by earlier researchers is defined in this section.

Ioana Sporea[1] has defined a work on activity recognition by using spiking neuron based supervised learning approach. Author defined the analysis on different learning algorithms and after identifying their limitation, the spiking neuron model is presented by the author. This model used the firing neuron concept to perform activity analysis and recognition. Author analyzed the work on complex datasets. Riano Lorenzo[2] also defined a spiking neuron based approach to perform pattern recognition. Author defined a three stage model for object recognition. The classical approach defined by the author includes the distinguish analysis over the recognition model so that the binary input adaptive approach is defined. The analysis is here defined under the similar pattern analysis and learning rate based recognition process. Author defined a generalized model for similar object generation and recognition. Author defined the middle layer associated work under the recognition process so that effective object recognition over the dataset is presented. Matthias Oster[3] has defined spiking neuron based recognition process under multi neuron classifier. Author defined a spiking information analysis approach under movement specification and definition. Author improved the system with effective recognition process. A work on spiking neuron based learning

model and information extraction and representation by Qing Xiang W[4]. Author defined a data mining oriented work to perform the effective recognition process. Author defined a new model under the conventional neural network approach. Author defined a neural model under fuzzy rule and logic representation. Author defined the dependency analysis approach for recognition system. Author defined the dependent spike analysis approach for effective recognition of object pattern. Susumu Nagatoishi [5] presented a neural sequence model for effective object recognition and sequence analysis approach for recognition of hand object. Author defined the chaotic neuron based sequence analysis approach using back propagation neural network. Author defined a layered scheme for activity analysis and correlation identification so that the effective recognition rate is obtained.

Yan Meng[6] has defined a spiking neuron based model for effective object classification and recognition. Author defined the plasticity and meta plasticity using BCM approach. Author defined the weight specification and analysis approach for gene network generation and object recognition. Author defined the neuro modulation effective model for object generation and recognition. Jae-sun Seo[7] defined a scalable architecture for object generation and recognition. Author defined a dream learning object model for object detection and recognition. Author defined the spiking neuron based model under scalability limits to perform the analog neuron circuit generation and based on this circuit analysis the object recognition is performed. Qiang Yu[8] defined a computational model for temporal model for dataset encoding and learning. Author defined an integrated recognition model using firing neurons so that the recognition rate over the system will be improved. Author defined a performance analysis on real time images.

Kshiti Dhoble[9] defined a work on pattern recognition based on spatio temporal analysis and spike generation using learning model. Author defined a rank order based analysis for spike generation and learning. Author presented a eSSN model for encoding process so that the spike and temporal spike based encoding will be done. Author defined a learning model under plasticity analysis so that the artificial intelligence will be applied for effective object recognition. Author[10] has presented a work on human activity recognition by including the wearable sensors. Author performed the distance analysis approach for real time activity identification and detection approach. Author defined a system configuration and sensor placement approach location tracking so that effective object recognition will be performed. Soumitra Samanta[11] defined a description analysis approach to perform effective object detection and activity recognition. Author defined a space time based approach for object environment scaling so that the interest points over the video will be identified effectively. Author defined the human activity classification approach for generalized detection.

III. RESEARCH METHODOLOGY

In this present work, the real time pattern Registration is presented for the input image to identify the existence of particular type of real time patterns over the database. The presented work is a hybrid model in which the spiking neuron based PCA approach is used to perform the image identification. The Registration systems itself have a number of properties along with standard architecture. The architecture includes the basic three components called Input Image, Image DataSet and Registration process.

When the input image or the dataset images are collected or extracted they can be slightly different respective of defined properties. In such case before implementing the Registration process some preprocessing operations are performed to improve these Properties based similarity ratio. The Accuracy of the system is based on this pre-processing stage. In this present work, we have collected the dataset from different sources because of this the images are very much different in terms of size, color etc. To obtain the normalized image from the dataset, the size based normalization and color based normalization is performed in this work. The presented work is performed on this image dataset.

Where the preprocessing stage defines used to improve the effectiveness of the system in terms of efficiency and the accuracy. The post processing is used to estimate the reliability of the system. As discussed earlier, the reliability depends on two major factors. One is the matching ratio for correct sign identification.

Detecting real time pattern image across a large dataset is more challenging that also includes variation caused by rotation in depth, self-occlusion and self-shadowing. The view sphere is separated into several small segments. On each segment, a feature detector is constructed. In this work we have used a classification approach to categorize the input image in the form of relational images. We have maintained all the co related images as a single class. Once the dataset is maintained the is to perform the matching process

A) Spiking Neuron Approach

Spiking Neurons are described as the potential elements called spikes. To identify these spikes some kind of encoding mechanism is required. This mechanism can be based on multiple factors such as the temporal vector (time-interval), intensity variation analysis, delay analysis etc. In case of image processing, the firing neuron elements can be obtained by performing the intensity, contrast and color analysis. In the simplest form of neuron identification, single variable analysis is performed.

According to this, the input position is defined and based on it the neighborhood analysis is performed under the defined variable. The intensity variation helps to identify the difference value and to identify the firing neuron over the image.

B) PCA

PCA calculates the Eigen vectors of the covariance matrix, and projects the original data onto a lower dimensional feature space, which is defined by Eigen vectors with large Eigen values. PCA has been used in representation and recognition where the Eigen vectors calculated are referred to as Eigen faces. In gel images, even more than in human faces, the dimensionality of the original data is vast compared to the size of the dataset, suggesting PCA as a useful first step in analysis. There are many approaches to real time object recognition ranging from the Principal Component Analysis (PCA) approach (also known as Eigen faces). Prediction through feature matching. The idea of feature selection and point matching has been used to track human motion. Eigen faces have been used to track real time object.

IV. RESULTS

In this present work we have implemented the a hybrid model to perform the detection of some real time pattern. The presented model used the spiking neuron based PCA approach to perform the real time pattern detection over the image. At the initial stage, as the image or is accepted from the user, the preprocessing is performed to convert the real time pattern image to normalized image. In this stage, the image enhancement is done. Once the image is enhanced, the next work is to identify the image features in terms of spiking ROI identification. As the skin ROI is identified, the spiking neuron is applied to perform the feature detection. This spiking neuron process is based on the centroid based analysis over the gesture image. Based on this method, the spiking neuron image dataset is represented in the form of featured dataset. Now this featured dataset is considered for the recognition process. As a new real time pattern image is taken for the recognition process, same spiking neuron approach is implemented over it to identify the image features. Now this featured dataset is compared with the feature of single input image. For this identification, neural network approach is applied to perform the recognition. The PCA approach considered the featured dataset as the training set and input image features as the testing set. After the PCA based classification process, the results are obtained in the form of predicted output value. This predicted value is compared with dataset values and the nearest match is considered as the final result. The recognition rate based analysis obtained in shown here under

Table 1: Dataset I : Gesture Recognition

Properties	Values
Training Set Size	30
Testing Set	20
Testing Image Type	Dataset Image
Number of Instance Analyzed	20
TP (True Positive) Recognized Correctly	19
Incorrect Recognition	1
Accuracy	95%

V. CONCLUSION

In this paper, feature analysis based hybrid model is presented to perform real time object recognition. The work is divided in two main stages. In earlier stage, spiking neuron model is applied for feature identification. This feature extraction is presented in the form of neuron curve. Later on the PCA based approach is applied to perform the recognition. The results shows the effective recognition ration obtained from the work.

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