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An Overview of Pattern Recognition Applications and Its Approaches: A Review

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Abstract: ***Now days, Pattern Recognition has become an important concept from researcher point of view. It is used in many applications like Speech recognition, Face recognition, Biometrics and many other also. This review paper will explain many applications and approaches of the pattern recognition. Mainly four types of approaches statistical, template, structural and neural approach. And further statistical approach classification is also done.***

Keywords: Pattern recognition, Statistical, Structural, Neural, Template, PCA, SVM, RBF.

1. Introduction

The term "pattern recognition" means recognising pattern of any kind of object or data, which is very difficult for a human being to detect by himself. So artificially it can be implemented i a very effective and good way. Pattern recognition is solution for many kind of problems and to complex problems

Pattern recognition can perform many types of tasks like Face recognition, speech recognition; handwritten characters will be recognised, also used in medical diagnosis. Pattern recognition is actually the study of machines that how they understand our objects which are present in our environment. Basically three steps take place in 1) Data acquisition 2) Data analysis3)Pattern recognition classification

Two types of classification**:**
- Supervised classification
- Unsupervised classification

1.1 Pattern

Pattern is arrangement or collection of objects which are similar to each other. It has many definitions "A pattern is essentially an arrangement. It is characterized by the order of the elements of which it is made, rather than by the intrinsic nature of these elements," is a definition given by Norbert Wiener[4].

Watanabe [5] defines a pattern as "opposite of a chaos; it is an entity, vaguely defined, that could be given a name". Pattern class is family of patterns and collection of similar patterns. And also present in pattern recognition.

Pattern recognition is used in many fields and in many ways. It helps in digital image processing and recognise the patterns. And those can be done by using many techniques and approaches. The rapidly growing and available computing power, while enabling faster processing of huge data sets, has also facilitated the use of elaborate and diverse methods for data analysis and classification. At the same time, demands pattern recognition systems are rising enormously due to the availability of large databases and stringent performance requirements (speed, accuracy, and cost).
Many types of application explained next.

1.2 Applications of Pattern Recognition with Examples

Table 1

Applications	*Feilds In Which Used*	*Examples Of Pattern*
Internet search	Multimedia database retrieval	Video clip, Video games
Searching for meaning full patterns	Data mining	Points in multi dimensional space.
Sequence analysis	Bioinformatics	DNA/Protein sequence
Forecasting crop yield	Remote Sensing	Multispectral image
Personal identification	Biometric recognition	Face, fingerprints
Internet search	Document classification	Text document

2. Pattern Recognition Approches

Many types of Approaches are present in the pattern recognition and all are very useful.

2.1 Template Matching

This is most simple and efficient technique which give very good results and response. It is used to detect simultaneously any two objects or entities; it may be curves, points or shapes. Mainly it is prototype of the pattern which is to recognise is made and available. Main thing whatever pattern you are recognising should match to the template made means prototype.

2.2 Statistical Approach

In this approach, each pattern is seen as a dimensional space as either d-feature or measurements. Mainly patterns are described in terms of the Features. Pre-processing operations are performed to make it more good approach and is also suitable for training purposes. In statistical approach mainly decision boundaries are determine. Example: MEAN SQUARE ERROR CRITERION.

2.3 Syntactic/ Structural Approach

It is mainly involve in complex patterns. Like in multidimensional space where pattern may be divided into sub patterns and then each sub pattern is recognised and solve the problem. Sub-pattern to recognise are called primitives ad they will appear as sentences. Results of this technique are very good.

2.4 Neural Network

They are computational models which are very useful and have number of neurons and is capable of machine learning algorithms and pattern recognition. They are also parallel processors which run simultaneously ad perform work fasters. Also used in Matlab as learning algorithms which are very helpful. Many types of neural networks like RBF(Radical Basis Function) ,Feed Forward Network, PCA(Principle Component Analysis), SVM(Support Vector Machine). Neural approach act as a mind and behave also like mind. It has many types and all are used for the pattern recognition in digital image processing. Both neural network approach and pattern recognition are correlated terms with each other and both are helpful to each other.

Table 2

Model or Approach	Recognition Function	Represen-Tation	Criertion
Template matching	Correlation, Distance Measure	Samples, Pixels, Curves	Classification error
Statistical approach	Discriminate Function	Features	Classification error
Structural approach	Rules/ Grammar	Primitive	Acceptance error
Neural approach	Network Function	Samples, Pixels, Curves	Mean square error

This is comparison of all the four approaches or methods of the pattern recognition. Each approach perform different task and is used in different area of interest. Examples of each is given in the above table and their recognition function is also given and written over there. Representation of ach method that in which type of area they are represented is also given.

3. Methods In Statistical Pattern Recognition

Statistical approach is described in terms of features and dimensional representation is also done. Basically two modes in which recognition can be performed 1) Trainin(learning) 2) Classification (Testing). Feature Extraction is also performed.

Steps For Classification:
1 Pattern which is to test is given.
2 Pre-processing is performed
3 Feature Measurement is done
4 Classifications is performed

Steps For Training:
1 Pattern which is to test is given.
2 Pre-processing is performed
3 Feature Measurement is done
4 Learning is done.

3.1 Many Types of Approaches in Statastical Method

There are many types of statistical approaches and that are explained in next diagram properly. So see next figure.

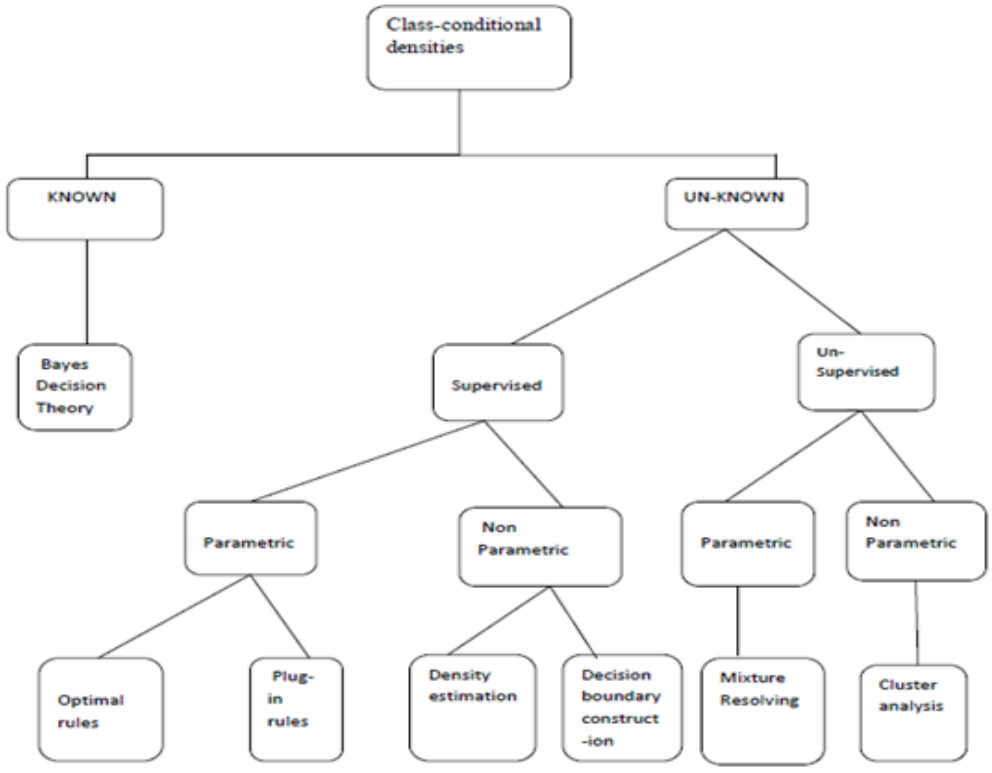

Figure 1: Approaches of statistical pattern recognition

4. Conclusion

In this paper pattern recognition is explained and an application in which it is used is discussed. In this paper approaches or methods how pattern recognition can be performed is explained and further statistical methods further types are explained diagrammatically in efficient way. So by conclusion we get to know these are recent areas to work in digital image processing and has great impact on our work and is very effective topic.

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