

Enhanced Efficiency Using Pattern Recognition System

Nikita Chhillar, Nisha Yadav, Neha Jaiswal

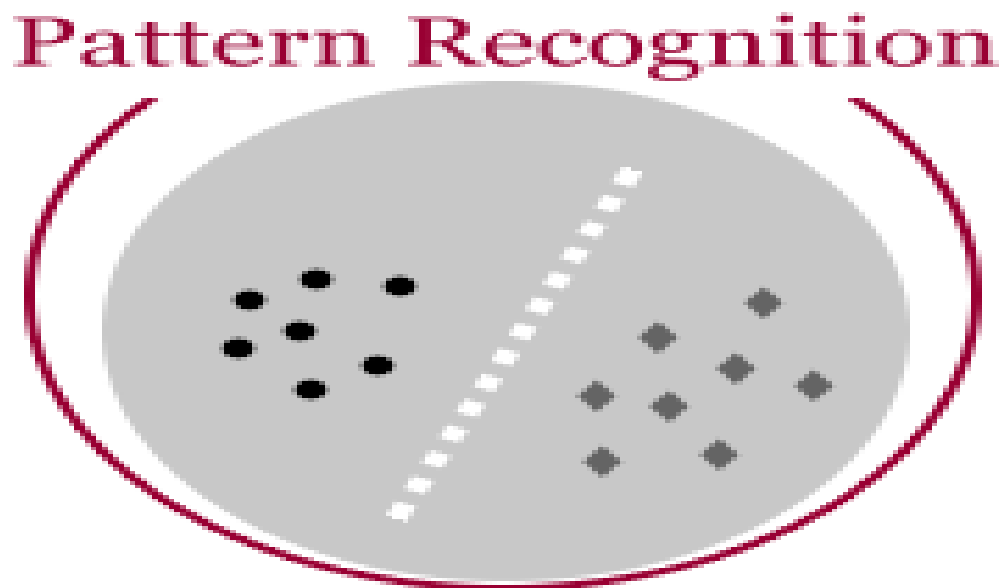
Department of Computer Science and Engineering, Dronacharya College of Engineering, Khentawas, Farukhnagar, Gurgaon, India

Department of Computer Science and Engineering, Dronacharya College of Engineering, Khentawas, Farukhnagar, Gurgaon, India

Department of Computer Science and Engineering, Dronacharya College of Engineering, Khentawas, Farukhnagar, Gurgaon, India

Email: nikitachhillar@yahoo.com, yadavnisha2993@yahoo.com, jaiswalneha99@gmail.com

ABSTRACT: A pattern is an entity, imprecisely described, that could be given a name, fingerprint, image, handwritten word, human face, speech signal, DNA sequence etc. **Pattern recognition** is the allocation of a label to a given input value. Pattern recognition algorithms usually intend to supply a logical answer for all probable inputs and to perform "most likely" and identical matching of the inputs, taking into account their statistical discrepancy. Pattern recognition is becoming ever more significant in the era of automation and information handling and retrieval. In order to categorize a set of objects and afterward on to identify a fresh or an already known one, one needs to gather, examine, store and process data in a significant way. Among the different conventional approaches of pattern recognition the statistical approach has been most thoroughly studied and used in practice. More recently, the addition of artificial neural network techniques theory have been receiving important considerations.



KEYWORDS: Pattern Recognition, correlation, Neural Network

INTRODUCTION

Pattern recognition is basically that study which tells us that how machines can examine the environment, find out to differentiate patterns of interest from their background, and make logical and sensible judgments about the categories of the patterns. It includes sub disciplines like discriminate analysis, character extraction, fault approximation, cluster analysis which is together sometimes called statistical pattern recognition, grammatical inference and parsing which is also sometimes known as syntactical pattern recognition. Thus, pattern recognition consists of a set of techniques and methods used to organize a group of objects, processes or phenomena. The main objective of visual pattern recognition from the past fifty years has

always been the expansion of automated systems that rival or even surpass human accuracy, at better speed and reduced price. Human interaction is believed, only to deal with "rejects" in the ultimate step. However, there are many well-designed interactive systems, like word processors, computer-aided drafting, photo-editors and spreadsheets that help laypersons to attain near-expert performance. The best pattern recognizers in most of the instances are human beings, yet we do not realize how we humans recognize patterns. Our main purpose in this paper is to introduce pattern recognition via artificial neural network as the best possible way of utilizing existing sensors, processors, and domain knowledge to make decisions automatically.

PERCEPTION OF HUMAN BEINGS

Human beings have build up highly complicated as well as sophisticated expertise of sensing their environment and performing actions according to what they actually observe for example

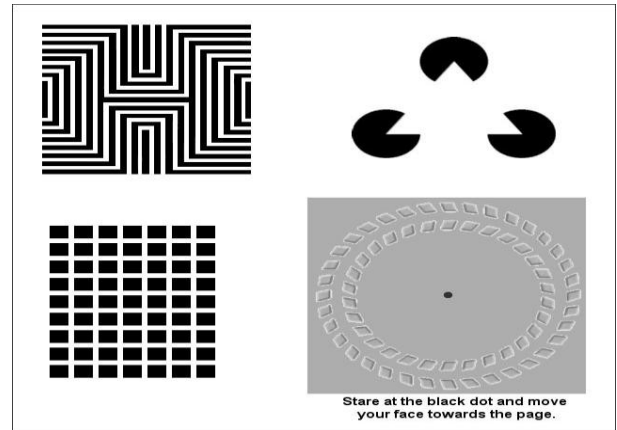
- identifying a face,
- recognizing as well as understanding the spoken words,
- Reading handwriting,
- Discriminating fresh food from its aroma.

Nowadays we live in a machine age so it is necessary to give similar capabilities to machines and this is only possible with the help of pattern recognition that's why it is considered really important and significant.



DIFFERENT AREAS OF PATTERN RECOGNITION

- **Template matching:** In this the pattern to be recognized is matched against a stored template while taking into account all allowable pose like translation and rotation and scale changes.
- **Statistical pattern recognition:** The statistical pattern recognition focuses on the statistical properties of the pattern like the probability densities etc.
- **Artificial Neural Networks:** The artificial neural networks are inspired by biological neural network models.
- **Syntactic pattern recognition:** In this one the decisions consist of logical rules or grammars and thus it proceeds further.



THE PATTERN CLASSIFICATION

The solution for a good pattern recognition procedure is a well prepared clustering procedure. The execution of the algorithm should satisfy the most important requests for a good organization and our results confirm that we have done really well. The main points to be considered for the pattern classification are as follows

- **Recognition:** It consists of the program capability to understand an accurate classification of the given objects. The *recognition speed* calculates how many from the total number of the objects are classified correctly.
- **Convergence:** It expresses the rapidity of the algorithms to succeed to acquire a recognition speed closer to 100%.
- **Trust:** It is a very significant feature and refers to the correct recognition and classification of the altered input patterns. Few of the accessible systems have a high trust percentage.
- **Prediction:** It refers to the rate of correct classification of the information which is not a part of the input training set. The research and experiments illustrate that the system we have built has a very high-quality recognition rate, a very good convergence, a little trust rate and a superior prediction if the algorithm's parameters are most favorable chosen.

PATTERN REPRESENTATION SCHEMES-

Patterns can be represented in different ways here we have stated three ways which are as follows:

- (1) **Vectors of real-numbers.**
- (2) **Lists of attributes.**
- (3) **Descriptions of parts and their relationships.**

With this some more important points are also there which should be kept in mind for the pattern presentation schemes

- The similar patterns should always have the similar representations.
- Patterns belonging to different classes should always have dissimilar representations.

- We should try to choose those features which are robust to noise.
- Favor features that lead to simpler decision regions.

PATTERN RECOGNITION SYSTEM

The pattern recognition system consists of several stages which are described as follows:

Data collection: In this stage the collection, training and testing of the data is done. This is the first stage of the pattern recognition system.

Feature selection: This is the second stage which tells about the following things: Domain dependence and prior information, Computational cost and feasibility, Discriminative features, Similar values for similar patterns, Different values for different patterns, deformation and variations in environment.

Model selection: This is the next stage that tells about which type of model should be like templates, decision-theoretic or statistical, syntactic or structural, neural, and hybrid. It also tells us about the definition of design criteria, computational complexity as well as the handling of missing features.

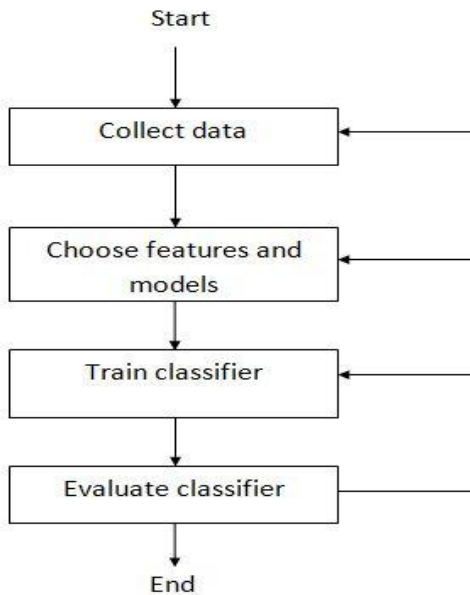


Figure 1 pattern recognition system

Training: Training tells us that how can we learn the rule from data and also tell about supervised, unsupervised, enforcement learning. By this we can estimate the performance with training examples and predict the performance with future data.

Evaluation: It helps in the estimation of performance with training examples. This is the final stage of the pattern recognition system.

MAJOR DIFFICULTIES AND PROBLEMS IN PATTERN RECOGNITION

1. **Feature Extraction:** It is a domain-specific problem that can influence the classifier's performance like which attributes are most promising or are there ways to automatically learn which features are excellent.
2. **Noise:** Noise is responsible for reducing the reliability of the attribute values calculated and knowledge of the noise process can help in improving performance.
3. **Overfitting:** *Overfitting* means good performance on the training data but poor performance on novel data and complex models lead to this problem
4. **Model Selection:** model selection means we should know process when to reject a class of models and try another one.
5. **Prior Knowledge:** Can be derived from information about the production of patterns.
6. **Missing Features:** Certain features might be missing due to occlusion. So the classifier should make the best decision with missing features
7. **Segmentation:** Individual patterns are needed to be segmented. So we should know how to classify them.
8. **Evidence Pooling:** The performance can be improved by using a "pool" of classifiers.
9. **Costs and Risks:** Each classification is associated with a cost or risk because of classification error. So we design classifiers by minimizing some cost or risk.
10. **Computational Complexity:** It basically means how an algorithm *scale* with the number of feature dimensions, number of patterns and number of categories

PATTERN RECOGNITION IN E LEARNING SYSTEM

E learning is a very important application of pattern recognition nowadays. The goal of the proposed system is to provide students with realistic audio-visual contents when they are leaning. This e learning system consists of image recognition, color and polka-dot pattern recognition with audio-visual contents.

Polka-dot Pattern Recognition: The polka-dot patterns are rare in the usual textbook, and well recognized both in the grayscale and color images. The polka-dot band for a finger is used as a computer mouse. We exploit the polka-dot marker for interactive augmentation of contents and menu selection. To detect polka-dot pattern exactly in real-time, we propose fast filters of integer operations, hierarchical searching, and edge information.



Color-band Recognition

Some interactions in the educational scenarios require two or more markers simultaneously to manipulate multiple objects. Since the polka-dot patterns have little distinct difference between them, it is difficult to operate the multiple markers independently. We need new multiple markers to be individually discriminated. This paper designs two color-band markers which consist of three colors. The color-band markers are discriminated with each other and the polka-dot marker, thus, we use three markers simultaneously according to the educational scenarios and interaction.

CONCLUSIONS

While investigating this paper chronologically we have observed that though there are some merits and demerits of each of the applications in each pattern recognition case still it can work very efficiently. The main goal of our research was to recognize different patterns and work accordingly. We came across the major problems as well as major applications of the pattern recognition system.

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