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PATTERN RECOGNITION PROBLEMS AND SYSTEMS

Pattern recognition is a branch of cybernetics which describes methods and classification algorithms for objects of various nature. [1, 9] Throughout life, humans are constantly faced with problems related to objects identification. Effectiveness of existence or even creature's life depends on the success in solving these problems. That is why every healthy organism has remarkably developed abilities to recognize patterns.

Recently, with increasing possibilities of computer technology, this kind of problems is becoming relevant to people who work in the field of information technology. Consequently, the image recognition attracted other industries from medical to security.

We can define the following branches of expert systems that use pattern recognition techniques:
- classification, clustering;
- search in databases and knowledge bases;
- scene recognition and analysis;
- character recognition;
- security systems;
- medical diagnosis.

The main problem of pattern recognition theory can be described as an algorithm with the following steps:

1. Converting input data about the pattern to vector form. Created feature vector is an n-dimensional numerical vector, where every number represents a feature of specific object. When describing images, values inside vector can describe pixels as well as higher level features (object contour coordinates etc.) Vector space related to this vectors is often called feature space.

2. Descriptive features selection. It lies in finding a minimal number of features that will describe certain pattern in given feature space most informative.

3. Classification. It comes to determining the edge of classes and choosing optimal methods for associating some feature vector to a class. The boundaries of classes can be defined explicitly during development or implicitly for a system to define them at a runtime.

4. Correcting steps 2 and 3 by evaluation of results. Such evaluation is necessary to determine the magnitude of errors related to classification and its further improvement.

Types of characteristics of patterns [2]

There are four basic classes of features:

1. Physical characteristics. Data from different measuring devices.
2. Qualitative characteristics. For example, concept of «red», «light», «low» and so on.
3. Structural characteristics. Geometrical description, various relations with other features.
4. Logical characteristics. Statements which can be either true or false.

Types of recognition systems:

1. Systems without learning. The amount of initial data is sufficient to form full and minimal set of features for recognition and classification. There is no automatic correction of errors in such systems. [1, 97]
2. Supervised learning systems. The amount of initial data is sufficient to form full and minimal set of features for recognition but not enough for classification. During their runtime such systems are provided with so called "training" data where patterns are linked to classes manually, leaving for the system to figure out the rules for assignment given pattern to a particular class. [1, 108]
3. Unsupervised learning systems. In such systems features are not given from the outside, but they are generalized inside using set of rules provided by experts. [1, 330]

So, the described methods and systems are general. That is why every given problem in the field requires further improvement of methods and modification of algorithms.

LITERATURE

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