METHODS AND ALGORITHMS FOR OBJECT RECOGNITION

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ABSTRACT

The paper deals with problems of computer image processing with a view to applications in the area of industrial robotics. Besides classical methods for object recognition especially nontraditional methods and algorithms (the Multi Layer Perceptron neural network algorithm and the Levenshtein algorithm) were tested in simulation environment. Implemented algorithms were tested on the simulated objects of technological scene given. The results of the simulation experiments show that the Multi Layer Perceptron neural network with the Back-Propagation algorithm and the Levenshtein algorithm are very promising for object recognition of technological scenes for the use of industrial robots control.

Keywords: *Image processing, flag vector, neural network, syntactic analysis.*

INTRODUCTION Pattern recognition consists in sorting objects into classes. Class is a subset of objects whose elements have common features from the classification standpoint. Object has a physical character, which in computer vision is most frequently taken to mean a part of segmented image. Methods for the classification of objects constitute last and upper-most step in computer vision theory. The following methods were mutually compared:

- Recognition with the aid of syntacticanalysis
- Recognition with the aid of neural network

TEST SCENES AND ENVIRONMENT USED

Technological scene and program environment were used for the comparison of individual algorithms. Measuring the time of individual functions has been built into the program. The time is displayed in the image frame. The values given in the tables were obtained by threefold execution of the function tested and by calculating the arithmetic mean. This should provide for possible fluctuations caused by programs running on the background. Evaluating the quality of edge detection results is highly subjective, it is based on individual assessment.

RECOGNITION WITH THE AID OF SYNTACTIC ANALYSIS

While in flag methods of pattern recognition use is made of quantitative description of objects by numerical parameters, the flag vector, in syntactical

methods the input description is of quantitative nature reflecting the structure of the object. The elementary properties of syntactically described objects are referred to as primitives. Primitives are edge parts of a certain shape or a graph or relation description of areas when the primitives are sub-areas of a certain shape. The task of syntactical pattern recognition of an image is to determine

whether the image under analysis corresponds to the images of a given grammar, i.e. whether this grammar can generate this image. The image is

represented by a language string given by the grammar.

RECOGNITION WITH THE AID OF NEURAL NETWORK

Back-propagation algorithm is an iterative method where the network gets from an initial non-learned state to the full learned one. It is possible to

describe the algorithm in the following way:

random initialization of weights;

repeat

repeat

choose_pattern _from_training_set;

put_chosen_pattern_in_input_of_network;

compute_outputs_of_network;

compare_outputs_with_required_values;

modify_weights;

until all_patterns_from_traning_set_are_chosen;

until total_error < criterion;

CONCLUSION Syntactic analysis recognition are suitable to use in applications which require recognizing differently rotated objects and when the emphasis is on recognizing small changes in the segment edge. Setting up a grammar requires time and the knowledge of grammar description of edges. Preparing the rules for grammar must be done manually, it is not done automatically as in other methods. Recognition with the aid of neural network is the fastest of all the methods under comparison. For the description of objects using this method 70 symptomatic vectors were used that went from the centre of gravity to object edges. This method can recognize objects with considerably modified shapes but it may identify incorrectly objects of similar shape. This method recognizes differently rotates objects. The error of the method increases with decreasing size of objects.

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