Volume 1, Number1, Feb 2015, pp. 31-33
ISSN: 2395-3519

International Journal of Advanced Trends in Computer Applications
www.ijatca.com

Intelligent Pattern identification and knowledge discovery using Particle swarm optimization techniques

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Abstract: *The proposed system recognizes the object using Particle Swarm Optimization. Initially an image is chosen from a specific database and the images relate to computer field is used. Initially an image is read from database, an image is read and the agent position is initialized randomly. A swarm system capable of extracting and exploiting the geometric properties of objects for fast and accurate recognition.*

Introduction

Computer vision is the science and technology of machines to extract information from an image and it is necessary to solve a task. A scientific discipline computer vision is concerned with the theory behind artificial systems that extract information from images. The image data can take many forms like as video sequences, views from multiple cameras or multi-dimensional data from a medical scanner.

Relationships cannot be perceived by the human eyes. Image processing is used to solve identification problems like forensic medicine or in creating weather maps from satellite pictures. It deals with images in bitmapped graphics format that have been scanned in or captured with digital cameras. A technique in the data from an image are digitized and various mathematical operations are applied to the data and with a digital computer in order to create an enhanced image and it is more useful or pleasing to a human observer or to perform some of the interpretation and recognition tasks usually performed by humans.

Pattern recognition aims to classify data (patterns) based on either a priori knowledge or on statistical information extracted from the patterns. The patterns to be classified are usually groups of measurements or observations, defining points in an appropriate multidimensional space. A complete pattern recognition system consists of a sensor that gathers the observations to be classified or described. A feature extraction mechanism that computes numeric or symbolic information from the observations. A classification or description scheme that does the actual job of classifying or describing observations relying on the extracted features. The classification or description scheme is usually based on the availability of a set of patterns that have already been classified or described. This set of patterns is termed the training set and the resulting learning strategy is characterized as supervised. Learning can also be unsupervised in the sense that the system is not given an a priori labeling of patterns, instead it establishes the classes itself based on the statistical regularities of the patterns.

PSO is a robust stochastic optimization technique based on the movement and intelligence of swarms. PSO applies the concept of social interaction to problem solving. It was developed in 1995 by James Kennedy (social-psychologist) and Russell Eberhart (electrical engineer). It uses a number of agents (particles) that constitute a swarm moving around in the search space looking for the best solution. Each particle is treated as a point in an N-dimensional space adjusts its "flying" according to its own flying experience as well as the flying experience of other particles.

Related Work

Tanya Mirzayans [12] proposed a method called a Swarm based system for object recognition. The author introduced a swarm system capable of extracting and exploiting the geometric properties of objects in images for fast and accurate recognition. Yuri owechko and swarup medasani [15] proposed a swarm-based volition/attention framework for object recognition. The author presented an object recognition framework that

combines top-down volitional recognition with attention processes using a swarm of cooperating intelligent agents. Rui li, yirong guo, yujuan xing ming li [8] proposed a novel multi-swarm particle swarm optimization algorithm applied in active contour model. The proposed algorithm could expand the control point of the searching area and optimize convergence speed. Shuang wang, peng zhao, ke qiao [11] proposed a study on passenger train stopping scheme based on improved particle swarm optimization algorithm. The author develops a multi-objective optimization model for the passenger train stopping scheme on high-speed railway lines. Xu jun,huiyou chang[14] proposed a discrete binary version of the improved particle swarm optimization algorithm. The author developed discrete variables combinatorial optimization problem based on gene and simulated annealing algorithms. Fan chunxia, wan youhong [3] proposed an adaptive simple particle swarm optimization algorithm. The author developed the particle swarm optimization algorithm with constriction factor has some demerits relapsing into local extremum, slow convergence velocity and low convergence precision in the late evolutionary.

Jian-hai ma1, li li [4] proposed a well logging automatic core relocation based of the immune particle swarm optimization algorithm. There exist shortcomings of inaccuracy and subjective error in traditional manual core location. There are relativities between the well logging curve and physical data at the same depth. Lin lu, qi luo, jun-yong liu, chuan long [5] proposed an improved particle swarm optimization algorithm. The author developed a hierarchical structure poly-particle swarm optimization approach using the hierarchical structure concept of control theory is presented. Shengli song and shujun liang [10] proposed an improved particle swarm cooperative optimization algorithm based on chaos and simplex method based on standard particle swarm optimization. The centroid of particle swarm is introduced in particle swarm optimization to enhance inter-particle cooperation and information sharing capabilities and then combining with ergodicity of the chaotic motion and fast convergence of the simplex algorithm. Yashar mehdad,bernardo magnini [16] proposed an optimizing textual entailment recognition using particle swarm optimization. The main constraints of recognizing textual entailment using tree edit distance is to tune the cost of edit operations and it is a difficult and challenging task in dealing with the entailment problem and datasets.

Handwritten Digit Recognition Using Pso

The proposed system recognizes the object using Particle Swarm Optimization. Initially an image is chosen from a specific database and the images relate to computer field is used. Initially an image is read from database**,** an image is read and the agent position is initialized randomly. A swarm system capable of extracting and exploiting the geometric properties of objects for fast and accurate recognition.

Implementation and Result

Step 1: Load the handwritten scanned image

The handwritten scanned image is first loaded and the image format is in JPEG, BMP and GIF.

The function used to load the image is as follows:

[filename, pathname] = uigetfile({'*.bmp';'*.jpg';'*.gif';'*.*'}, 'Pick an Image File');

S = imread([pathname,filename]);

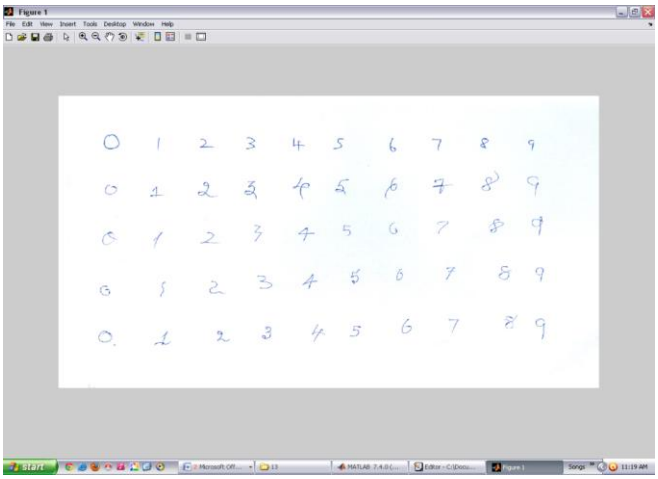


Figure 4.1 Sampleimageone.jpg

Step 2:Crop the selected digit

Step 3:Preprocessing steps are as follows:

a) RGB to GRAY

The RGB image is converted to GRAY image

```
Igray = rgb2gray(I);
IB = im2bw(Igray,graythresh(Igray));
```

b) Binarization

Binarization is done for accuracy of the scanned image

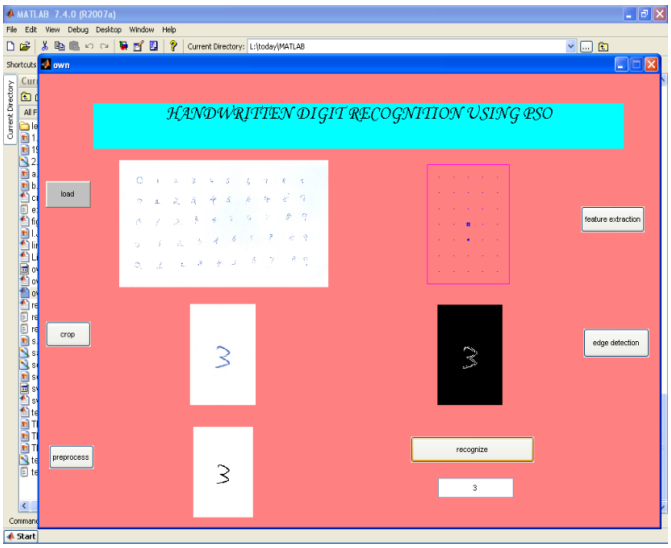
c) Edge Detection

Edges of the digit are to be clearly detected using search based zero base or prewitt edge detection.

```
Iedge = edge(uint8(IB));
```

Step 4:Feature Extraction from the digit

Step 5:Recognize the digit



SIMULATION RESULTS

The table represents the digits performance result and number of iterations to recognize the digits.

Table 5.1 Performance of Sampleimage1.jpg

S. No.	Digit database	Digits	Iterations	Performance
1.	Sample image1 .jpg	0	31	95%
		1	28	80%
		2	43	75%
		3	22	63%
		4	39	98%
		5	46	87%
		6	24	74%
		7	67	88%
		8	25	93%
		9	19	76%

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Authors Biography

Dr. M. Thangamani is nearly 20 years of experience in research, teaching, consulting and practical application development to solve real-world business problems using analytics. Her research expertise covers data mining, machine learning, cloud computing, big data, fuzzy, soft computing, ontology development, web services and open source software. She has published 23 articles in International journals and presented over 53 papers in national and international conferences in above field. She has delivered more than 25 Guest Lectures in reputed engineering colleges on various topics. She has organized many self supporting and sponsored (DRDO, DBT) national conference and Workshop in the field of data mining, big data and cloud computing. She continues to actively serve the academic and research communities. She is on the editorial board and reviewing committee of leading research journals, and on the program committee of top international data mining and soft computing conferences in various countries. She also seasonal reviewer in IEEE Transaction on Fuzzy System, international journal of advances in Fuzzy System and Applied mathematics and information journals. She has organizing chair and keynote speaker in international conferences in India and other countries like Malaysia, Thailand and China. She has Life Membership in ISTE, Member in CSI, International Association of Engineers and Computer Scientists in China, IAENG, IRES and Athens Institute for Education and Research. She is currently working as Assistant Professor in Kongu Engineering College.