Orientation of Multiple Principal Axes Shapes Using Efficient Averaging Method

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Abstract

In this paper we propose an effective, low computational cost technique to find the orientation of shapes that have several non-equally separated axes of symmetry. In our technique we define a simple method to calculate the average angle of the shape’s axes of symmetry. The axes of symmetry of the shape could be detected using any of the well-known techniques reported in the literature. In the proposed technique we use the edge points of the shape to have the ability to deal with natural pictures like coins. The internal edges are used in addition to the external boundary edges to increase the orientation detection capabilities of the algorithm. First, the edge map of the image is extracted by applying Canny edge detector. Second, the center of the object is detected by calculating the average of the vertical and horizontal coordinates of the points of the edge map. Third, the total perpendicular absolute distances from the edge map points to the line that passes through the center point with specified angle are calculated. These calculations are repeated with different angles to find the angles of the minimum peaks of the calculated distances. Finally, if the shape has more than one minimum peak we use our averaging method to get the dominant direction angle of the shape or the shape orientation. By using this technique we only use the first moment of inertia and do not have to use any higher orders to reduce the computational cost.

Keywords: Edge Detection; Shape Orientation; Image processing.

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References

Fuzzy Particle Swarm Optimization with Simulated Annealing and Neighborhood Information Communication for Solving TSP

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Abstract

In this paper, an effective hybrid algorithm based on Particle Swarm Optimization (PSO) is proposed for solving the Traveling Salesman Problem (TSP), which is a well-known NP-complete problem. The hybrid algorithm combines the high global search efficiency of fuzzy PSO with the powerful ability to avoid being trapped in local minimum. In the fuzzy PSO system, fuzzy matrices were used to represent the position and velocity of the particles in PSO and the operators in the original PSO position and velocity formulas were redefined. Two strategies were employed in the hybrid algorithm to strengthen the diversity of the particles and to speed up the convergence process. The first strategy is based on Neighborhood Information Communication (NIC) among the particles where a particle absorbs better historical experience of the neighboring particles. This strategy does not depend on the individual experience of the particles only, but also the neighbor sharing information of the current state. The second strategy is the use of Simulated Annealing (SA) which randomizes the search algorithm in a way that allows occasional alterations that worsen the solution in an attempt to increase the probability of escaping local optima. SA is used to slow down the degeneration of the PSO swarm and increase the swarm’s diversity. In SA, a new solution in the neighborhood of the original one is generated by using a designed $\lambda$ search method. A new solution with fitness worse than the original solution is accepted with a probability that gradually decreases at the late stages of the search process. The hybrid algorithm is examined using a set of benchmark problems from the TSPLIB with various sizes and levels of hardness. Comparative experiments were made between the proposed algorithm and regular fuzzy PSO, SA, and basic ACO. The computational results demonstrate the effectiveness of the proposed algorithm for TSP in terms of the obtained solution quality and convergence speed.

Keywords: Information Communication; Particle Swarm Optimization; Simulated Annealing; TSP.

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Abstract

QoS multicast routing is a non-linear combinatorial optimization problem that arises in many multimedia applications. Providing QoS support is crucial to guarantee effective transportation of multimedia service in multicast communication. Computing the band-width-delay constrained least cost multicast routing tree is a NP-complete problem. In this paper, a novel heuristic QoS multicast routing algorithm with bandwidth and delay constraints is proposed. The algorithm applies the discrete particle swarm optimization algorithm to optimally search the solution space for the optimal multicast tree which satisfies the QoS requirement. New PSO operators have been introduced to modify the original PSO velocity and position update rules to adapt to the discrete solution space of the multicast routing problem. A new adjustable PSO-GA hybrid multicast routing algorithm which combines PSO with genetic operators was proposed. The proposed hybrid technique combines the strengths of PSO and GA to realize the balance between natural selection and good knowledge sharing to provide robust and efficient search of the solution space. Two driving parameters are utilized in the adjustable hybrid model to optimize the performance of the PSO-GA hybrid by giving preference to either PSO or GA. The proposed algorithm is utilized with an efficient dynamic component that is capable of handling dynamic situations arising due to either change in the multicast group membership or node/link failure without the reconstruction of the multicast tree. Simulation results show that the proposed hybrid algorithm can overcome the disadvantages of particle swarm optimization and genetic algorithms, and achieve better QoS performance. Results show that with the correct combination of GA and PSO the hybrid does outperform both the standard PSO and GA models, The flexibility in the choice of parameters in the hybrid algorithm improves the evolutionary operators to generate strong-developing individuals that can achieve faster convergence and avoids premature convergence to local optima.

Keywords: Multicast routing; Particle swarm optimization; QoS.

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QASYO: A Question Answering System for YAGO Ontology

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Abstract

The tremendous development in information technology led to an explosion of data and motivated the need for powerful yet efficient strategies for data mining and knowledge discovery. Question Answering (QA) systems made it possible to ask questions and retrieve answers using natural language (NL) queries, rather than the keyword-based retrieval mechanisms used by current search engines. In Ontology-based QA system, the knowledge-based data, where the answers are sought, has a structured organization. The question-answer retrieval of ontology knowledge base provides a convenient way to obtain knowledge for use, but the natural language need to be mapped to the query statement of ontology. QASYO is a sentence level question-answering system that integrates natural language processing, ontologies, and information retrieval technologies in a unified framework. It accepts queries expressed in natural language and YAGO ontology as inputs and provides answers drawn from the available semantic markup. QASYO combines several powerful techniques in a novel way to make sense of NL queries and to map them to semantic markup. Semantic analysis of questions is performed in order to extract keywords used in the retrieval queries and to detect the expected answer type. In this paper we describe the current version of the system, in particular discussing its reasoning capabilities, and Performance.

Keywords: Information Retrieval; Question Answering; Ontologies; YAGO.

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References

3D Face Compression and Recognition using Spherical Wavelet Parametrization

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Abstract
In this research an innovative fully automated 3D face compression and recognition system is presented. Several novelties are introduced to make the system performance robust and efficient. These novelties include: First, an automatic pose correction and normalization process by using curvature analysis for nose tip detection and iterative closest point (ICP) image registration. Second, the use of spherical based wavelet coefficients for efficient representation of the 3D face. The spherical wavelet transformation is used to decompose the face image into multi-resolution sub images characterizing the underlying functions in a local fashion in both spacial and frequency domains. Two representation features based on spherical wavelet parameterization of the face image were proposed for the 3D face compression and recognition. Principle component analysis (PCA) is used to project to a low resolution sub-band. To evaluate the performance of the proposed approach, experiments were performed on the GAVAB face database. Experimental results show that the spherical wavelet coefficients yield excellent compression capabilities with minimal set of features. Haar wavelet coefficients extracted from the face geometry image was found to generate good recognition results that outperform other methods working on the GAVAB database.

Keywords: 3D Face Recognition; Face Compression; Geometry coding; Nose tip detection; Spherical Wavelets.

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