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Guest Editorial
Parallel Computing and Applications

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1. Background

The research on parallel computing and relevant applications is undergoing deep changes and generating far-reaching impacts. Abundant theory, design and analysis on parallel and distributed computing systems have been provided in this field. The objective of this special session is to publish and overview the cutting edge research in parallel computing and applications. This special session includes papers based on the presentation at the 10th International Conference on Parallel Architectures, Algorithms and Programming (PAAP 2019), and the 20th International Conference on Parallel and Distributed Computing, Applications and Technologies (PDCAT 2019).

2. Scanning the session

The topics of this special session covers a new model to predict the age and number of criminal suspects through the feature modeling of historical data, an improved heuristic-dynamic programming algorithm for rectangular cutting problem, energy-efficient algorithms of non-linear k-barrier coverage in mobile sensor network, maximizing concurrent data flows in Multi-radio Multi-channel wireless mesh networks, and an improved Monte Carlo Localization Boxed algorithm for node localization in wireless sensor networks.

The first paper "A New Model for Predicting the Attributes of Suspects," by Chuyue Zhang et al. proposes a new model to predict the age and number of suspects through the feature modeling of historical data. 9 machine learning algorithms and Deep Neural Networks are used to extract the numerical features. Convolutional Neural Networks and Long Short-Term Memory are used to extract the text features of case description. These two types of features are combined and fed into fully connected layer and softmax layer. The experimental results show that the new model improves accuracy by 3% in predicting the number of suspects and improves accuracy by 12% in predicting the number of suspects.

The second paper "An Improved Heuristic-Dynamic Programming Algorithm for Rectangular Cutting Problem," by Aihua Yin et al. proposes an improved heuristic-dynamic programming algorithm for rectangular cutting problem. The objective is to cut some rectangles in a given shape and direction without overlapping the defects from the rectangular plate and maximize some profit associated. In this algorithm, the discrete set contains

not only the solution of one-dimensional knapsack problem with small rectangular block width and height, but also the cutting positions of one unit outside four boundaries of each defect. The computational experimental results show that the computation time is less than that of the latest literature algorithms.

The third paper "Energy-Efficient Non-linear K-Barrier Coverage in Mobile Sensor Network," by Zijing Ma et al. proposes two algorithms to form non-linear k-barrier coverage energy-efficiently. The algorithms use the horizontal virtual force model by considering both the Euclidean distance and horizontal angle between two sensors. The first algorithm always chooses the mobile sensor chain with the largest horizontal virtual force and then moves it to construct the barrier, called mobile sensor chain movement algorithm. The other algorithm chooses the mobile sensor with the largest horizontal virtual force and moves it to construct the barrier, other than the mobile sensor chain, called single sensor movement algorithm. Simulation results show that the algorithms significantly reduce the movements of mobile sensors compared to a linear k-barrier coverage algorithm.

The fourth paper "Maximize Concurrent Data Flows in Multi-radio Multi-channel Wireless Mesh Networks," by Zhanmao Cao et al. analyzes traffic behaviors and designs a coexisting algorithm to maximize the number of concurrent data flows, in Multi-radio Multi-channel wireless mesh networks. Simulations are conducted in combinatorial cases of channel and radio with various traffic requests of multiple pairs. The experimental results show the efficacy of the coexisting algorithm over a randomly generated topology. This scheme can be used to develop routing and scheduling solutions for various multi-flow network applications through prior computing.

Aiming at the problem of low sampling efficiency and high demand for anchor node density of traditional Monte Carlo Localization Boxed algorithm, the fifth paper "An Improved MCB Localization Algorithm Based on Weighted RSSI and Motion Prediction," by Chunyue Zhou et al. proposes an improved algorithm based on historical anchor node information and the received signal strength indicator (RSSI) ranging weight which can effectively constrain sampling area of the node to be located. Moreover, the RSSI ranging of the surrounding anchors and the neighbor nodes is used to provide references for the position sampling weights of the nodes, and an improved motion model is proposed to further restrict the sampling area in direction. The simulation results show that the improved Monte Carlo Localization Boxed algorithm effectively improves the accuracy and efficiency of localization.