Editorial

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In this special issue, several studies discussed different research issues in the areas of intelligent computing and cyber systems which include computer vision, evolving spiking neural network (ESNN), object recognition, image retrieval and recognition, handwritten word recognition, human detection, surveillance systems, indoor localisation techniques, tracking control, and air blower system control.

In computer vision field, local features that are based on interest points have received a great interest and they play an important role in many applications, such as object recognition, tracking, and image retrieval. These features have proven to be invariant against the geometric and photometric transformations and proven to be robust under different types of image disturbances. Matching technique is usually employed in this field to recognise the object. Yet, it is not suitable for some applications such as searching for an isolated object, part-based object recognition, and object categorisation. Ahsan and Bin Mohamad proposed a model for object detection with an artificial neural network (ANN) to overcome such shortages. Two datasets were prepared to be used for learning; one for human faces and the other for the cars. Features were extracted using speed-up robust feature (SURF). The proposed model was evaluated using two benchmark datasets: Caltech101 and VOC2009. The obtained results were encouraging.

The third generation of ANN is known as the spiking neural network, which could be a good replacement for improvement of ANN learning due to its dominance in capturing the internal relationship of neurons. Spiking models provide an in-depth description of the biological behaviour of neurons. More information has been used with the average firing rate for computation of real neurons. Furthermore, instead of rate coding, the difference in the situation of firing times may be used. Due to the crucial role of SNN in biological information processing and solving practical real world problems, researchers today are developing new hybrid models for SNN algorithms. As one of the most recent popular types of SNN, ESNN is considered to be a promising candidate because it is a simple, efficient neural model and fast one-pass learning algorithm. Saleh, Shamsuddin and Hamed utilised the differential evolution (DE) to solve the problem of tuning the parameters of ESNN manually. As ESNN is sensitive to its parameters as other models, optimal integration of parameters leads to better classification accuracy. A hybrid differential evolution for parameter tuning of evolving spiking neural network (DEPT-ESNN) was presented for parameter optimisation for determining the optimal number of ESNN parameters: modulation factor (Mod), similarity factor (Sim) and threshold factor (C). The best values of parameters are adaptively selected by DE to avoid selecting suitable values for a particular problem by trial-and-error approach.

Several standard datasets from UCI machine learning were used for evaluating the performance of this hybrid model. It has been found that the classification accuracy and other performance measures can be increased by using hybrid method with DEPT-ESNN.

Detecting human figures is currently an active research topic in computer vision. It is a key enabler for applications in robotics, surveillance, and intelligent transport systems (ITS). It is used for tracking, and recognising people. As a result, automated systems that can estimate and track moving objects have received a lot of attention from industry and academia for their potential surveillance and engineering applications including video surveillance, content-based image retrieval, and gait recognition. Detecting people in images is quite challenging because of their intra-class variability, the diversity of the backgrounds, and the conditions under which the images were acquired. Variations in the images such as clothing, lighting and shape morphing present additional challenges. Even the detection of non-occluded, stationary human figures has been the subject of a number of studies. Noaman, Ali and Zainal used the enhanced Lucas-Kanade optical flow technique to improve human detection in terms of speed and accuracy. The object segmentation output was combined with a human detector using an optical flow algorithm. The proposed technique used the optical flow to find the area of interest to complete object segmentation and use those results as an input for the human detector. This technique has been developed to be used in surveillance systems. The experiments indicated that the proposed method was 37% faster and 118% more accurate than the standard Felzenszwalb (PFF) detector.

Object detection has been a fundamental problem in infrared (IR) images with widespread applications such as night vision, automotive driving assistant systems, image retrieval, target acquisition, weather forecasting, homing and tracking, surveillance, detection and alarming of high dangerous areas etc. Among these widespread applications, pedestrian detection is one of the major areas of concern for defence applications in particular. IR image differs from visible image, as it captures the heat emitted from objects. IR system is very useful in pedestrian detection during the day as well as the night, when compared to visible camera which fails to detect the same during the night. Though usage of IR system is beneficial, the obtained IR image might be degraded due to clutter background, low signal to noise ratio, sensor noise, low foreground, heavy noise, poor illumination and appearance of pose, body shape, size and intensity. These difficulties make the pedestrian detection challenging in IR image. Hence, automatic pedestrian detection is an active locale of research. Soundrapandiyan and Chandra Mouli addressed this problem using fuzzy-based enhancement followed by top-hat transform. The proposed method is adaptive in the sense that the parameters required for the process are calculated adaptively based on the image characteristics. Experimental results on the standard dataset showed the robustness of the proposed method with 90% detection rate of pedestrians under different conditions and outperform the other existing methods.

Tracking the position and orientation (pose) of camera is a critical challenge for different modern applications like augmented reality, robot navigation, robot localisation, 3D modelling and surveillance systems. Marker-based tracking is the most active technique used for camera pose estimation. For the development of augmented reality applications, different marker-based tracking toolkits are available that consists of specific set of fiducial markers. Rabbi, Ullah, Javed and Zen analysed various fiducial marker attributes that helps to increase the accuracy of marker-based tracking in augmented reality applications. Experimental modules were developed to calculate the

optimal values for each attribute. The experiments were designed to analyse the marker size, distance between marker and camera, the marker speed along all axis, the environmental brightness, the lighting contrast in the environment and dependency of marker size on tracking distance. Experimental study showed that these attributes affect the marker tracking. Augmented reality researchers can use these findings for the development of more reliable and accurate applications.

Recently, indoor localisation techniques that use wireless local area network (WLAN) beacon signals have gained much attention by the research communities. Many localisations methods are used to estimate the user of mobile device in door environments. However, the accuracy of these methods is affected by the nature of the testbed environment. Alhammadi Alias, Tan and Sapumohotti introduced an experimental testbed in a typical indoor environment. A fingerprinting-based localisation algorithm was used to estimate the user location. The fingerprinting technique consists of two phases: offline phase and online phase. In the offline phase, calibration points are collected at certain places in floor to build a radio map. In the online phase, deterministic and probabilistic approaches are applied in order to get the correct estimated position of a mobile device. In deterministic approach, the position of mobile device estimated by K-nearest neighbour (KNN). In probabilistic approach, the position of mobile device estimated by Bayesian network (BN). Clustering technique was used to improve the system's accuracy and reduce the radio map size in the offline phase. The experimental results showed the system accuracy was improved and the size of radio map was reduced by using the proposed clustering technique.

Handwritten word recognition is the ability of a computer to receive and interpret intelligible handwritten input. The important document recognition application is bank cheque processing. The Arabic bank cheque processing system has not been studied as much as Latin and Chinese systems. The domain of handwriting in the Arabic script presents unique technical challenges; proposing a model for feature extraction which combines multiple types of features most likely will help to improve the recognition rate. Al-Nuzaili, Hashim, Saeed, Khalil and Mohamad et al. proposed a pixel distribution-based features model (PDM) for offline Arabic handwritten word recognition. Two combination levels were used: the first combines different features and the second combination was done by ensemble classifiers. The AHDB dataset was used and the experimental results showed superior performance when combining multiple features and using multi classifiers.

A surge of concern has been witnessed to manage the growing size of image information available from various sources namely internet and digital image capturing devices. The rich content of information available with image data has proved to be useful for analytical decision making process. Content-based image recognition has been considered as an effective measure to identify the object of interest. The success of aforementioned procedure has largely been influenced by the method of feature extraction from the image content. Image binarisation has proved to be an efficient tool for feature vector extraction using various threshold selection techniques. Das, Thepade and Ghosh have proposed a novel feature extraction technique based on local threshold selection and have evaluated the technique on 17,021 images for performance assessment. The precision results for classification and retrieval have shown an increment of 17% and 13.1% respectively when compared to state-of-the art techniques. A

statistical test has also been conducted to establish the significance of the proposed method over the existing techniques.

The study of micro-nano patterned surfaces has become a key area in the last few years. While the principal reason behind this interest is the wide range of applications of these surfaces; adhesion and wetting studies also have turned into important areas of research. This is especially important in applications such as biomimetic surfaces, lab-on-chip devices, etc. The study of the contact angle and surface energy is therefore both interesting and crucial. In this paper, an attempt is made to compute the contact angle of various substrates using four different methods. Apart from the traditional half angle method and goniometry which are quite well-known, image processing methods based on curve fitting and Hough transforms which have been developed by the authors have been considered for this comparative analysis. Chebolu and Nagahanumaiah discussed the Hough transforms-based technique. While it is difficult to declare any one technique as the universally best, the pros and cons of all the four algorithms have been discussed in the results section. The algorithms were tested on micro-patterned surfaces fabricated over three different materials: poly dimethyl siloxane (PDMS), polystyrene and acrylic using laser.

Software testing is an important step in the software development process, accounting for more than 50% of software development cost as it is laborious and time-consuming. The most critical step of software testing is the generation of test data (set of program input data) for test cases. The process of generating test data should be accomplished with the implementation of test adequacy criterion that is determined when the testing process of a program is finished. Manual testing is a tedious time consuming process, particularly because of the manual effort devoted to solve the problem. The automation of this generation can improve the process to satisfy the required test adequacy criterion. This process is called an automatic test data generation (ATDG). As a result, many studies have been proposed to automate the testing process in order to reduce the cost and time and to increase confidence in the results. Negative selection algorithm (NSA) has been used by Mohi-Aldeen, Mohamad and Deris to generate test data for path testing automatically. The proposed algorithm has been applied to the most commonly used benchmarking program which is triangle classifier. The experimental results showed that the proposed algorithm is more efficient in time of execution and more effective in the generation of test data when compared with random testing and genetic algorithm.

The research on the tracking control of a wheeled mobile robot (WMR) is increased dramatically in recent years due to its important in robotics community. The path tracking controller is aimed to produce a control low for the linear and angular velocity/acceleration of the WMR in order to force the robot to pursue a desired trajectory. The objective of the tracking controller is to stabilise the tracking errors to zero. However, the tracking error cannot be avoided due to slippage, disturbances, noise, interaction between robot and its environment and the measured sensor errors from internal as well as external sources. Therefore, designing of an efficient and effective controller that allows the robot to accurately track a desired trajectory is still an open research topic in the robotics area. Obaid and Husain presented a time varying backstepping tracking controller (TVBTC) for the kinematic model of the non-holonomic WMR that can improves the transient performances of the standard backstepping control scheme. The proposed TVBTC is derived based on the analysis of the error dynamic, as well as the stability conditions of the controlled system. The asymptotic stability of the system and the convergence of the posture errors to zero are guaranteed using the

Lyapunov stability theory. In comparison with the other tracking control methods for the mobile robot, the simulation results demonstrate that the transient performance can be improved significantly using the proposed TVBTC, which is capable to track a circular path with faster settling time and minimal overshoot. In addition, the TVBTC can efficiently handle a situation with arbitrarily large initial tracking errors and it is capable to produce smooth and bounded velocity output in a finite time interval. The simulation results showed the effectiveness of the proposed tracking controller at the starting time.

In thermal machines, temperature is an essential control variable like flow rate and motor velocity. For industrial applications, temperature needs to be finely controlled with consideration of equipment safety. The air blower system is a common process in our daily life where certain desired temperature is controlled. In industries such as pharmaceutical, the ability to control temperature is critical to ensure the quality of the product always within control. However, most of heating plants are complex with higher-order systems, which leads to unsatisfactory performance. The PT-326 air blower system is selected as a model system which needs to be maintained at a certain level of temperature. Therefore, the model system has to be controlled by a suitable controller to achieve its desired temperature. Alsofyani, Rahmat, Anbaran, and Alamri studied the identification and control of an air blower system PT-326. Modelling of the PT-326 system is required before designing the controller. Hence, it is estimated by using system identification toolbox available in MATLAB. The process of identification began with the collection of input and output data from an experiment. The collected data is used for model estimation based on the selection of auto-regressive with exogenous (ARX) model structure of the PT-326 system. Based on the input and output data of the system, best fit criterion and correlation analysis of the residual are analysed to determine the adequate parameters of ARX model representing the PT-326 system. To achieve a good performance for the air blower system, right selection of the PID controller parameters is essential. In addition, authors presented a simple approach for designing a PID controller using minimum square error tuning scheme and compares it with a conventional Ziegler-tuning method for the identified model via simulation and experiment. The results obtained from both tuning methods showed that the outputs of the system with the PID controller in simulation and experiment are almost similar.