

## ICMSOA2019 Speeches

**Host:** Prof. Zhizhang Shen from Plymouth State University, Plymouth, USA

**Speech 1:** Nazarenko Nikita from Bauman Moscow State Technical University, Moscow, Russia

Speech Title: The method to annotate buildings with images from CCTV cameras with an intersecting field of view

Abstract. Video surveillance and tracking systems help to increase the safety of human activity in a given area and improve detecting the geo-location of an observer (a swarm of drones, autopilot) in modern cities. This article proposes the method for determining the full or partial address (annotation) of buildings by using images from several CCTV cameras with an intersecting field of view. As input parameters, the method takes several images from surveillance cameras, their geographical coordinates and directions of the optical axes and the vector map of the area where the cameras are located. The outputs are annotations of buildings for the initial images. The proposed method allows solving the problem of georeferencing the video analytics system and improving the work of the surveillance and object tracking systems. The resulting annotations of buildings provide an opportunity to determine more accurately the situations with overlapping of the tracked objects with buildings and predict the probable paths of the objects. A lost object on one camera can be found by using annotations from other cameras, which field of view is not overlapped by this building. Besides, the proposed approach is sustainable to full or partial overlapping of buildings and allows solving to solve the problem in the absence of a detailed height map of the terrain and buildings. Also, the article researches the restrictions of the method. It is necessary to find an angle between two cameras, at which the best result can be achieved. That is, the method should return the correct addresses of all buildings visible in the image.

**Speech 2:** Yijie Wang from Yunnan University, Kunming, China

Speech Title: Evolutionary dynamics of Chinese tourism market extremely low-priced strategies based on wright-fisher processes

Abstract. Extremely low-priced of package tours is an important cause of Chinese tourism market price disorder. Regulating the price of package tours in Chinese tourism market, can solve the problem of Chinese tourism market price disorder. In order to research the reason of extremely low package tours price, consider the stochastic dynamics of  $N$  homogeneous mixed travel agency pricing strategies, and each travel agency could choose Extremely low-pricing or regular pricing. Based on Wright-Fisher processes, we obtain the dominant strategy of Extremely low-pricing and regular pricing under the weak selectivity in the package tours price setting, when the travel agency groups are finite. And then further verify these conditions by numerical simulation. The simulation shows that the Price elasticity of tourism demand, the transparency of the tourism market and the degree of government supervision strength have important effects on the stochastic evolution of package tours price setting. Reducing the demand elasticity of tourism market, increasing the transparency of the tourism market and the degree of government supervision strength can make travel agency choose regular pricing and solve chaotic of Chinese tourism market further. Therefore, this paper puts the suggestion of "two increases and one decrease" for the development of Chinese tourism market.



**Speech 3:** Yakovleva Olga Viktorovna from Bauman Moscow State Technical University, Moscow, Russia

Speech Title: Predict post spreading in online social networks based on independent cascade model

Abstract. Today, online social networks play an important role in the information spreading. Based on the social influence effect, posts can be spread across the network by repost mechanism. This paper addresses the problem of using independent cascade model for repost dynamics prediction in online social networks. A spreading post probability between two connected users is presented as function of preassigned features and coefficients fitted by the EM algorithm. This approach combines ideas of previously proposed methods. The list of considered features is composed and it includes users, their relationships and posts features. The iteratively solved by the Newton's method system of equation is derived for independent cascade model to obtain coefficients of a probability function. The experiments with the Sina Weibo dataset show that the EM algorithm more accurately estimates unknown coefficients of probability function that the logistic regression method. Since actual values of diffusion probabilities are unknown for a real network, a problem of their estimation is considered as a binary classification problem to determine accuracy of various methods. The independent cascade model tuned by proposed method of diffusion probability estimation was verified. The experimental results show than the model can commendably predict the reposting dynamics for a given post.

**Speech 4:** Jun He from University of Science and Technology of China, Hefei, China

Speech Title: Financial deepening, inclusive finance and economic growth: Analysis based on endogenous growth theory

Abstract. This article studies the relationship between financial development and economic growth from the perspectives of financial deepening and inclusive finance. The theoretical research expands the financial endogenous economic growth model, constructs the Hamiltonian function, using the first-order optimization conditions to obtain explicit relationship between economic growth and financial development under balanced path. Theoretical research shows that financial deepening and inclusive finance are significant and stable in promoting economic growth.

**Speech 5:** Murashov Ivan Dmitrievich from Bauman Moscow State Technical University, China

Speech Title: Method of determining vehicle speed according to video stream data

Abstract. This article presents a method of determining the speed of a dynamic object from the data of a video stream. The determination of speed occurs based on the analysis of repeated objects of the environment, the distance between which varies according to a previously known law, such as lamp posts, milestones or bump stops on roads, intermittent road marking lines, emergency exits in tunnels. The method of determining vehicle speed includes three steps: pre-processing of the frame, searching for a pattern in the image, calculating the average vehicle speed obtained on the basis of the number of repeated objects, taking into account the law of their repetition and the distance between them for some fixed time. The advantage of the proposed method is that there is no need to install any additional sensors on the dynamic object except video camera. The development of an additional method for calculating speed has a significant application value for the complexes of control of autonomous traffic, as the existing methods of determining speed have their disadvantages (not high enough accuracy, the requirement for the

presence of additional equipment). This algorithm was studied on regularly recurring objects (lampposts) under different lighting conditions (day, night), the distance between repeated objects and different weather conditions. It was also compared with other methods of determining the speed of the data from the video stream, the results of which the proposed method has a significant advantage in accuracy as compared with analogs in the absence of interference with video.

**Speech 6:** Zhizhang Shen from Plymouth State University, Plymouth, USA

Speech Title: Faulty node modeling and diagnosis in interconnection networks

Abstract. Faulty processing node analysis, in particular, self-diagnostic paradigm, is an important topic in the area of interconnection network studies. Several diagnostic models have been introduced, with the PMC and MM\* models being two of the most popular ones. Researchers have also proposed various extensions and enhancements of fault-tolerance models to better capture the distribution, and identification, of faulty nodes in realistic scenarios. One of them is the g-extra fault-tolerance model, where each cluster in a network with faulty nodes contains at least  $g+1$  fault-free nodes. This paper, following an analytical and constructive approach based on applied graph theory, suggests a general process to identify the maximum number of faulty nodes in a network in terms of the g-extra fault-tolerance model, and as a demonstrative example, provides a specific result for the  $(n, k)$ -star graphs.

**Speech 7:** Cong Ke from Hubei University of Technology

Speech Title: Image Registration of Infrared and Visible Image Based on Geometric Constraint

Abstract. With the wide application of infrared sensors and visible sensors, the registration of two heterogeneous images has caused widespread concern. Multi-angle comprehensive analysis of multi-sensor imaging systems can obtain more accurate image information. However, the main challenge of image registration is the detection of feature points and the acquisition of the correct feature point matching pairs. A Geometric constraint method is proposed to obtain the correct feature matching pairs. Three feature point matching pairs are randomly selected in the two images, and the ratio of the corresponding line segment lengths is obtained according to the coordinates of the three feature points to find the most three similar feature point matching pairs. Compared with the RANSAC algorithm, the method can obtain the correct feature point matching pair better. The algorithm runs on the DSP platform for about 30s, the error is 1 pixel, and the correct rate reaches 80%.

**Speech 9:** Basim Salem from Bauman Moscow State Technical University, Moscow, Russia

Speech Title: Decision support system for an early-stage keratoconus diagnosis

Abstract. Currently, there is a wide variety of different diseases that exist, a lot of which can be hardly promptly diagnosed even by medical specialists. This paper presents a method for early-stage diagnosis of ophthalmologic disorder keratoconus. Working with medical imagery that was captured by a rotating Scheimpflug camera system for anterior segment analysis, the goal was to create a decision support system to aid ophthalmologists in prompt detection of the disorder to eliminate the chance of further surgical intervention. Given approach uses several steps to achieve that goal, such as find the region of interest on the medical imagery using a Single Shot MultiBox Detector, filter and binarize the image, locate the cornea and approximate the curve with least squares fitting, classify the stage according to the previously labeled dataset by medical specialists

with a random forest method. The suggested approach achieves 76% precision on a dataset containing 500 images of the patients with the first stage of keratoconus and healthy patients. The final result was compared with modern existing medical methods that are usually used in ophthalmologic clinics by medical specialists.

**Speech 10:** Qijun Zhang from China Communication Microelectronics Technology Co Ltd, Shenzhen, China

Speech Title: Automated Model Generation for Electronic Devices Using Neural Network Approaches

Abstract. This paper describes artificial neural network approaches to convert the conventionally expensive process of electronic modelling into an automated model generation process. Artificial neural networks are trained using machine learning algorithm to learn the electronic behaviour, and the trained neural network becomes a model to help predict the electronic device behaviour. The automated model generation algorithm performs adaptive data sampling to determine the amount and the distribution of training data needed to train neural networks. The algorithm also determines the number of hidden neurons needed to achieve a compact and accurate model. Also incorporated into the automated model generation method is an efficient interpolation approach to make the process much faster. The objective of the described method is to generate a compact neural-network based model with better accuracy and in less time than conventional approach. Examples of automated modeling of radio-frequency and microwave filters used in wireless electronic systems are described showing the advantage of this technique.