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Jianhong Zhou
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Introduction

After eleven very successful previous conferences, the 12th International Conference on Machine Vision (ICMV 2019) was again a very impressive event where more than 150 international experts reported their recent findings in this important field. Overall, 98 oral and 33 poster presentations were made at this conference.

I joined the conference for the first time in 2018 in Munich and was very impressed with the quality of presentations and the liveliness of discussions. The organizers achieve this by including both hot topics in machine vision and a good mixture of experts from industry and academia.

The highlights of the 2019 conference were the keynote presentation given by Prof. Alexander Reiterer from the Fraunhofer Institute for Physical Measurement in Freiburg, Germany, the four plenary talks presented by renowned international experts in image processing and machine vision, and the three special sessions. In his keynote, Prof. Reiterer reported on new approaches in machine learning for infrastructure monitoring and shared some very impressive examples.

In the first special session entitled, "Camera Based and Mobile Recognition," 13 experts from Russian institutions reported their latest findings in using mobiles for various recognition tasks. Special attention was paid to topics of improving image quality and recognition accuracy in a video stream as well as to various approaches for object recognition on mobile devices. Both classical algorithms and machine learning approaches were considered. There were several talks on introducing distortions in the training data with the goal of increasing the accuracy and/or reliability of machine learning methods. Last, but not least, one of the talks was devoted to a new deeply annotated video dataset MIDV-2019 designed for research in the tasks of OCR, template matching, motion tracking, image normalization and stabilization, for images captured using low-end mobile devices in uncontrolled conditions.

In the second special session nine experts from Italy and Russia discussed new insights in tomography. Here specialists in x-ray optics and algorithms, both theoretical and applied scientists, discussed together their recent insights in this important field of 3D imaging. The majority of talks were devoted to classical computed tomography; however, topics of phase-contrast tomography and MRI were also discussed. The central part of the session was four works on the methods of improving the reconstruction quality in conditions where a classical CT model insufficiently describes the experimental setting. A significant attention was paid to ring artifacts, cupping effect, aperture limiting effect, and geometry calibration issues. Another highlight was undoubtedly the special session focused on new solutions for the control of autonomous cars under harsh environmental conditions. The development of autonomous driven cars is a hot topic taken up not only by industry but increasingly by research institutions. The topic is not new. Already in the 80th big research projects

such as the European EUREKA project "Prometheus" (PROgramme for a European Traffic of Highest Efficiency and Unprecedented Safety, 1986–1994) were aimed at finding new solutions for increased road safety. However, the key finding gained almost 30 years ago was not so much an increase in autonomy as improved driver assistance in order to provide more support to the driver in more complex situations. New algorithms and implementations of Artificial Intelligence, sophisticated sensors, and sensor fusion techniques are currently promising a significant improvement in the reliability of autonomous vehicles. In that context a lot of challenging problems are waiting on an answer especially questions directed to changing environmental conditions during the autonomous drive such as rain, fog, snow, and in general difficult visibility conditions. If vehicles are to drive fully autonomously in the future, systems are required which scan the environment with high precision, high spatial and temporal resolution and that guarantee the necessary reliability even in these difficult situations. Today, a wealth of different sensors is integrated and combined. The sensor and data fusion can be described as inadequate in current configurations, since the individual data streams are processed and interpreted in parallel. A combination of the results takes place very late in the process chain. Inadequate results characterized by latency and blurring are the result.

The third special session was dedicated to that challenge. Various lectures from Germany and China addressed new approaches for better dealing with such complex situations. This included a novel LiDAR sensor, new adaptive algorithms for object recognition, and two new sensors for the improvement of object detection through scattering media.

In fact, machine vision is not a very young but nevertheless emerging field. Many aspects of the digitization hype such as the Internet of Things (IoT), the digital factory, universal public safety, robotics, and autonomous traffic are affected by new technologies that are developed and implemented in this field. Therefore, we look ahead with great interest to the 13th International Conference on Machine Vision which will take place in the Autumn of 2020. Until then, the papers in this volume will hopefully find a grateful audience and be a source of new inspiration. Our thanks go to all this year's conference participants and especially to the organizers. We fully expect them to bring us of another wonderful ICMV next year.

Wolfgang Osten