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| **Understanding The Problem** | **Citation** |
| In the power industry, equipment that has been running for a long time will have poor airtight performance over time, and the liquid in the equipment or pipeline will leak out, causing drip leakage. With the rapid development of computer vision technology, especially the development of convolutional neural networks and target detection models, target detection algorithms based on deep learning are increasingly being used in the power industry. In this paper, the YOLOV3 algorithm based on the PyTorch framework is used to detect the falling process of the dripping liquid. However, because the real power plant environment cannot be inspected on the spot, it can only simulate the falling process of the dripping liquid in the power plant by itself. The leakage of the water from the household faucet is used to simulate the leakage of the power plant equipment, and the pictures of the water droplets and the video of the falling process of the water droplets are taken with the mobile phone, which are used for the production, training and target detection of the subsequent data sets. By taking pictures of water droplets and performing data augmentation, a data set of droplet pictures is constructed, and the labelImg software is used to label the droplets in the pictures. The data set has only one droplet classification. Then, the data set of the augmented dripping pictures is made into the PASCL VOC data set, and the YOLOv3 model is used for training. The MAP of the training result is 0.996. When using the model obtained after training to detect the dripping video, it can be accurately identified. And locate the dripping target in the video frame.  **keywords:** {Training; Deep learning; Liquids; Shape; Object detection; Production; Power industry;YOLOV3;PyTorch;Electricity;Drip;Leakage}.  **URL:** <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9873616&isnumber=9873533> | L. Wu, N. Zhang, Z. An, Y. Guo and J. Dong, "Liquid Drip Detection in Power Plant based on Machine Vision," 2022 IEEE 4th International Conference on Power, Intelligent Computing and Systems (ICPICS), Shenyang, China, 2022, pp. 16-21, doi: 10.1109/ICPICS55264.2022.9873616. |
| As an important parameter in various industries such as metal processing, agriculture, and medicine, the measurement of liquid flow can not only help us ensure the quality of production, but also improve production efficiency. In recent years, the development of computer vision has driven the development of flow detection towards intelligence. As a non-contact, fast measurement, high degree of automation, and high-precision measurement method, image processing technology has gradually been applied to various industries. Many researchers have invested a lot of research work on flow measurement. The representative research and solutions are summarized for more than 20 years, and describes the six main methods used in the flow detection of each fluid. It includes the following aspects: obtaining the flow through the liquid level detection; measuring the volume change rate by detecting the contour of the droplet; detecting the flow through a water ruler; adding markers such as tracer particles and tracer fluid to the liquid; using the interframe displacement of the water surface texture method. The article points out that the accuracy of the flow measurement is mainly affected by the liquid environment, and there are still many problems in the selection of light sources and algorithm research, and the true non-contact has not been achieved. At the same time, the future research trends and development directions are given. Through a large number of literature reviews, a review of the detection of fluid flow is provided, which provides many ideas for the next topic of milk flow detection. | Yanling Lan, Ding Han, Fengshan Bai, Zhaonan Zhong, and Zhi Weng. 2020. Review of Research and Application of Fluid Flow Detection Based on Computer Vision. In Proceedings of the 4th International Conference on Computer Science and Application Engineering (CSAE '20). Association for Computing Machinery, New York, NY, USA, Article 127, 1–8. https://doi.org/10.1145/3424978.3425112 |
| The rapid development of vision sensor based on artificial intelligence (AI) is reforming industries and making our world smarter. Among these trends, it is of great significance to adapt AI technologies into the intelligent agricultural management. In smart agricultural aviation spraying, the droplets’ distribution and deposition are important indexes for estimating effectiveness in plant protection process. However, conventional approaches are problematic, they lack adaptivity to environmental changes, and consumes non-reusable test materials. One example is that the machine vision algorithms they employ can’t guarantee that the division of adhesive droplets thereby disabling the accurate measurement of critical parameters. To alleviate these problems, we put forward an intelligent visual droplet detection node which can adapt to the environment illumination change. Then, we propose a modified marker controllable watershed segmentation algorithm to segment those adhesive droplets, and calculate their characteristic parameters on the basis of the segmentation results, including number, coverage, coverage density, etc. Finally, we use the intelligent node to detect droplets, and then expound the situation that the droplet region is effectively segmented and marked. The intelligent node has better adaptability and robustness even under the condition of illumination changing. The large-scale distributed detection result indicates that our approach has good consistency with the non-recyclable water-sensitive paper approach. Our approach provides an intelligent and environmental friendly way of tests for spraying techniques, especially for plant protection with Unmanned Aerial Vehicles.  Keywords:  [droplets](https://www.mdpi.com/search?q=droplets); [intelligent node](https://www.mdpi.com/search?q=intelligent+node); [vision sensor](https://www.mdpi.com/search?q=vision+sensor); [adaptability](https://www.mdpi.com/search?q=adaptability); [Unmanned Aerial Vehicles](https://www.mdpi.com/search?q=Unmanned+Aerial+Vehicles) | Wang, Linhui, Xuejun Yue, Yongxin Liu, Jian Wang, and Huihui Wang. 2019. "An Intelligent Vision Based Sensing Approach for Spraying Droplets Deposition Detection" *Sensors* 19, no. 4: 933. https://doi.org/10.3390/s19040933 |
| The recognition and extraction of water droplets on object surface have important practical application value. This article focuses on summarizing the different water droplet recognition segmentation algorithms, mainly based on threshold, edge detection, region and morphology segmentation, and clustering and special model-based segmentation algorithms. Then, some shortcomings of the current algorithms are analyzed and the future research direction is prospected. | Zheng Yingya1 and Zan Xiangzhen1  Published under licence by IOP Publishing Ltd [Journal of Physics: Conference Series](https://iopscience.iop.org/journal/1742-6596), [Volume 1605](https://iopscience.iop.org/volume/1742-6596/1605), [The 2020 International Conference on Internet of Things, Artificial Intelligence and Mechanical Automation.](https://iopscience.iop.org/issue/1742-6596/1605/1)  “A Survey of Water Droplet Recognition Algorithms on Object Surface”  **Citation** Zheng Yingya and Zan Xiangzhen 2020 *J. Phys.: Conf. Ser.* 1605 012039  **DOI** 10.1088/1742-6596/1605/1/012039 |
| Quantifying the nucleation processes involved in liquid-vapor phase-change phenomena, while dauntingly challenging, is central in designing energy conversion and thermal management systems. Recent technological advances in the deep learning and computer vision field offer the potential for quantifying such complex two-phase nucleation processes at unprecedented levels. By leveraging these new technologies, a multiple object tracking framework called “vision inspired online nuclei tracker (VISION-iT)” has been proposed to extract large-scale, physical features residing within boiling and condensation videos. However, extracting high-quality features that can be integrated with domain knowledge requires detailed discussions that may be field- or case-specific problems. In this regard, we present a demonstration and discussion of the detailed construction, algorithms, and optimization of individual modules to enable adaptation of the framework to custom datasets. The concepts and procedures outlined in this study are transferable and can benefit broader audiences dealing with similar problems.  Keywords: Deep learning; Computer vision; Nucleation; Heat transfer; Phase-change phenomena | Youngjoon Suh, Sanghyeon Chang, Peter Simadiris, Tiffany B. Inouye, Muhammad Jahidul Hoque, Siavash Khodakarami, Chirag Kharangate, Nenad Miljkovic, Yoonjin Won,  VISION-iT: A Framework for Digitizing Bubbles and Droplets,  Energy and AI,Volume 15,2024,100309,ISSN 2666-5468,  https://doi.org/10.1016/j.egyai.2023.100309.  (<https://www.sciencedirect.com/science/article/pii/S2666546823000812>) |
| Object detection in camera images, using deep learning has been proven successfully in recent years. Rising detection rates and computationally efficient network structures are pushing this technique towards application in production vehicles.  Nevertheless, the sensor quality of the camera is limited in severe weather conditions and through increased sensor noise in sparselylit areas and at night. Our approach enhances current 2D object detection networks by fusing camera data and projected sparse radar data in the network layers. The proposed Camera-Radar-Fusion-Net (CRF-Net) automatically learns at which level the fusion of the sensor data is most beneficial for the detection result.  Additionally, we introduce BlackIn, a training strategy inspired by Dropout, which focuses the learning on a specific sensor type. We show that the fusion network is able to outperform a state-of-the-art image-only network for two different datasets. The  code for this research will be made available to the public at:  https://github.com/TUMFTM/CameraRadarFusionNet  Index Terms—Sensor Fusion, Object Detection, Deep Learning,  Radar Processing, Autonomous Driving, Neural Networks, Neural Fusion, Raw Data Fusion, Low Level Fusion, Multi-modal Sensor Fusion | Felix Nobis∗, Maximilian Geisslinger†, Markus Weber‡, Johannes Betz and Markus Lienkamp  Chair of Automotive Technology, Technical University of Munich Munich, Germany  A Deep Learning-based Radar and Camera Sensor Fusion Architecture for Object Detection  Email: ∗nobis@ftm.mw.tum.de, maximilian.geisslinger@tum.de, markus.weber@tum.de |
| In this paper, we propose a novel raindrop shape model for the detection of view-disturbing, adherent raindrops on inclined surfaces. Whereas state-of-the-art techniques do not consider inclined surfaces because they assume the droplets as sphere sections with equal contact angles, our model incorporates cubic Bézier curves that provide a low dimensional and physically interpretable representation of a raindrop surface. The parameters are empirically deduced from numerous observations of different raindrop sizes and surface inclination angles. It can be easily integrated into a probabilistic framework for raindrop recognition, using geometrical optics to simulate the visual raindrop appearance. In comparison to a sphere section model, the proposed model yields an improved droplet surface accuracy up to three orders of magnitude. | Roser, M., Kurz, J., Geiger, A. (2011). Realistic Modeling of Water Droplets for Monocular Adherent Raindrop Recognition Using Bézier Curves. In: Koch, R., Huang, F. (eds) Computer Vision – ACCV 2010 Workshops. ACCV 2010. Lecture Notes in Computer Science, vol 6469. Springer, Berlin, Heidelberg. <https://doi.org/10.1007/978-3-642-22819-3_24> |