

Enhancing Driver Safety in Challenging Weather Conditions for Efficient Vision Driver Assistance Systems

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ABSTRACT

Traffic accidents pose a heightened level of severity under various conditions that result in reduced visibility, such as wet days, dark nights, gloomy and/or rainy nights, foggy days, and similar circumstances. Contemporary vision-based driver assistance systems are specifically engineered to operate optimally in favorable weather conditions. Classification is a systematic approach utilized to ascertain the optical attributes of vision enhancement algorithms, with the aim of enhancing their efficiency. In order to enhance the performance of machine vision systems under adverse weather conditions, this study introduces a multi-class weather classification approach that relies on a combination of several weather features and supervised learning techniques. Initially, the extraction of underlying visual characteristics is performed on multi-traffic scene photos. Subsequently, these characteristics are represented as an eight-dimensional feature matrix. Furthermore, a total of five supervised learning methods are employed in order to train the classifiers. The findings of the investigation indicate that the extracted features possess the capability to effectively express the semantics of the image. Moreover, the classifiers demonstrate a notable level of accuracy in recognizing the image, as well as the ability to adapt to varying conditions. The strategy described in this study serves as a foundation for improving the identification of vehicles in front during nighttime light variations, as well as extending the driver's visual range in foggy weather conditions.

Keywords: Supervised learning models, traffic scene perception, image enhancement, image denoising, histogram

I. INTRODUCTION

Highway traffic accidents bring huge losses to people's lives and property. The advanced driver assistance systems (ADAS) play a significant role in reducing traffic accidents. Multi-traffic scene perception of complex weather condition is a piece of valuable information for assistance systems. Based on different weather category, specialized approaches can be used to improve visibility. This will contribute to expand the application of ADAS. Little work has been done on weather related issues for in-vehicle camera systems so far. Payne et al. propose classifying indoor and outdoor images by edge intensity [1]. Lu et al. propose a sunny and cloudy weather classification method for single outdoor image [2]. Lee and Kim propose intensity curves arranged to classify four fog levels by a neural network [3]. Zheng et al. present a novel framework for recognizing different weather conditions [4]. Milford et al. present vision-based simultaneous localization and mapping in changing outdoor environments [5]. Detecting critical change of environments while driving is an important task in driver assistance systems [6]. Liu et al. propose a vision-based skyline detection algorithm under image brightness variations [7]. Fu et al. propose automatic traffic data collection under varying lighting conditions [8]. Fritsch et al. use classifiers for detecting road area under multi-traffic scene [9]. Wang et al. propose a multi-

vehicle detection and tracking system and it is evaluated by roadway video captured in a variety of illumination and weather conditions [10]. Satzoda et al. propose a vehicle detection method on seven different datasets that captured varying road, traffic, and weather conditions [11]. Below are the key problems for implementing this article:

1.1. Impact of complex weather on driver

Low visibility conditions will bring the driver a sense of tension. Due to variations of human physiological and psychological, driver's reaction time is different with the different driver's ages and individuals. The statistics show that driver's reaction time in complex low visibility weather conditions is significantly longer than on a clear day. In general, the driver's reaction time is about 0.2s ~ 1s. If the driver needs to make a choice in complex cases, driver's reaction time is 1s ~ 3s. If the driver needs to make complex judgment, the average reaction time is 3s~ 5s.

Disadvantages

- Not cleared detect the weather conditions for in this process.
- Traffic analysis is not accurate the predict the final report for weather conditions.
- Weather report is not cleared so accident is increased.

2. PROPOSED SYSTEM

Image feature extraction is the premise step of supervised learning. It is divided into global feature extraction and local feature extraction. In the work, we are interested in the entire image, the global feature descriptions are suitable and conducive to understand complex image. Therefore, multi-traffic scene perception more concerned about global features, such as color distribution, texture features outdoor conditions. Propose night image enhancement method in order to improve nighttime driving and reduce rear-end accident. Present an effective nighttime vehicle detection system based on image enhancement. Present an image enhancement algorithm for low-light scenes in an environment with insufficient illumination. Propose an image fusion technique to improve imaging quality in low light shooting. Present global and local contrast measurements method for single-image defogging. Present single image dehazing by using of dark channel model. Present a novel histogram reshaping technique to make color image more intuitive.

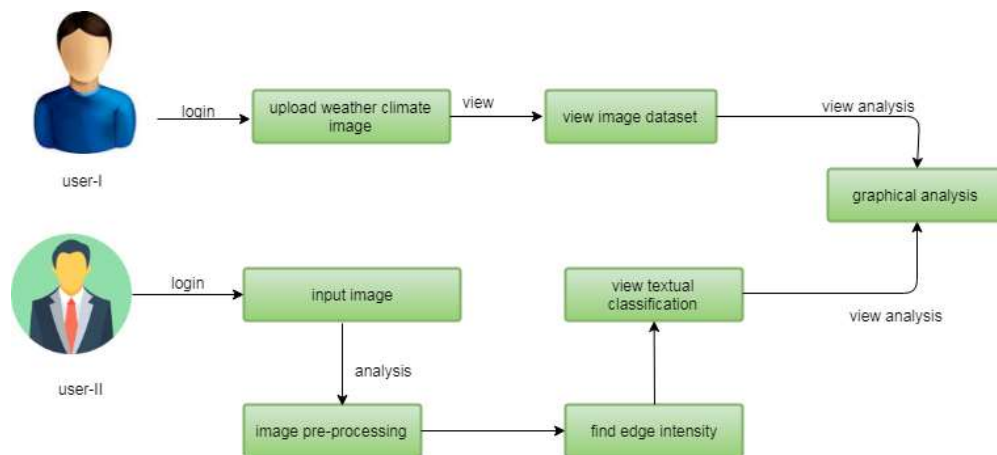


Figure 1. Architecture of proposed multi-traffic scene classification algorithm.

Present a framework that uses the textural content of the images to guide the color transfer and colorization. In order to improve visibility. Propose an improved EM method to transfer selective colors from a set of source images to a target image propose a multi-vehicle detection and tracking system and it is evaluated by roadway video captured in a variety of illumination and weather conditions. Propose a vehicle detection method on seven different weather images that captured varying road, traffic, and weather conditions. So, reduce the traffic and accident issues.

Advantages

- Predict the accurate weather conditions for this process.
- Reduce the traffic issues and another one is accident issues it is major one of problems for nowadays.
- Using digital image processing so time consume is save.

Following are the modules involved in proposed multi-traffic scene classification:

Weather Reports: Admin upload the training image weather data set and maintaining the perfect dataset for admin. Any details is upload and delete the date in report model. Data set for weather conditions and traffic positions and area finding the location. IN the model admin maintaining the training data set.

Find Weather: User login the page and upload the weather conditions image and next process image is analysis the admin training data set and lost finding the weather conditions. It is output for digital image processing. They will algorithms using for digital image processing and support vector machine.

Analysis Reports: They will finally report for weather conditions and which area affect for traffic issues finding the final data report. And using support vector machine algorithm split the weather conditions for separate process. And user view the all the data in finding the data process in data set.

Graphical Representations: The analyses of proposed systems are calculated based on the traffic issues. This can be measured with the help of graphical notations such as pie chart, bar chart and line chart. The data can be given in a dynamical data.

3. EXPERIMENT RESULTS

In the following section, we will first introduce the traffic scene dataset, and then the experimental set up will be briefly outlined including performance comparison, followed by the details of experiments on the database for traffic scene recognition. Our dataset contains 2000 images assigned to 10 categories of traffic scenes with 200 images belonging to each category (Figure 2): bridges, gas station, highway, indoor parking, outdoor parking, roundabout, toll station, traffic jams, train station and tunnel. The average size of each image is approximately 450*500 pixels. The images of the 10 categories were obtained by us from both the Google image search engine as well as personal photographs. Each category of scenes was split randomly into two separate sets of images, 135 for training and the rest for testing.



Figure 2 Sub-sample of 10 categories traffic road scene (from left to right, from top to bottom, the labels are 1-10)



(a) Upload test image.



(b) Detection of traffic.



(c) Classification.

Figure 3. Proposed traffic detection.

4. CONCLUSION

Road signals based on road images are a new and challenging subject, which is widely needed in many sectors. Therefore, the study of weather authorization based on images is an urgent request, which helps detect weather conditions for many visual systems. Classification is a method to classify optical properties for more efficient vision development protocols. In this sheet, eight global basic features are extracted, and 5-tracking learning algorithms are used to understand the multi-traffic road view used to evaluate color features, protocol features, and range features. Thus, the extracted features are more detailed. The proposed eight features have demonstrated that the image attributes cannot accurately describe but have strong weakness and stability in a complex climate environment. In the future, the proposed instructions should be checked with a larger image package. Integrated learning is a new paradigm in the field of machine learning. It is worth to learn about the generalization of a machine learning system. Visual image expansion mechanisms used in the public film are desirable to further investigate.

REFERENCES

- [1] A. Payne and S. Singh, "Indoor vs. outdoor scene classification in digital photographs," *Pattern Recognition*, vol. 38, no. 10, pp. 1533-1545, Oct 2005.
- [2] C. Lu, D. Lin, J. Jia, and C.-K. Tang, "Two-Class Weather Classification," *IEEE transactions on pattern analysis and machine intelligence*, 2016-Dec-15 2016.
- [3] Y. Lee and G. Kim, "Fog level estimation using non-parametric intensity curves in road environments," *Electron. Lett.*, vol. 53, no. 21, pp. 1404-1406, 2017.
- [4] C. Zheng, F. Zhang, H. Hou, C. Bi, M. Zhang, and B. Zhang, "Active Discriminative Dictionary Learning for Weather Recognition," *Mathematical Problems in Engineering*, 2016 2016, Art. no. 8272859.
- [5] M. Milford, E. Vig, W. Scheirer, and D. Cox, "Vision-based Simultaneous Localization and Mapping in Changing Outdoor Environments," *Journal of Field Robotics*, vol. 31, no. 5, pp. 814-836, Sep-Oct 2014.
- [6] C. Y. Fang, S. W. Chen, and C. S. Fuh, "Automatic change detection of driving environments in a vision-based driver assistance system," *Ieee Transactions on Neural Networks*, vol. 14, no. 3, pp. 646-657, May 2003.
- [7] Y. J. Liu, C. C. Chiu, and J. H. Yang, "A Robust Vision-Based Skyline Detection Algorithm Under Different Weather Conditions," *IEEE Access*, vol. 5, pp. 22992-23009, 2017.
- [8] T. Fu, J. Stipanovic, S. Zangenehpour, L. Miranda-Moreno, and N. Saunier, "Automatic Traffic Data Collection under Varying Lighting and Temperature Conditions in Multimodal Environments: Thermal versus Visible Spectrum Video-Based Systems," *Journal Of Advanced Transportation*, pp. 1-15, 2017 2017, Art. no. Unsp 5142732.
- [9] J. Fritsch, T. Kuehnl, and F. Kummert, "Monocular Road Terrain Detection by Combining Visual and Spatial Information," *Ieee Transactions on Intelligent Transportation Systems*, vol. 15, no. 4, pp. 1586-1596, Aug 2014.

- [10] K. Wang, Z. Huang, and Z. Zhong, "Simultaneous Multi-vehicle Detection and Tracking Framework with Pavement Constraints Based on Machine Learning and Particle Filter Algorithm," *Chinese Journal of Mechanical Engineering*, vol. 27, no. 6, pp. 1169-1177, Nov 2014.
- [11] R. K. Satzoda and M. M. Trivedi, "Multipart Vehicle Detection Using Symmetry-Derived Analysis and Active Learning," *Ieee Transactions on Intelligent Transportation Systems*, vol. 17, no. 4, pp. 926-937, Apr 2016.
- [12] M. Chen, L. Jin, Y. Jiang, L. Gao, F. Wang, and X. Xie, "Study on Leading Vehicle Detection at Night Based on Multisensor and Image Enhancement Method," *Mathematical Problems in Engineering*, 2016 2016, Art. no. 5810910.