

Intelligent detection system of community electric vehicle based on visual deep learning

Changle Wang^{1,a}, Pei Yu^{1,b,*}, Guochen Zhang^{1,c}

¹China Fire and Rescue Institute, Beijing, 102202, China

^a245730902@qq.com, ^bbiacd_yupe@163.com, ^c458241710@qq.com

*Corresponding author

Abstract: At present, the number of electric bicycles in China is still increasing rapidly, with the risk of fire still exceeding 300 million. This paper designs an electric vehicle monitoring system based on deep learning. The system uses the image real-time transmission system and deep learning platform to identify and detect the relevant behaviors of electric vehicles in real time. Infrared cameras are set in the areas with high fire risk such as the centralized parking point and charging point of electric vehicles. The captured infrared image is based on the smoke removal processing method of histogram equalization to improve the contrast of the image. It is convenient for the upper computer to identify the high-temperature point, find the fire point in time, and nip the danger in the bud.

Keywords: electric vehicle, graphics processing, deep learning

1. Introduction

In 2021, more than 14000 electric bicycle fires have occurred in China, causing 41 deaths and 157 injuries^[1]. Although China has successively issued relevant electric vehicle control policies and various regions have also taken corresponding control measures, there is no complete set of detection means at present. For the communities where people live, strengthening the intelligent management of electric bicycles has become a popular trend. Therefore, our group has developed and designed a set of intelligent detection system for electric bicycles, which is combined with human resources to form a relatively complete community electric vehicle monitoring system. The system can be mainly applied in places with high monitoring coverage, and can effectively monitor the illegal parking, charging and other illegal behaviors of electric bicycles. Then timely report to relevant units for rectification. The system can greatly improve the supervision strength and efficiency. For electric vehicles operating in violation of regulations, it can be found and rectified early to avoid causing great disasters.

2. Design scheme

The system is mainly composed of the following parts:

2.1 Data acquisition module

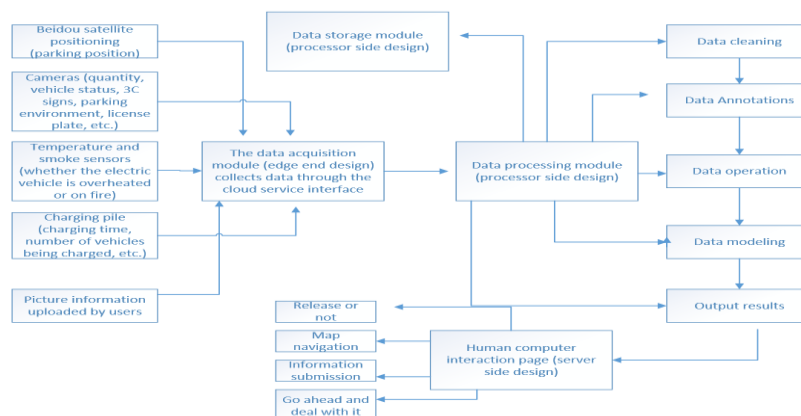


Figure 1: Functional program diagram

This module mainly uses the camera in the community to realize the image acquisition of illegal parking, illegal charging and other illegal acts of electric vehicles;

2.2 Data processing module

2.2.1 Make dataset

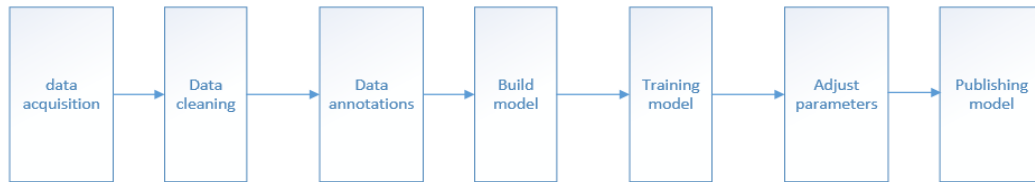


Figure 2: Flow chart of data set production

A: collect photos of electric vehicles in various scenes, and divide the photos into various types, such as 3C quality inspection mark of electric vehicles, parking location, wiring charging, parking quantity, etc. collect no less than 100 pictures of each type.

B: preprocess the pictures collected in step a with the help of PS and other common image processing software, and adjust the existing pictures by scaling, random rotation, random clipping, contrast adjustment, hue adjustment and saturation adjustment,

C: store the photos processed in step B in different folders according to categories. The folders are named according to the corresponding categories and uploaded to Baidu esaydl center^[2].

2.2.2 Model training

A: create a model, determine the model name, and fill in the function description of the model;

B: prepare and upload the data set, add training labels, and mark the data set according to the labels (flying line charging, parking position, wiring charging and parking quantity);

C: conduct model training on the marked data set, check the evaluation results after the training, and then verify the model results^[3];

D: repeat the training and modify the parameters to get a better model effect.

E: publish the model and deploy the trained model on the server.



Figure 3 (1): Experimental result

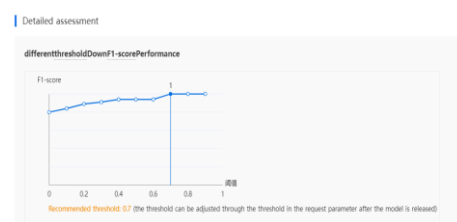


Figure 3 (2): Experimental result

2.3 Design of human-computer interaction page of the system

Connection between various modules, data processing and transmission, and intelligent or artificial disposal according to the processed data.

3. Image processing in high temperature and dense smoke environment

When there is a fire at the parking place or charging pile, the imaging environment is usually bad, such as smoke during combustion. In addition to the poor imaging line of sight caused by smoke, it will also radiate a certain intensity of infrared, resulting in large image noise and affecting the image imaging effect. Therefore, in order to obtain a clearer image, it is necessary to enhance the original image. The smog removal processing method based on local histogram equalization is adopted to improve the

contrast of the image, improve the clarity of the object edge, highlight the high brightness target points, and facilitate the target point positioning in the next step^[4].

To complete local histogram equalization, we first need to define a neighborhood, and then move the center of the region from one pixel to another. At each different position, the histogram of points in the neighborhood is calculated, and the histogram equalization image and specified transformation function are obtained^[5]. The specified transformation function is finally used to map the gray level of the central pixel of the neighborhood. Then, move the center of the neighborhood to an adjacent pixel position, and repeat the above process until the final result is output^[5].

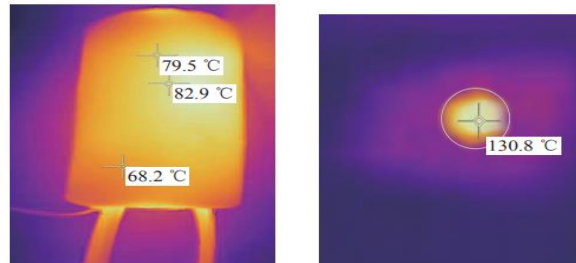


Figure 4 (1): Point area

Figure 4 (2): Plane area

4. Conclusion

How to reduce the evaluation rate of electric vehicle fire, in addition to working hard on the electric vehicle manufacturing process, the key is to find and extinguish the hidden danger of electric vehicle fire in time. In order to reduce the discipline violations of electric vehicles that are easy to cause fire and improve the supervision efficiency, an intelligent supervision system of electric vehicles based on deep learning platform is proposed, and the smoke removal processing method is integrated into it. The real-time image information is collected through the camera in the community to realize the detection and recognition of electric vehicles. At the same time, the relative position of the camera obtained by Beidou Positioning System is calculated to obtain the accurate coordinates of the electric vehicle for better disposal. The practical analysis results show that the system can achieve good recognition effect, the accuracy of high temperature point position judgment is relatively high, and can provide efficient and reliable auxiliary information for electric vehicle management and control. The follow-up research plans to focus on improving the accuracy and efficiency of the path algorithm, and gradually build an integrated detection platform such as whether personnel wear helmets and anti-theft of electric vehicles by using Baidu easydl platform.

Acknowledgements

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