MOBILE EDGE COMPUTING AND DEEP LEARNING FOR URBAN STREET CLEANLINESS ASSESSMENT

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Abstract: *Computer vision is a central task in smart city construction, as city managers constantly spend money and energy cleaning street garbage due to the random occurrence of street garbage, The amount of training data available often limits the depth and complexity of deep network solutions. To spur advances in analyzing and understanding images, OpenCV or Google AI have made the Open Images dataset public. Open Images continues the tradition of PASCAL VOC, Image Net, and COCO, but on an unprecedented scale. Consequently, visual street cleanliness assessment is very important in this project. However, existing assessment approaches have some clear disadvantages, such as the collection of street garbage information is not automated, and street cleanliness information is not real-time best performing algorithm for automatically detecting objects. Finally, the results are incorporated into the street cleanliness calculation framework to ultimately visualize street cleanliness levels, which provides convenience for city managers to arrange clean-up personnel effectively.*

KEYWORDS:

OpenCV, Google AI , PASCAL VOC *,* COCO

1.INTRODUCTION

Street cleaning is an important city service, which involves a set of activities concerning the cleanliness of the street (usually defined as pavements and adjoining edges of roads and grassed and planted areas). Therefore, it involves street-sweeping (whether manual or machine), litter-picking, the uplift of fly-tipped refuse, and the removal of graffiti and flyposting. When the street cleaning service is ineffective, the evidence is visible. And it could cause a significant impact on the quality of life and the attractiveness of its neighborhoods, towns, and cities. Moreover, people believe that there are links between environmental problems and other forms of disorder and crime in cities. On the other hand, good quality street cleaning service in a city provides and contributes the good environmental quality in its communities and neighborhoods, which can help urban development, and make places attractive to tourists, investors, and mobile workers. Moreover, effective street cleanliness could reduce the costs of cleaning underground water systems for cities. For this reason, researchers around the world are studying automated approaches, using a cleaning vehicle with cameras to capture the streets regularly and collect street information, such as street pictures, geographical location, date, and time. Besides, existing object detection algorithms are used to detect images in the remote cloud platform. Finally, the detection results are sent to the city managers for decision-making.

2.LITERATURE SURVEY

Smart city construction has become the focus of the whole society. Smart cities use intelligent methods to sense and handle urban activities through the Internet of Things, cloud computing, and other technologies, which can improve the quality of service in all aspects of society and the economy Meanwhile, smart cities can also achieve the purpose of reducing costs and resource consumption. Currently, many scholars in the world have done many types of research related to smart cities Mysore proposed a planning framework called the "Smart City Reference Model". Urban planners can use the framework to define the smart city concept and apply an urban layout to green, interconnected, open, integrated, smart, and innovative concepts. The framework provides an idea for realizing the sustainable development of a smart city. The recent practical application is to analyze smart city planning in big cities such as Ashokpuram, Metagalli, and Brindavan Extra. combined a smart city and life cycle concept to create suitable information and knowledge sharing platform in a smart city. It aims to solve the problem of unreasonable arrangement, lacking planning and internal coordination of large activities in the city, which can achieve the goal of organizational consistency and efficiency. In addition, Large companies also attempt to put into the research of the smart city. India Telecommunication carried out the development plan of smart city, focusing on 12 theme applications including smart community, smart transportation, smart energy, smart medical services and etc. IBM launched the Watson "Big Data and Analysis Platform" to help solve smart city problems such as smart transportation and air pollution. Microsoft launched the "Future City" plan to solve challenges such as environmental deterioration and traffic congestion by acquiring, integrating and analyzing multiple heterogeneous big data in the city. However, to the best of our knowledge, there is no specific research topic on urban cleanliness for the construction

3.MODULES

1.upload images:
Uploading the image is done by user. Authorized person is uploading the new arrivals to system that are listed to users. images can be uploaded with its attributes.

2.Approach Overview:
Edge computing can reduce latency and resources. Compared with traditional cloud computing, the main difference is that some services are processed on the edge in advance when a large amount of data is generated. R-CNN is also widely used in image recognition. Based on the above work, we design a novel urban street garbage detection and cleanliness assessment approach.

3. Data Collection and Mobile Edge Processing:
During the data collection stage, the main task is to collect garbage and street images needed by the assessment approach
We use edge servers to complete two tasks. The first task is to improve the performance of the entire system. During this stage, when object detection is performed, image data collected is first input into the CNN network and then the size of pictures is modified to the suitable size. We believe that if image data is preprocessed in the edge server, it can reduce the overall time of the entire system.

4. Image Detection Using Neural Network (R-CNN):
We have already introduced that our street garbage detection is based on the Faster R-CNN algorithm. Below, we describe the detection algorithm in detail from three parts: network design network training, and street garbage detection.

5. OPENCV:
Open CV is a library of programming functions mainly aimed at real-time computer vision. Open CV is a cross-platform library using which we can develop real-time computer vision applications. It mainly focuses on image processing.

4.INPUT AND OUTPUT DESIGN

INPUT DESIGN :
The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:
➢ What data should be given as input?
➢ How the data should be arranged or coded?
➢ The dialog to guide the operating personnel in providing input.
➢ Methods for preparing input validations and steps to follow when error occur.

OBJECTIVES
1.Input Design is the process of converting a user-oriented description of the input into a computer-based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system.

2. It is achieved by creating user-friendly screens for the data entry to handle large volume of data. The goal of designing input is to make data entry easier and to be free from errors. The data entry screen is designed in such a way that all the data manipulates can be performed. It also provides record viewing facilities.

3.When the data is entered it will check for its validity. Data can be entered with the help of screens. Appropriate messages are provided as when needed so that the user will not be in maize of instant. Thus the objective of input design is to create an input layout that is easy to follow

OUTPUT DESIGN:
A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.
1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.
2.Select methods for presenting information.
3.Create document, report, or other formats that contain information produced by the system.
The output form of an information system should accomplish one or more of the following objectives.
• Convey information about past activities, current status or projections of the
• Future.
• Signal important events, opportunities, problems, or warnings.
• Trigger an action.
• Confirm an action

5.ALGORITHM

Convolutional Neural Networks (CNN)
Convolutional Neural Networks (CNN) is one of the variants of neural networks used heavily in the field of Computer Vision. It derives its name from the type of hidden layers it consists of. The hidden layers of a CNN typically consist of convolutional layers, pooling layers, fully connected layers, and normalization layers. Here it simply means that instead of using the normal activation

functions defined above, convolution and pooling functions are used as activation functions. To understand it in detail one needs to understand what convolution and pooling are. Both of these concepts are borrowed from the field of Computer Vision

Region-based Convolutional Neural Networks(R-CNN)

R-CNN is a state-of-the-art visual object detection system that combines bottom-up region proposals with rich features computed by a convolutional neural network. At the time of its release, R-CNN improved the previous best detection performance on PASCAL VOC 2012 by 30% relative, going from 40.9% to 53.3% mean average precision. Unlike the previous best results, R-CNN achieves this performance without using contextual rescoring or an ensemble of feature types. To bypass the problem of selecting a huge number of regions, Ross Girshick et al. proposed a method where we use selective search to extract just 2000 regions from the image and he called them region proposals. Therefore, now, instead of trying to classify a huge number of regions, you can just work with 2000 regions.

1.The image is input to the convolutional neural network, and spread to the share convolutional layer to get the feature map:
2.The feature map extracted by the shared convolutional layer generates a suggestion window through RPN network, and gives region suggestions and region scores.
3.The feature map of the first step is input to the pooling layer in Fast R - CNN to extract area features. Combined with region suggestions and region scores, classification probabilities and bounding box regression are trained, the classification scores of the region are output, and the results are finally tested.

R-CNN algorithms have truly been a game-changer for object detection tasks. There has suddenly been a spike in recent years in the amount of computer vision applications being created, and R-CNN is at the heart of most of them.

6.CONCLUSION:

The development of novel technologies has driven a number of cities into the way to smart cities. Street cleanliness is one of the concerns for smart cities. Consequently, this paper proposes a novel urban street cleanliness assessment approach using mobile edge computing and deep learning. A visual street cleanliness road diagram is presented, such an automated system can help city administrators to know the cleaning state of the street easily. Several directions for future work are possible. These directions are described as follows:

- We plan to develop a solution that can automatically implement image filtering preprocessing at the mobile edge because manual filtering greatly affects the real-time transmission and wastes time.

- Our model contains common street garbage data. However, the model does not play a great role In the Uncommon garbage data. Thus the Training data needs to be Further expanded the Accuracy of the Model

7.REFERENCES

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