Smart Cleanliness Reporting System based on Machine Learning

Shakti Bangare
Department of Information Technology
Acropolis Institute of Technology and Research, Indore, Madhya Pradesh, India

Abstract— Swachh Bharat Mission is a one step towards keeping our village and cities clean and make people aware to maintain it. A lot of workforce is employed and working under the Swachh Bharat Mission but maintaining cleanliness is still a big issue. Cleanliness is done by various ground level workers and supervisors submit cleanliness report to their seniors and senior supervisors submit their reports to their seniors. This is a long hierarchy to see the cleanliness report by the responsible persons at higher hierarchy and it has a lot of mismatch with the ground level cleanliness. So supervising cleanliness is a big problem and cleanliness at ground level is not transparent to the responsible authorities. In proposed solution cameras will be installed all over the places where supervising is required. We will prepare a dataset which will show the dirtiness and cleanliness at different level for the specified places. To report the cleanliness our software will capture a picture everyday at specified time and it will compare with the designed software and it will produce a transparent and accurate report of cleanliness of the specified places to the responsible authorities.

Keywords: Smart City, Swachh Bharat Mission, Cleanliness Report, Machine Learning, Deep Learning, Machine Learning Solution for Cleanliness

I. INTRODUCTION

A smart city contains a wish list of infrastructure and services that describes his or her level of aspiration [1]. Smart city needs various infrastructure developments like better energy and water management, mobility, security and various amenities which should be available in the city. In Indian cities development of infrastructure is not a big issue because we are the leading country in the Information Technology and Infrastructure development [2]. So we have various resources to develop it. Apart from the development of Indian cities keeping it clean is a big problem. Population, Poverty and illiteracy of people are hindrance to keeping places clean. Swachh Bharat Mission is one step towards keeping our village and cities clean and make people aware to maintain it [3]. A lot of workforce is employed and working under the Swachh Bharat Mission but maintaining cleanliness is still a big issue. In Indian places like villages, cities, universities and large buildings maintenance of cleanliness is done by a long hierarchy. Cleanliness is done by various ground level workers and supervisors submit cleanliness report to their seniors and senior supervisors submit their reports to their seniors. This is a long hierarchy to see the cleanliness report by the responsible persons at higher hierarchy and it has a lot of mismatch with the ground level cleanliness. So supervising cleanliness is a big problem. Cleanliness at ground level is not transparent to their seniors. In proposed solution cameras will be installed to cover all the places and we develop a software system where our software will monitor the cleanliness through the cameras and will produce a transparent and accurate report of cleanliness of specified or all places to the responsible authorities.

II. LITERATURE SURVEY

1) Dog v Cat: In this problem a dataset consists of dogs and cats pictures. It is a standard computer vision dataset that involves classifying photos as either containing a dog or cat [4]. So using deep learning convolutional neural networks this problem can be solved. It can be used as the basis for learning and practicing how to develop, evaluate, and use convolutional deep learning neural networks for image classification. In this solution training is done by the data set and after that a random picture of dog or cat can be accurately identified as picture is of dog or cat.
2) Handwriting recognition: Handwriting recognition such as characters and digits by the computer programs is one of the most difficult problems of pattern recognition and artificial intelligence [5]. Neural networks approach the problem in a different way. The idea is to take a large number of handwritten digits, known as training datasets.

Fig. 1: Digits Handwriting as a training set

Then develop software which can learn from this training dataset. So by increasing the number of different training examples system can learn more about handwriting. After developing the system when we give the new example of handwriting of some different persons system is able to understand the handwriting and can generate the actual computer formatted text [6].

3) Image Classification using Deep Learning: Classification of images in the image processing is a step towards image processing. Image classification is also a classical problem of computer vision and machine learning fields. In this paper authors proposed the image classification using deep learning. They proposed a solution based on AlexNet architecture with convolutional neural networks [7]. Four test images are selected from the database for the classification purpose. They cropped the images from various angles and conducted their classifications. The results show the successfully classifications of the images based on AlexNet.

III. OBJECTIVES

The objective of proposed project may include-

1) Our system will be able to provide a report to the responsible authorities about the cleanliness of the specified places at specified time every day.
2) Report will include about a place that it is cleaned or not and if cleaned at what time it has been cleaned.
3) Report will also produce percentage of cleanliness about the places that workers have cleaned spot correctly or not

IV. PROPOSED SOLUTION

In the proposed solution cameras should be installed to cover all specified places. Cameras should be able to take high quality pictures and videos. Proposed solution will be achieved by machine learning and deep learning techniques. Machine learning and deep learning solution of cleanliness problem of a spot can be achieved in following steps:

A. Preparation of datasets:

After installation of cameras it is the first step towards preparing a solution at software level. We will capture different pictures of the same place from different angles. It will include many pictures showing dirtiness and cleanliness. We can capture pictures from our installed camera also. Collecting these pictures is the preparation of dataset of a spot. We will prepare datasets for all the spots where we want this solution. Dataset will include 1000 to 2000 pictures of a spot and these all pictures will include dirtiness and cleanliness level. Then we will classify our pictures in two sets as cleaned and not cleaned set using some standard method like convolutional neural networks. So whole dataset will be divided into two set i.e., cleaned and not cleaned set.

B. Training and Validation dataset:

After preparation of dataset we will divide it into training and validation dataset we will divide it in 70:30 ratios respectively [8]. It is a standard division ratio.

C. Software level solution:

All machine learning and deep learning problems can be solved easily using Python Language so we will design proposed solution in Python [9]. During the designing of software solution we give training set of spots as input to the software to categorize the pictures as cleaned and not cleaned. Then after successfully designing the solution we will validate the software using prepared validation set.

D. Application:

After successfully designing of software solution we can use it. A picture will be captured from the installed camera and it will be compared with our prepared dataset. Software will generate a report about the place that it is cleaned or not.
Our proposed solution will include the following:

1) Add Time: The admin or responsible authority can add reporting times. So system will generate cleanliness report at the specified time.
2) View cleanliness report: The Admin can see cleanliness report about the spot which will show spot is cleaned today till specified time or not and at what percentage cleanliness is done.

V. ADVANTAGES

Designing of software solution of cleanliness problem will have the following advantages:

1) The biggest advantage of this solution is that cleanliness is of a city is a ground level activity which is done by all the workers. So cleanliness report will be transparent to the higher level authorities and it will not mismatch with the ground level cleanliness. False cleanliness report submitted by the supervisors can be easily identified.
2) 2. It will not include any extra cost to install cameras because Smart City Project will include various surveillance cameras which can be utilized to produce our solution.
3) 3. If cameras are installed for the solution of this project only, then these cameras can also be used as surveillance for the security of the city.
4) 4. Proposed solution will reduce the overall cost of maintenance of the cleanliness. We will maintain some small hierarchy of immediate supervisors because most of the supervising task will be done by the proposed solution. So cost of large supervising team can be eliminated.

VI. CONCLUSION

Proposed solution will use machine learning and deep learning techniques to solve the cleanliness problem of major places of India like villages, cities, universities and large buildings. Proposed solution will capture a random picture of the specified place at a specified time and produce a report of cleanliness of that spot. It will also show the report that spot is cleaned nicely or roughly.

VII. FUTURE ENHANCEMENT

In future we can propose a solution which will capture the pictures of people who makes places dirty so that we can charge them fine or arrest them if they try to make places untidy.

REFERENCES

[1] http://smartcities.gov.in/content/innerpage/what-is-smart-city.php
[2] https://economictimes.indiatimes.com/tech/internet/india-rises-4-places-to-44th-rank-in-world-digital-competitiveness-rankings/articleshow/71312837.cms?from=mdr
[3] https://swachhbharatmission.gov.in/sbmcms/index.htm
[4] https://machinelearningmastery.com/how-to-develop-a-convolutional-neural-network-to-classify-photos-of-dogs-and-cats/
[5] Amanda Bischoff, Patrick S. P. Wang: Handwritten digit recognition using neural networks. In the Proceeding of SPIE 1608, Intelligent Robots and Computer Vision X: Neural, Biological, and 3-D Methods, (1 March 1992).
[6] http://neuralnetworksanddeeplearning.com/chap1.html
[7] M Manoj Krishna, M Neelima, M Harshali and M Venu Gopala Rao: Image classification using Deep Learning. In the proceeding of International Journal of Engineering & Technology.

[8] Isabelle Guyon: A scaling law for validation-set training-set size ratio. AT & T Bell Laboratories, Berkeley, California.
[9] https://www.python.org/

