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IOT Based Garbage Container Monitoring System

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ABSTRACT

The Internet of Things (IoT) shall be able to incorporate transparently and seamlessly a large number of different and heterogeneous end systems, while providing open access to selected subsets of data for the development of a plethora of digital services. Building a general architecture for the IoT is hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies, and services that may be involved in such a system. One of the main concerns with our environment has been solid waste management which in addition to disturbing the balance of the environment also has adverse effects on the health of the society. The detection, monitoring and management of wastes is one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a complex, cumbersome process and utilizes more human effort, time and cost which is not compatible with the present day technologies in any way. This an advanced method in which waste management is automated. This project IoT Garbage Container Monitoring system is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the garbage bins that if it is full or whether it is surrounded by garbage via a web page regularly after some time interval. This web page also send sms and email to garbage management department in Municipal Corporation.

1. Introduction

Garbage may consists of unwanted material left over from city, Public area , Society, Collage, Home etc. This project is related to the' Smart City' based on "Internet Of Things".So for Smart lifestyle cleanliness is needed and cleanliness is begins with Garbage Bins. This Project will helps to eradicate or minimize the garbage disposal problem. This project IOT based Garbage Container Monitoring Sysem is very innovative system monitors the garbage bins and the surrounded area of garbage bins. This system will inform that whether bins are full or it is overflowing. Also sometimes what happen that garbage bins are empty but the area around the bins are very ugly means all the wastes material are at the surrounding of bins. So this system imforms about the bins are full or it is surrounded by waste through the web pages.web pages use sms and email to imform about the bins status.

For this system we use CCTV Cameras in the areas arround the garbage Container to take the images of bins after fixed time interval. And using Matlab Image processing System we compare the empty Dustbin Image And the image captured by CCTV. Whereas web page is build to show the status to the user monitoring it. The web page gives a graphical view of the garbage bins and display the massage in box whether it is Full Or not. And if it is full then Send the Sms and also Email to respective person so that he will help to clean the city.

2. System Design and Implementation

Here is the block diagram of our proposed algorithm for the image processing section. The block diagram gives an overview of how status of Dustbin is checked.

Following are the generalized main steps involved in the image processing

∟ Image acquisition

∟ RGB to gray conversion

∟ Image enhancement

∟ Image matching using edge detection

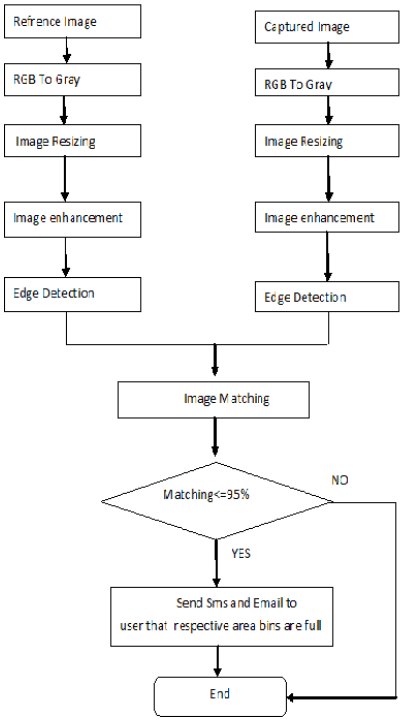

Fig 1.Algorithm

Detailed Procedures Implemented

Phase1:

∟ Initially image acquisition is done with the help of camera

∟ First image of the road is captured, when there is no traffic on the road

∟ This empty road's image is saved as reference image at a particular location specified in the program

∟ RGB to gray conversion is done on the reference image

∟ Histogram equalization is done on the reference gray image to achieve image enhancement

∟ Edge detection of this reference image is done thereafter with the help of Canny edge detection technique

Phase2:

∟ Images of the road are captured.

∟ RGB to gray conversion is done on the sequence of captured images

∟ Histogram equalization is done on each of the captured gray image to achieve image enhancement

∟ Edge detection of these real time images of the road is now done with the help of Canny edge detection technique

Phase3:

∟ After edge detection procedure both reference and real time images are matched and traffic lights can be controlled based on percentage of matching.

3.Steps

A. Image Acquisition

Image acquisition in image processing can be broadly defined as the action of retrieving an image from some source, usually a hardware-based source, so it can be passed through whatever processes need to occur afterward. Performing image acquisition in image processing is always the first step in the workflow sequence because, without an image, no processing is possible. The image that is acquired is completely unprocessed and is the result of whatever hardware was used to generate it, which can be very important in some fields to have a consistent baseline from which to work. One of the ultimate goals of this process is to have a source of input that operates within such controlled and measured guidelines that the same image can, if necessary, be nearly perfectly reproduced under the same conditions so anomalous factors are easier to locate and eliminate.

Image Acquisition Toolbox™ provides functions and blocks that enable you to connect industrial and scientific cameras to MATLAB® and Simulink®. It includes a MATLAB app that lets you interactively detect and configure hardware properties. The toolbox enables acquisition modes such as processing in-the-loop, hardware triggering, background acquisition, and synchronizing acquisition across multiple devices.Image Acquisition Toolbox supports all major standards and hardware vendors, including USB3 Vision, GigE Vision®, and GenICam™ GenTL. You can connect to 3D depth cameras, machine vision cameras, and frame grabbers, as well as high-end scientific and industrial devices.

B. Image Resizing

We have some conditions for forming an image f(x,y) as values of image are proportional to energy radiated by a physical source. So f(x,y) must be nonzero and finite. i.e. **0< f(x,y) <** ∞**.** Image scaling

occurs in all digital photos at some stage whether this be in Bayer demosaicing or in photo enlargement. It happens anytime you resize your image from one pixel grid to another. Image resizing is necessary when you need to increase or decrease the total number of pixels. Even if the same image resize is performed, the result can vary significantly depending on the algorithm. Images are resized because of number of reasons but one of them is very important in our project. Every camera has its resolution, so when a system is designed for some camera specifications it will not run correctly for any other camera depending on specification similarities. so it is necessary to make the resolution constant for the application and hence perform image resizing.

C.RGB To Gray Conversion

Humans perceive color through wavelength-sensitive sensory cells called cones. There are three different types of cones, each with a different sensitivity to electromagnetic radiation (light) of different wavelength. One type of cone is mainly sensitive to red light, one to green light, and one to blue light. By emitting a controlled combination of these three basic colors (red,green and blue), and hence stimulate the three types of cones at will, we are able to generate almost any perceivable color. This is the reasoning behind why color images are often stored as three separate image matrices; one storing the amount of red (R) in each pixel, one the amount of green (G) and one the amount of blue (B). We call such color images as stored in an RGB format.

In grayscale images, however, we do not differentiate how much we emit of the different colors, we emit the same amount in each channel. What we can differentiate is the total amount of emitted light for each pixel; little light gives dark pixels and much light is perceived as bright pixels.
When converting an RGB image to grayscale, we have to take the RGB values for each pixel and make as output a single value reflecting the brightness of that pixel. One such approach is to take the average of the contribution from each channel: (R+B+C)/3. However, since the perceived brightness is often dominated by the green component, a different, more "human-oriented", method is to take a weighted average, e.g.: 0.3R + 0.59G + 0.11B.

A different approach is to let the weights in our averaging be dependent on the actual image that we want to convert, i.e., be adaptive. A (somewhat) simple take on this is to form the weights so that the resulting image has pixels that have the most variance, since pixel variance is linked to the contrast of the image. In the applet above, the "optimal projection" calculates how we should combine the RGB channels in the selected image to make a grayscale image that has the most variance. [For the more technically advanced; we find the weights by taking the principal eigenvector of the sample covariance matrix of the RGB channels.]

D. Image Enhancement

Image enhancement is the process of adjusting digital images so that the results are more suitable for display or further image analysis. For example, you can remove noise, sharpen, or brighten an image, making it easier to identify key features.

Here are some useful examples and methods of image enhancement:

- Filtering with morphological operators
- Histogram equalization
- Noise removal using a Wiener filter
- Linear contrast adjustment
- Median filtering
- Unsharp mask filtering
- Contrast-limited adaptive histogram equalization (CLAHE)
- Decorrelation stretch.

E. Edge Detection

Edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. Edge detection is used for image segmentation and data extraction in areas such as image processing, computer vision, and machine vision.Common edge detection algorithms include Sobel, Canny, Prewitt, Roberts, and fuzzy logic methods.

Here I have used Sobel Edge Dectection algorithm. In this the gradient of the image is calculated for each pixel position in the image.

Fig 2.Sobel Edge Detection

F. Image Matching

Recognition techniques based on matching represent each class by a prototype pattern vector. An unknown pattern is assigned to the class to which is closest in terms of predefined metric. The simplest approach is the minimum distance classifier, which, as its name implies, computes the (Euclidean) distance between the unknown and each of the prototype vectors. It chooses the smallest distance to make decision. There is another approach based on correlation, which can be formulated directly in terms of images and is quite intuitive.

We have used a totally different approach for image matching. Comparing a reference image with the real time image pixel by pixel. Though there are some disadvantages related to pixel based matching but it is one of the best techniques for the algorithm which is used in the project for decision making. Real image is stored in matric in memory and the real time image is also converted in the desired matric. For images to be same their pixel values in matrix must be same. This is the simplest fact used in pixel matching. If there is any mismatch in pixel value it adds on to the counter used to calculate number of pixel mismatches. Finally percentage of matching is expressed as

%match = No .of pixels matched successful
Total no of pixels

E. Status of Dustbin

If the percentage matching is less than or equal to 95% then this shows that dustbin or garbage container is full.

If the garbage container is full then it will send sms and email to respective person that particular area dustbin is full.

So he will do the further action to clean the environment

3. ScreenShot and Results of System

Fig 3.Result of the System

References

[1] Internet of Things for Smart Cities by Andrea Zanella, Senior Member, IEEE, Nicola Bui, Angelo Castellani, Lorenzo Vangelista, Senior Member, IEEE, Michele Zorzi, Fellow, IEEE The final version of this manuscript will appear in the IEEE Internet Of Things Journal, vol. 1, no. 1, Feb. 2014. DOI: 10.1109/JIOT.2014.2306328.

[2] Digital image processing by Rafael C. Gonzalez and Richard E. Woods.

[3] Smart Garbage Monitoring System using Internet of Things (IOT) by Prof. Dr. Sandeep M. Chaware, Shriram Dighe, Akshay Joshi, Namrata Bajare, Rohini Korke. International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering ISO 3297:2007 Certified Vol. 5, Issue 1, January 2017

[4] A REVIEW: GARBAGE COLLECTION MANAGEMENT SYSTEM by P.A. Lokhande, M.D.Pawar IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308

[5] Smart Garbage Collection Bin overflows Indicator using IOT by Vishesh Kumar Kurre International Research Journal of Engineering and Technology (IRJET) e-Volume: 03 Issue: 05 | May-2016

[6] http://www.mathworks.com Web

[7] Kanchan Mahajan, Prof.J.S.Chitode,“ Waste Bin monitoring system using Integrated Technology”, International Journal of Innovative Research in Scienceengineering and Technology, July 2014.