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Drainage Overflow Detection

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***Abstract*—**The underground drainage infrastructure is a significant element of city organization. Drainage overflow detection is prerequisite condition to plummet adverse impacts on city environment. Therefore, it is essential to have a system that could evaluate underground drainage without human interventions. Advancements in Machine vision system enabled timely detection and reduction of drainage overflow. This paper mainly focuses on evaluation drainage overflow detection using Image processing techniques. Manhole images are analyzed using Image processing toolbox of MATLAB. Canny edge detection algorithm is used to detect edges in an image. Circular Hough transformation is performed on image to detect circles and image is segmented using Binary conversion to extract relevant features. HSV colour features are extracted and Lucas-Kanade method is applied to estimate optical flow. Distance based classifier is used to detect overflow based on trained models. The GSM module will send information about drainage overflow. Rain sensor is interfaced to differentiate drainage overflow and rain.

Keywords- Resize Image, Canny Edge Detection, Circular Hough Transform, Lucas Kanade

I. INTRODUCTION

The underground drainage arrangement is an important element of city infrastructure. If the drainage maintenance isn't properly maintained then natural water may receives the contaminated drainage water and leads to infectious sicknesses. The drainage gets blocked at some stage in rainy season, which will create problem for habitual lifestyles also the environment turns into dirty and absolutely it upsets the general public. To build a better management system for an underground drainage maintains in a massive towns is very difficult, because it is hard for the government personnel to locate the exact manhole which is facing the trouble. Therefore, it is necessary to have a system that could manipulate underground drainage without human involvement.

Underground Drainage has sewerage gadget, gasoline pipeline network, water pipeline, and manholes. This venture describes numerous capabilities used for protection and tracking of underground drainage machine. The system consists of sensors, camera, GSM module and controller. Initially system is trained with dry and wet images of drainage. Whenever the sensor detects the moisture, then camera will take the picture of drainage. Then image is given to the system and system will tell whether drainage overflow happened or not. The system will also send the message to the authority regarding the condition of drainage.

II. REALATED WORK

In [1] work on mean, widespread Deviation and Sum of Absolute difference set of rules (MSDDA) to apprehend Hoysala and Ganga durations characters. In this paper we presented a new approach called Advance Recognition algorithm (ARA) for recognition of characters and era identification of Kannada stone inscriptions belong Ganga and Hoysala period.

In[2] proposed the implementation and design features for tracking and dealing with underground drainage device with distinctive strategies. It additionally offers a information about water clever gadget and detection approach to identify leakage defects in sewer pipeline.

In[3] concentrated on a soil moisture tracking gadget which comprises of commercially to be had soil moisture sensor decagon ec-5, low strength NRF24L01 Wi-Fi transceiver, and MPC82G516A microcontroller.

In[4] proposed that canny edge detector is one of the maximum broadly used area detection algorithms due to its advanced performance. Unfortunately, it is computationally more extensive compared with different aspect detection algorithms, but it additionally has a better latency because it's far primarily based on frame-degree information.

In[5] proposed the Hough remodel for the detection of strains, circles, and ellipses. Here it is discovered to be greater study for picture containing perturbation noise. For best photos and pictures with speckle noise, the effects are found to rely upon the complexity of the object being detected, with greater complicated items favouring the up write.

In[6] proposed that massive-scale picture class techniques that can contain new instructions and education images continuously over the years at negligible price. To this end, we remember two distance-based classifiers, the k-nearest neighbor (k-nn) and nearest elegance imply (NCM) classifiers, and introduce a new metric gaining knowledge of method for the latter

III. PROPOSED SYSTEM

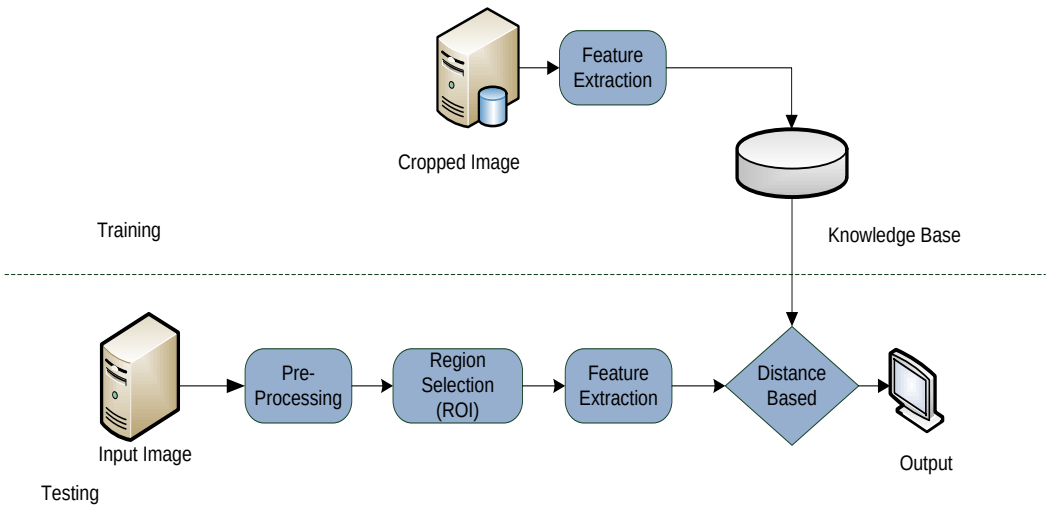


Fig.1. Methodology of Image Processing

In this section describes the suggest methodology. The design of proposed system is as shown in the Fig. 1. The architecture of the proposed system is categorized into two section called training and the testing. In the testing phase, the drainage image is considered as an input here; the picture is resized and that picture converted to gray scale image. The Circular Hough Transformation (CHT) is usable to find the circle in the drainage image. The ROI is selected to extract the features. That extracted features are trained by ROI that is cache into knowledge base. The RGB image is Change to HSV color plane extracting the features. The HSV planes features are extracted. Distance based classifier is used to classify the input query image with the trained knowledge base.

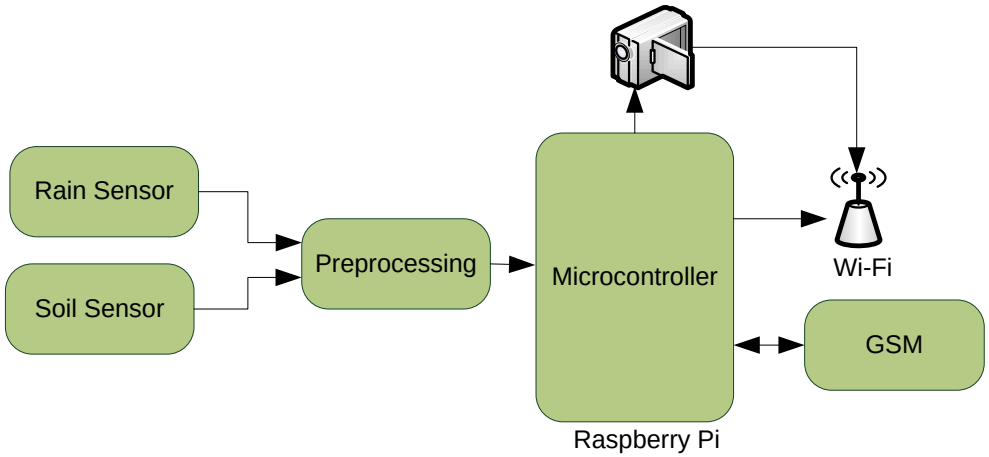


Fig.2. Block Diagram of Proposed System

There are two sensor are used here to sense and the send the signal. Soil sensor is used to intellect the moisture level of the soil and the rain sensor to indicate whether it is raining or not. The signals from the soil and the rain sensor are analog signal. In the preprocessing stage the analog signal is converted to digital. The Raspberry pi is a controller used here to control all the peripherals connected and process all the signals. When there is a signal from the soil sensor is received, it triggers the pi camera to capture image. The captured image is processed as explained in fig 1. Using a GSM an alert message is send to specified number. The soil sensor may also triggers to some fault condition like rain water etc; to reduce the fault condition rain sensor is used. When both the sensor triggers at the same time, it indicates the fault condition. Pi camera captures the image only when the signal received from the soil sensor.

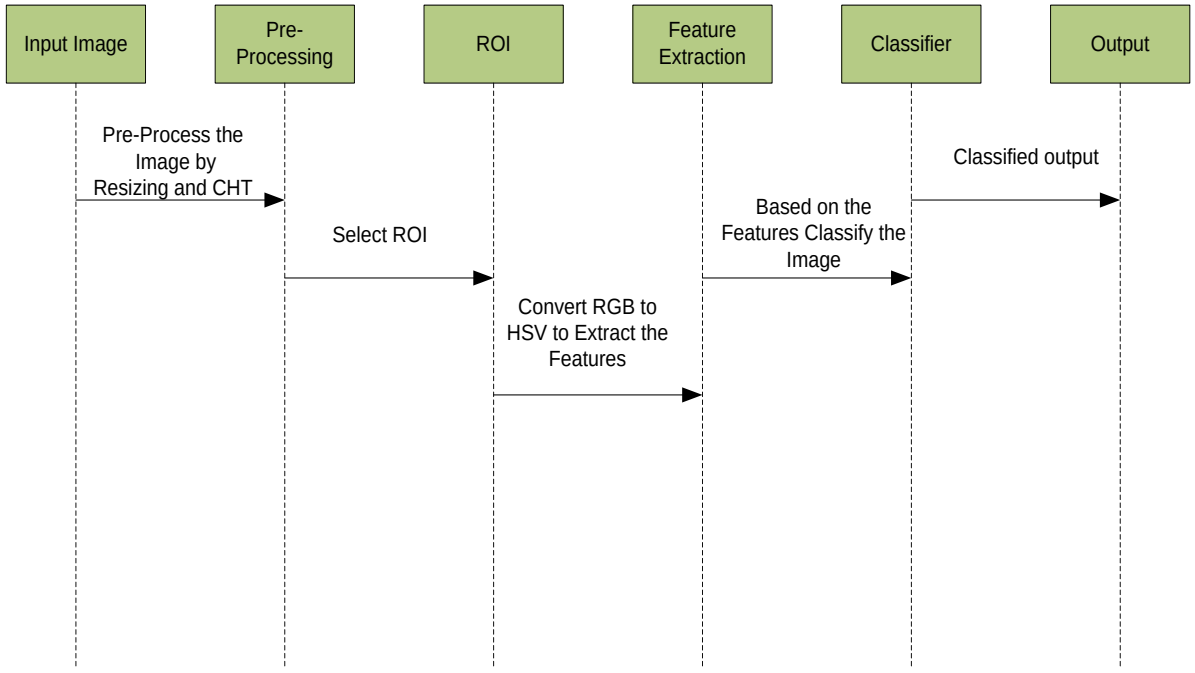


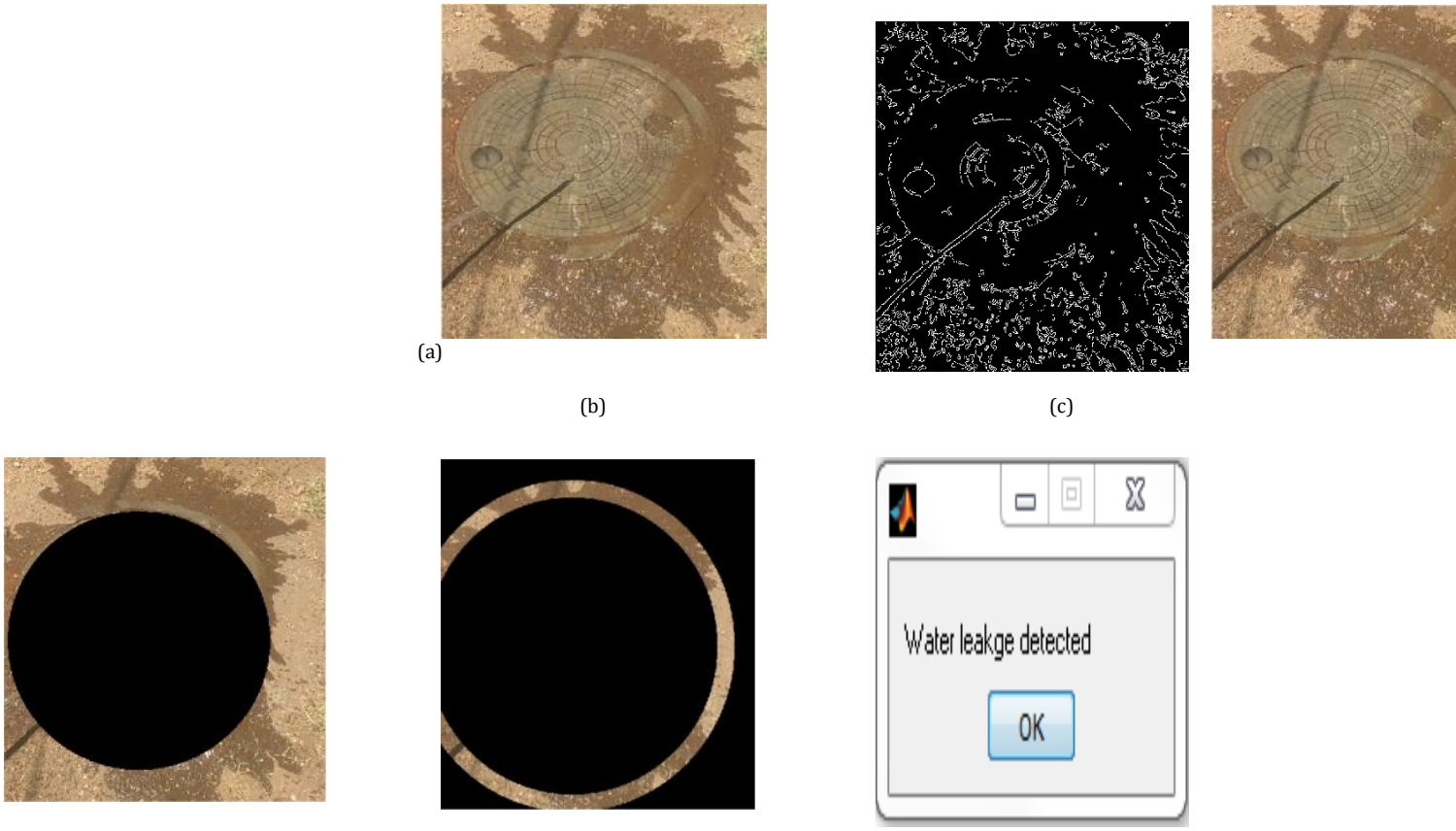
Fig.3. MATLAB Function Sequence Flow

It is an interaction diagram that expresses how objects work with one another and in what order. The fig 3 shows sequence diagram of the system. In the first stage an input image is considered. Input image dimension is resized in pre-processing. It is a significant step in image processing; image is resized to standard dimension without any loss in the information. Resized image transformed to gray image to apply CHT. ROI is selected to extract features of the image. Based on extracted features, classifier provides an output. Distance based classifier is used here as a classifier

IV. RESULT

Use Drainage Condition

Case1: Drainage Overflow

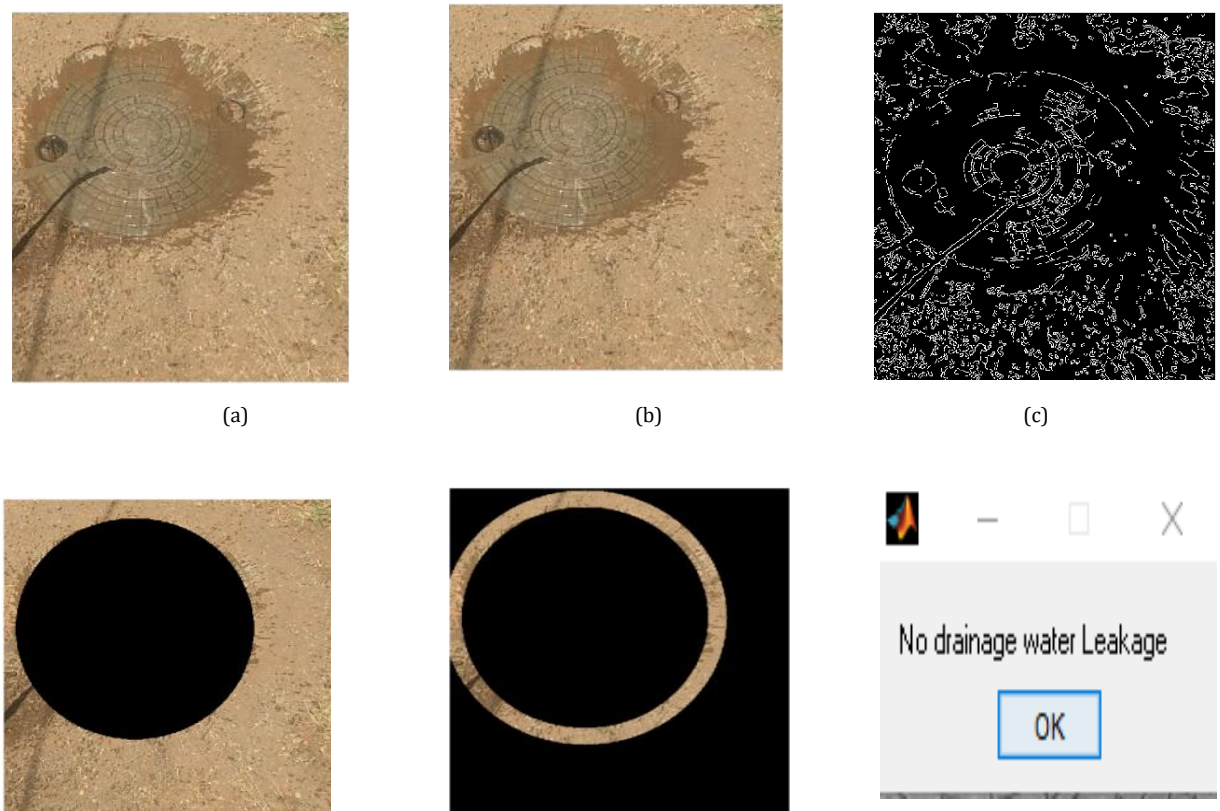


(a) (b) (c)

(d) (e) (f)

Fig.4. (a) RGB Image, (b) Resized Image, (c) Edge Image, (d) CHT Image, (e) ROI Image, (f) Output Window

Case 2: No Drainage Overflow



(a) (b) (c)

(d) (e) (f)

Fig.5. (a) RGB Image, (b) Resized Image, (c) Edge Image, (d) CHT Image, (e) ROI Image, (f) Output Window

TABLE I. VALIDATION TABLE

Drainage Cndition	No. of Tested Imags	Accuracy
Overflow	3	90%
No Overflow	3	90%

V. CONCLUSIONS

Proposed system detects the leakage of drainage water. Soil sensor is utilized to evaluate the water content in the soil, when water level is detected the sensor sends a triggering signal to controller. Raspberry pi board utilized as a controller to control and process the signals from the sensor, when signal from the soil sensor is received, raspberry pi camera is turned ON automatically and capture field of view. The captured image processed, if leakage is detected, through GSM respective ward number is message to registered number.

The soil sensor also detects water level during raining. Hence rain sensor is utilized with the soil sensor to reduce the fault condition. To obtain much accurate and better result pi camera is utilized to capture image. Visual image gives more clear information to verify that the drainage water leakage is overflowing or it's a fault condition

References

[1] Rajithkumar B, Dr. HS Mohan ,"Read and Recognition of old Kannada Stone Inscriptions Characters using Novel Algorithm" International Conference on Control, Instrumentation, Communication and Computational Technologies (ICCICCT)

[2] Yash Narale Apurva Jogal Himani Choudhary, "A Wireless Surveillance and Safety System for Mine worker based on Zigbee", IEEE International Conference on Recent Advances in Information Technology 2012.

[3] Chung W.Y., Villaverde J.F and Tan J, "Wireless Sensor Network Based Soil Moisture Monitoring System Design", Computer Science and Information Systems, pp. 79-8, 2013

[4] Qian Xu, Srenivas Varadarajan, Chaitali Chakrabarti, *Fellow, IEEE*, and Lina J. Karam, *Fellow, IEEE* "A Distributed Canny Edge Detector: Algorithm and FPGA Implementation" IEEE TRANSACTIONS ON IMAGE PROCESSING, VOL. 23, NO. 7, JULY 2014

[5] Hau T. Ngo, *Member*, IEEE, Ryan N. Rakvic, Randy P. Broussard,and Robert W. Ives, *Senior Member*, IEEE "Resource-Aware Architecture Design and Implementation of Hough Transform for a Real-time Iris Boundary Detection System" IEEE Transactions on Consumer Electronics Volume: 60, Issue: 3, Aug. 2014

[6] Thomas Mensink ,Jakob Verbeek ,Florent Perronnin," Distance-Based Image Classification: Generalizing to New Classes at Near-Zero Cost"IEEE Transactions on Pattern Analysis and Machine Intelligence Volume: 35, Issue: 11, Nov. 2013Author, F.: Article title. Journal 2(5), 99–110 (2016).