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Flood Early Warning System

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Abstract: Regional heavy rainfall is usually caused by extremeweather Conditions.Consequently, heavy rainfall often results in the flooding of rivers and the neighboring low-lying areas, which is responsible for a large number of casualties and considerable property loss. The existing weather forecast systems focus primarily on the analysis and forecast of large-scale areas and do not provide precise instant automatic monitoring and alert feedback for small areas and sections. In this paper, we propose a method to automatically monitor the flood level of a specific area based on video surveillance systems using image processing methods and computer vision techniques to provide instant feedback on flooding events. MATLAB, which specializes in real-time computer vision, is used for motion tracking and image processing. The system can track objects and analyze if its flood based on a set of features. The proposed method can better meet the practical needs of disaster prevention than large-area forecasting [1-5]. It also has several other advantages, such as flexibility in location deployment and it does not require specialized equipment. The results offer prompt information and reports for appropriate disaster warning and response in small localized areas

Keywords: video surveillance, MAT lab

I. INTRODUCTION

Floods are one of the widest spread natural disasters. They regularly cause large numbers of casualties with increasing economic losses, because of deforestation of mountains, clogged waterways and canals, and poor urban planning. When a large amount of water cannot be drained in time within the rainfall area, we face river overflow or urban inundation, which frequently causes serious problems. Therefore, effective near real-time hydrological information is extremely important for flood warning. The developed countries in the world are using a variety of weather forecasting systems to assist disaster prevention, relief, and evacuation, in order to drastically reduce the number of casualties and the amount of economic loss caused by disastrous weather conditions [4,6-9]. However, these forecast systems are normally based on predictions featuring a widespread region and a long lead-time. For both precipitation and flood forecasts, the results are not necessarily in line with the real situation and it is difficult to obtain precise results for small local areas, because of the various uncertain factors in the natural climate system like the complex interactions between hydrology, monsoon, ocean currents, and clouds. Therefore, many studies are currently being conducted with the aim of improving these forecast models. At present, it is still not easy to achieve reliable accuracy for precise regional flood forecasting in a given small area. The focus of this study is the detection of flood in a video sequences that is being fed by a static video surveillance camera [10]. Image segmentation is used for removing the surrounding objects, such as buildings and the geographicalbackground. Computer vision techniques are used for object detection.

II. RELATED WORK

This system has been used to implement a global surveillance program of multiple science phenomena including: volcanoes, flooding, cry sphere events, etc. (Chien, et al., 2006) The study by (Borges, Mayer,&Izquierdo, n.d.) propose a new image event

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detection method for identifying flood in videos[11].Traditional image based flood detection is often used in remote sensing and satellite imaging applications [12]. Experiments illustrated the applicability of the method and the improved performance in comparison to other techniques, in which large catastrophe can be strike off to a certain extend. While Dr. Catane's landslide warning system is still in the experimental stage, another group of scientists has already developed a low-cost and effective flood-warning device. The UP College of Science, with the help of scientists like Dr. Carlos Primo David of NIGS, has developed a contraption that sends flood warnings via cell phone-like device. The device's main component is a tipping bucket that collects rain water and measures exactly how fast or slow rain falls via a sensor. The tipping bucket is hooked up to a monitor that is also hooked up to a GSM modem. The GSM modem acts like a cellular phone that can send and receive text messages and calls. At any time, people can send texts or prompt "missed calls" to the modem togetinformation on rainfall data. (abs-cbnnews.com, 2009) “Bewared” from National University, is a real time push notification, where the users are notified for incoming disasters which provide the basic information about the specific disaster (i.e. alert level, location, and duration) and the information on the nearest evacuation center. (National University)

III. Proposed system

In the proposed system there will be a camera. And it wills continuously monitoring the flood warning areas like river, ponds, and sea banks. The frames from the camera were continuously monitoring for water presence [13]. Most importantly analyzing of each frame need to be done in necessary speed otherwise it may delay the warning system. The warning need to be given early as possible. First of all matlab will create video input object to interface camera. From that it will take pictures [14]. The received frames will convert to grayscale image. The conversion is based on the following equation .

```
Y= 0.2989 * R + 0.5870 * G + 0.1140 * B
```

In grey scale image we set a threshold value. All images in matlab are treated as matrix. For converting a grayscale image into binary one. Each pixels of grayscale image is compared with a threshold value. And pixels having value greater than threshold is treated as one and other as zero. In the binary figure user will have marked predefined points. And matlab will periodically convert the coming frames to binary value. And if ones comes in greater number than safe level it is a indication of overflow of water i.e. flood.

IV. .MATLAB PROGRAM

The matlab program will have a graphical user interface. In matlab graphical user interface is used to

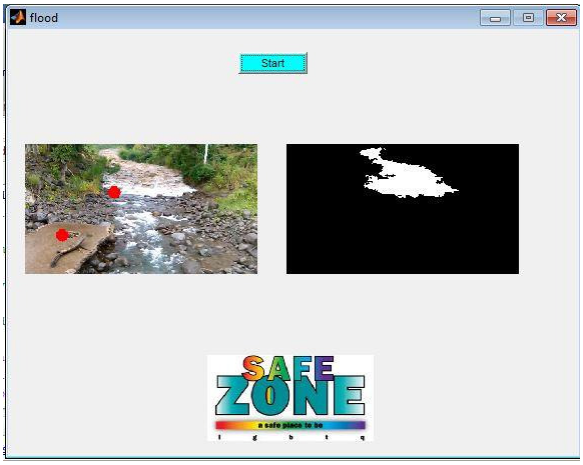

Figure 1: MATLAB graphical user interface in safe zone

Communicate with the user much more comfortably. In our GUI thermals three axes to display input video stream and processed video stream and the warning signal. If the presence of water is below the predefined area it is in safe zone. If the presence of water reaches above a predefined level it gives a warning . The push button is used to start the monitoring of video frames. If pushbutton pressed its callback will run and whole program is returned under pushbutton callback function. Each and every

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object in GUI can be handled using <handles.objectname> command. mask blob to the current frame and reference flood image (through row and column comparison of image) blob is a group of connected pixels in a binary image which represent an object or thing. In our case the area of over flood water is a blob. When the white colored area exceed the limiting position (row- column position), thus the flood is detected and alert signal or warning is generated.

V. Block diagram

The above block diagram represent the nutshell form of the flood detection system..The method utilizes image processing technique.

Initially the high definition camera is used for capturing the video of present water level condition. From the video clip periodic frames are captured. Each frame contains image of water bodies along with its background image[15].The background image will be constant in all image frames. Then the system masks the region of interest (water body region) and the points in the mask are predefined. After getting the mask of the image and the current frame of the video sequence, the system will normalize the luminance of the images to get the same distribution for every frame. Second, it will convert the two images to a grayscale form before subtracting the current frame from the background model [16]. The system performs a binary image transformation by setting up a threshold value. The image obtained as the result of this operation is a black and white image. The black portion is the region that was been grouped above threshold (logic 1' representation). Whereas the white portion is clusterthat was below threshold (logic '0' representation). Next, the system will get the size of the blob (binary large object) by computing for its area. Where area is divided into several rows and columns. If the size greater than area of interest it will

Figure 3:Flow chart of the system.

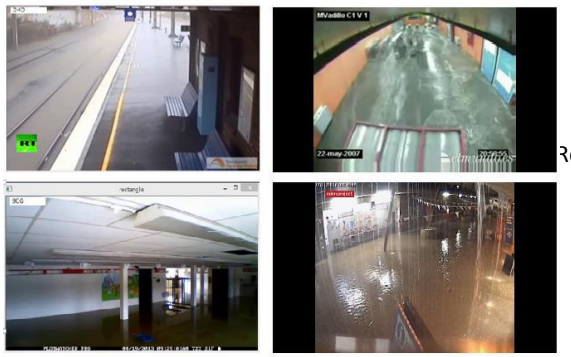

Figure 3: frames of flooded region from surveillance camera.

VI. Conclusion

The overall system of flood early warning system is worked out and it found to be working. The output of camera was analyzed frame by frame by matlab. The progression of the flood is successfully discovered and warning signal provided. And found to be it will be very helpful to people exceptionally to those live on river banks.

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