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Smart Agriculture System to Detect Flames using IoT and DIP

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Abstract — **Internet of Things is rapidly progressing in the present generation. In this paper the combination of IoT and digital image processing has been explained. An automation system which conducts pre-processing and feature extraction techniques on the image has been developed to detect casualties in the agricultural fields. The system includes Raspberry pi using python programming language. It performs as a central coordinator of the system. This program is very helpful for massive agricultural fields. It makes it easy to detect flames and save the yield by using wireless sensors and cameras.**

Keywords— Internet of Things (IoT), Digital Image processing, Raspberry pi.

I. INTRODUCTION

Agriculture is the backbone of Indian economy, almost 50% of people depend on agriculture. Therefore development in the field of agriculture will highly contribute to the economy of the country. But nowadays, agriculture is getting destroyed because of various causes. Technology has been developed to certain extent in various forms and in various sectors leading to development of India. When IoT and Digital Image Processing are used in the field of agriculture it will be effective and helps in achieving smart agriculture.

The Internet of Things (IoT), it consists of computing devices, digital machines, objects and people with specific identifications and it can send data through a network without any requirement of help from people. An IoT ecosystem has web- enabled devices that use processors, sensors and other hardware to acquire, transfer and act on the data. These devices share the data acquired by connecting to an IoT gateway or devices. These devices can communicate with other related devices and act on the data they have form each other. Hence, they do most of the work without any human

intervention. The connection, network and protocols used with these devices depend more on the IoT applications [7].

Digital Image Processing means processing digital image by means of a digital computer. Use of computer algorithms, gets the images enhanced either to extract some useful information. Acquisition (scaling and colour conversion), Image enhancement (extract some hidden details from an image), Image restoration (based on mathematical or probabilistic model), Colour image processing (deals with pseudo colour and full colour image processing), Wavelets and Multi-resolution processing (representing images in various degrees), Image compression (deals with image size or resolution), Morphological processing (extracting image components), Segmentation (partitioning an image into its constituent parts or objects), Representation and Description (transforming raw data into processed data), and Object detection and Recognition (assigns a label) are the phases of image processing[8].

As mentioned earlier, if this technology can implement in agriculture domain then we can have higher quality of produce by reducing the loss of crops due to various casualties like, change of weather, field fire and many other problems in agricultural field. The main aim is to reduce the loss of crop by fire. This can be done by regular monitoring of fields or crops by using an IoT based circuit which contains raspberry pi, sensors for the different conditions of surroundings and a camera to capture images at regular periods. The images taken will be improved in quality and checked for useful information, and to recognize the various conditions and changes that takes place or occurs due to various environmental or surrounding conditions due to various factors that take place. If any change is found that leads to the damage of crops and cultivating field, then water is pumped to extinguish the fire, thus this leads or contributes to increase the production of yield and reduce the damage and failure of crops.

The remaining part of the paper is structured into five sections. Section II deals with the literature survey. Section III explains the methodologies we adopt. The details about the proposed system is mentioned in Section IV and finally section V deals with results and conclusion.

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II. LITERATURE REVIEW

Authors of [1] You Only Look Once (YOLO) model to implement flame detection and compare it those shallow learning methods so as to determine the most efficient one for flame detection. Deep learning is a novel method which could be much efficient and accurate in flame detection. The Fuzzy pattern is proposed for fire detection. In the fuzzy, motion region of a flame will be set as the Region of Interest (ROI).

Authors of [2] this paper proposes automation and smart IOT based solution for agriculture. The highlighting features of this paper include temperature and humidity detection, soil moisture detection, leaf wetness detection, wind speed/direction detection and rainfall detection, soil pH detection, seed recognition and efficient irrigation system. This proposed system uses a microcontroller named raspberry pi with sensors which are used to sense the different environmental conditions.

Authors of [3] A fire detection system based on light detection and analysis is proposed in this paper. This system uses HSV and YCbCrcolor models with given conditions to separate orange, yellow and high brightness light from background and ambient light. Fire growth is analysed and calculated based on frame differences.

Authors of [4] Internet of Things (IoT) provide a good chance to build powerful system in fire industry. The fire ubiquity of radio-frequency identification (RFID), wireless sensor network and mobile give fire related applications by high leveraging level. The fire IoT aim to connect different things over the networks related with fire. The technology for IoT in fire detection is RFID technology. This technology uses microchips to transmit the identification information about the fire products to a reader through wireless communication. Another fundamental technology is wireless sensor networks.

Authors of [5] Vision based fire detection have recently gained popularity when compared to traditional fire based system. Colour is the basic technique to identify fire. Fire detection involves three steps: 1. Capturing the image using camera.

2. Image analysis and enhancement to detect the existence of fire. 3. Output is analysed image that generates alarm in case of an existence of fire.

Authors of [6] Smoke detection it is proposed by local binary patterns (LBP) and support vector machine (SVM). Initially, Median filtering algorithm was required to subtract the background from input frame. Shape based filtering was applied to get the region of interest. LBP values are calculated from image pixels and SVM is classified from region of interest.

III. METHODOLOGY

The idea to use both IoT and Image processing is to compare the results. IoT which will be used by using sensors like smoke and flame sensor. Smoke and flame they vary to the different places, and they lead to the drastic changes.

Smoke sensor (Mq-135) is an Air-quality sensor can detect smoke, Alcohol, CO2, etc. It is an analog and digital pin sensor. To use with analog sensor, read the values from 0-5v. When the power LED light is on that means gas is detected. When it is off, no gas is detected.

Algorithm for smoke sensor:

Step1: Initialize the sensor to any analog pins (A0- A8).

Step2: Read the values smoke and CO from assigned pin.

Step3: if smoke level>30:

Trigger buzzer.

Trigger water sprinklers.

Step4: Read the values continuously of time delay 1sec.

Flame sensor is used to detect the presence of fire. It gives a digital output saying 0 and 1. When fire is detected, the LED is turned on and the digital output is 1, and the LED is turned off, when no fire is detected the output saying 0. The flame sensor responds faster than smoke sensor in detecting the fire.

Algorithm for flame sensor:

Step1: Initialize the sensor to any digital pins.

Step2: Read the values of flame from assigned pin.

Step3: if flame==1:

Trigger buzzer.

Trigger water sprinklers.

Step4: Read the values continuously of time delay 1sec.

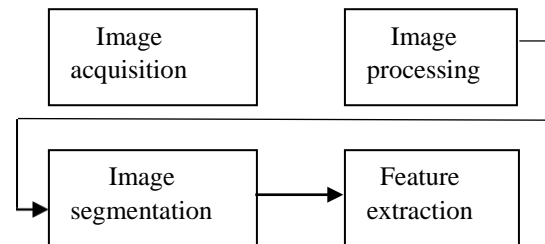The fundamental steps in image processing:
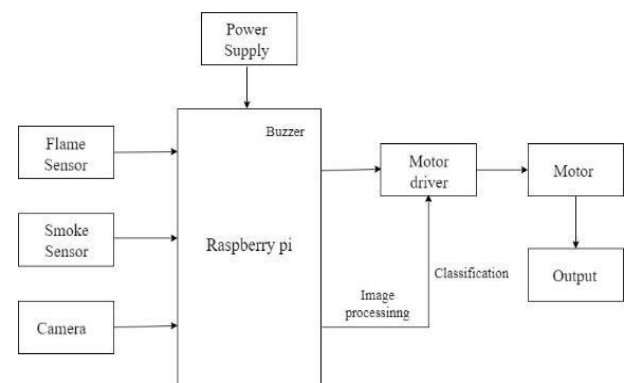

Figure 1: Fundamentals of image processing

Figure 2: Block diagram (High Level)

In image processing, image acquisition is the first step in

the workflow. It is defined as action of capturing a video from hardware source, usually surveillance camera. The captured video is converted into grayscale.

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Algorithm for image acquisition:

Step1: Import the Numpy.

Step2: Return the video from surveillance camera. Step3: Read the video by using cap.read().

Step4: Convert the video to gray scale. Step5: Show the video by using imshow(). Step6: Runs once per frame.

Step7: Release the surveillance camera and close imshow().

Image processing, is the second step in the workflow. It is defined as, a method to get an enhanced image or to extract useful information by using some mathematical operations.

Algorithm for image processing:

Step1: Grayscale video is taken as input.

Step2: video is processed by using "Gaussian blur" function.

Image segmentation, is the third step in the workflow. It is defined as, partitioning an image into multiple pixels. The main aim of image segmentation is to change the image representation into something which is easier to understand and analyse. The technique here used is canny edge detection. Canny edge detection is popular edge detection algorithm is used to detect the wide range of edges and is used to remove noise.
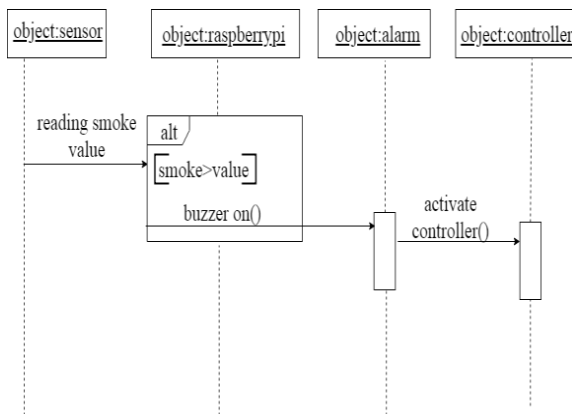

Figure 3: Sequence diagram (Low level)

Algorithm for image segmentation:

Step1: Apply Gaussian filter for smoothening of the image to reduce noise.

Step2: Find the intensity of image

Step3:Apply non-maximum suppression techniques to get rid of spurious edges.

Step4: Finalize the edges.

Feature extraction, is the fourth step in the workflow. It is a dimensionality reduction process, where it specifies a piece of information. Here, features can be objects, edges, points etc. The technique here used is Oriented Fast and Rotated brief (ORB). It is a fast local feature detector. It aim to be fast and efficient.

Algorithm for feature extraction:

Step1: Read an grayscale image Step2: Create an Orb object

Step3: Read the keypoints, descriptors

Step4: Draw the keypoints and show the image

IV. PROPOSED SYSTEM

he proposed system explains about detection of fire and smoke in the agricultural field. This can be done by using Internet of Things and Digital Image Processing.

IOT provides a wide range of sensors among which smoke sensor and flame sensor. These sensors are connected to the Raspberry pi through jumper wires. Jumper wires are of three

types: male-to-male, male-to-female and female-to-female. Female-to-female jumper wires are used in this system. Once the sensors are connected to the Raspberry pi successfully, the respective codes are run on Python programming language platform. If the fire detection code segment or the smoke detection code segment encounters fire or smoke respectively, then the buzzer is activated. The buzzer here is an inbuilt component on the Raspberry pi. Upon the buzzer being activated, a signal is sent to the motor driver to trigger the motor. The triggered motor pumps water through micro sprinklers to extinguish the flame.

Parallel, the system contains a surveillance camera is also connected to the Raspberry pi. It captures the continuous video of the crop field. The image frame is obtained from the video generated by the camera. This RGB frame is converted to its equivalent HSV frame. Images from the frames are detected using Canny edge detection. Noise is removed from the frame using Gaussian filtering. Fire images are extracted using ORB(Oriented FAST and Rotated BRIEF) feature extraction and the result is compared with the already stored images of the fire. Detection of flames in the frame will buzz the alarm which triggers the motor to sprinkle the water through the agricultural field.

Skimming occurs when a tiny portable device is attached to a card scanner on an ATM machine, at a gas pump, at a restaurant or anywhere else. The device captures your card's information as the magnetic strip passes through the scanner and provides criminals everything they need to steal your identity and funds from your account. There's also the threat of cameras recording your keypad entries or high-tech devices that record your PIN as you enter it. When you're using an ATM or any card reader, take these precautions:

- Take a close look at the card reading slot to determine if there are seams or gaps in the surrounding plastic or if anything else shows an indication of tampering

- Pull on the card reader; if it moves, don't use it.

- Look at other card readers near you to determine if they look the same as the one you're using.

- Use ATMs that are inside a store because it's more difficult to install a skimmer with employees nearby.

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- Choose the "Credit" option during purchases to avoid entering your PIN.

- Shield the keyboard when entering your PIN and be aware of your surroundings when using an ATM or any other card reader.

CONCLUSION

Thus, this paper has explained a smart agriculture system model where the Internet of Things and Digital Image Processing are applied for early detection of flames in the field. This agriculture system is made smart and automatic with the implementation of IOT devices such as sensors. We have used image processing techniques such as Gaussian Filtering, Canny Edge Detection to detect flames more efficiently from the video stream acquired from the surveillance camera. Any method that detects the flame will trigger the buzzer and activates the water sprinkling system to put off the flames. This system is run automatically without human intervention which decreases the loss that occurs due to the field fire.

REFERENCES

[1] Shen, Dongqing, Xin Chen, Minh Nguyen, and Wei Qi Yan. "Flame detection using deep learning." In *2018 4th International Conference on Control, Automation and Robotics (ICCAR)*, pp. 416-420. IEEE, 2018.

[2] PiyushPatil and VivekSachapara. "Providing Smart Agricultural solution/Techniques by using IoT based tool kit". IEEE, 2017.

[3] JareeratSeebamrungsat, Suphachai Praising, and PanomkhawnRiyamongkol. "Fire Detection in the Buildings Using Image Processing". IEEE, 2015.

[4]]Vijayalakshmi, S. R., and S. Muruganand. "A survey of Internet of Things in fire detection and fire industries." In *2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC)*, pp. 703-707. IEEE, 2017.

[5] Pritam, Divya, and Jaya H. Dewan. "Detection of fire using image processing techniques with LUV color space." In *2017 2nd International Conference for Convergence in Technology (I2CT)*, pp. 1158-1162. IEEE, 2017.

[6] Russo, Ashraf Uddin, Kaushik Deb, Sharmistha Chanda Tista, and Ariful Islam. "Smoke Detection Method Based on LBP and SVM from Surveillance Camera."IEEE, 2018.

[7] Kolambe, Kranti, RevatiPote, Anushka Jadhav, and Vaishnavi Chennur. "Spy Robot with Fire Detection and Water Sprinkling." IEEE, 2018.

[8] TianQiu, Yong Yan,Gang Lu. "A New Edge Detection Algorithm for flame Image Processing." IEEE 2011.