Satellite image processing in low-intensity light with object detection

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***Abstract*—now, a day's Image processing is very common and there is various technique in computer vision to do it. But there is no model which can process the satellite image of low-intensity light. This model is made using fast RCNN, we trained this model from scratch and defined 3 objects for this model. For the detection of objects in low-intensity of light we used histogram data division, this technique divided the features of images and its pixels from 0-255 via histogram equalizer technique. By this technique, each feature of the object can be clearly identified. And the result of Object detection in the low-intensity can be improved.**

Keywords—Histogram data division, Fast RCNN, Computer vision, Histogram equalizer, Satellite Image processing.

I. INTRODUCTION

Image processing using various tools and technique are very common and one can sharp the image, blur the image, use auto-encoder to encode and decode the image. But there is no model that can clearly extract the features of images in the night and detect objects. We divided the histogram data of satellite image into strips, this strips represent the features of objects. And again stack them to form a complete modified image. Now this modified image contains the same data but with more individual features of the object. And due to more features of new the modified image our model can detect more object with higher accuracy rate.

II. IMAGE PROCESSING IN LOW-INTENSITY LIGHT

A. Histogram Data Division.

The process starts with the collection of low-intensity light Satellite images into histogram form. This histogram represents features of objects, number of pixels and the intensity of color. Now we apply the division technique or the histogram equalizer technique to distribute the number of pixels from 0-255 with proper intensity of color. The graph represented that before the histogram equalizer our satellite image of low intensity light has pixels from 0-50 only. Due to this reason our old image of low-intensity light has less features as compare to our new modified image after histogram equalizer technique. This technique only work with colored images as the color range goes from 0-255.This Technique also formally distributed the intensity of color.

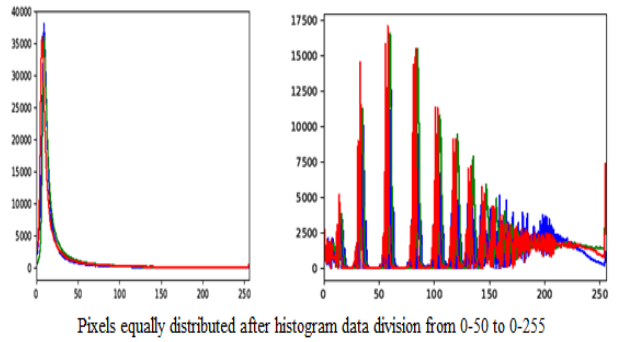

Fig-1. Histogram Data division using technique histogram equalizer.

III. OBJECT DETECTION USING FAST RCNN.

For the detection of the object we use Fast RCNN (Region convolution neural network). The Fast R-CNN model is used to extract the feature of images from a particular region without feed more to convolution neural networks. It's faster and efficient for the hardware to train itself. As this trained model is applied to the new modified image its detection rate of defined object increases.

A. Object detection

Object detection is a technique in computer vision by which our computer or machine can detect real-world objects through various learning algorithm. For this model, we use Fast region convolution neural networks to detect object.

Fast-RCNN

It's a neural networks algorithm which is used to detect the real-time the object in images. Fast R-CNN is different from CNN, RCNN because it extracts the feature from images from a particular region without feed more to convolution neural networks and much faster than other models.

B. Satellite Image Processing

Data or images used in the model has a large amount of pixels which overlapped with each other and hiding their features, so we used two technique to extract features. One is Histogram Data Division and the other is stack data strips.

Histogram Data Division

Data that used to train model or image for detection of defined objects do not have clear features, data pixels and intensity of color. To formally distribute the pixels and intensity of color from 0-255 and 0-20000 we used a technique histogram equalizer.

Histogram equalizer

Histogram equalizer is a technique to formally distribute the colored Images pixels and color intensity. By this technique pixel range from 0-50 and color intensity 0-40000 is formally distributed to 0-255 and 0-20000. After all this techniques

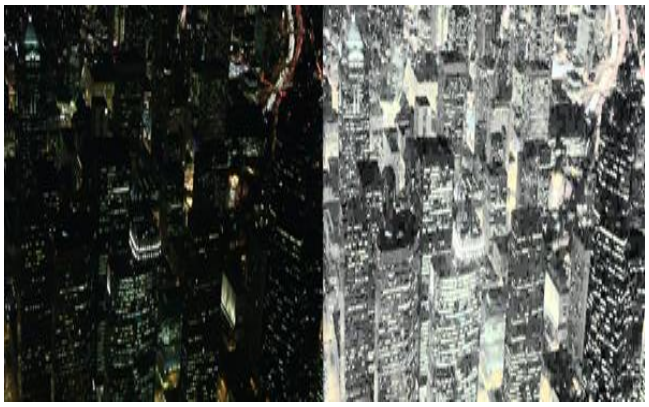

Fig-2. Comparison b/w original and modified Satellite image with histogram data division.

Satellite image of low-intensity light processed and each feature of object is clearly detected with our model.

IV. EXISTING MODEL

Satellite image processing and object detection model in recent time, doing work on basis of color gradient to detect the feature of object not on the basis of pixels and color intensity which can give the accurate result. Existing model consist of less no of detection with low rate of accuracy and larger training time. In existing model its detection objects are also limited and can only work on color gradient to detect road and trees on basis of their colors.

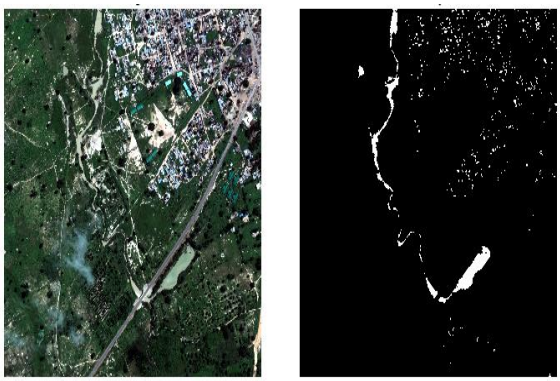

Fig-3.Existing model based on color gradient

V. PROPOSED MODEL

In this paper, we proposed a model that can process the satellite low light intensity image in such a way that the features of each object in an image can be extracted independently and after that, the detection rate of a model is increased as compared to normal detection model. This model work on histogram equalizer technique where each object feature can more visible by our model and the detection rate with accuracy also increase. This proposed model is worked on color low-intensity light satellite image.

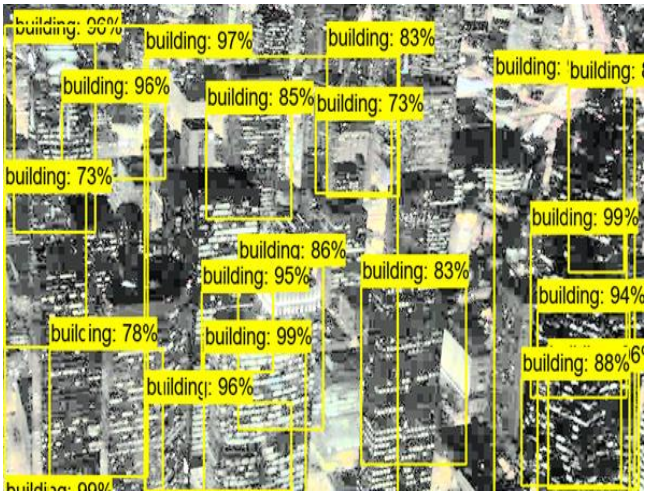

Fig-4. Proposed model for Satellite image processing and object detection using histogram equalizer.

VI. CONCLUSION AND FUTURE SCOPE

This model is developed on Fast RCNN learning algorithm which can able to, not only detect the object in normal satellite image but also it can detect objects in low-intensity light. This model accuracy rate is increased by applying a Histogram data division and distribution of image pixel and color intensity to proper range. As this model is purely Artificial-Intelligence based so it required minimum human interference to detect the objects.

This model can used in various fields that contains low-intensity light condition or where the number of objects are more.

This model can also be used in Drone and UAV's surveillance system.

This model can be applied in video processing and detection in low light conditions.

This model can be used in defence surveillance to detect enemy territory.

This model can be used in disaster management to detect buildings, schools, and hospitals in low light conditions.

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