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A Review on Image Processing Algorithm for Foliage Target Detection and Classification

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Abstract: **Image processing of a target using various methods and types of image processing. detecting an accurate target is hard many times because the targets are hidden in foliage, forest and dense area where humans can't reach the purpose of the research is to improve our defense power and also our various forces like the army. we study foliage target detection with image processing the processing of the image and detect changes in image processing flow compared two images then resizing them checking the grey scale converting the image coveted again into the binary image to check the intensity and sharpness of the image then we plotted the histogram of the image and then the last step labeling is happening Type of image processing1. Visualization- visualization is the process that detects objects that are unseen in the image. 2. realization- In the appreciation of steps we find or get the objects in the image with accuracy.3. enhance and Reconstruction-make an accurate image from the first image. happening in the sharpening and restoration 4. Pattern recognition Measure the various patterns around the objects in the image. this is the process of pattern recognition 5. Retrieval- in retrieval Browse and search images from a huge record of digital images that do not differ from the original image. The two phases fundamentally make up image processing Analyzing and modifying the image once it has been imported using image-capturing software output, the outcome of which might be a preprocess image or a data collection on the image accuracy.**

Keywords: **Radar, Image processing, target detection, change detection.**

I. INTRODUCTION

The aim of the research paper strengthens our defensive capability as well as our various forces like the army. Finding an accurate target is difficult many times since the targets are concealed in vegetation, forests, and dense areas where people can't reach them. We compare two photos, resize them, verify the greyscale, convert them again into a binary image to check the intensity and sharpness of the image, plot the histogram of the image, and label it as the final step before we analyze the identification of foliage targets using image processing. The research aims to strengthen our defensive capability as well as our various forces like the army [1,2]. Finding an accurate target is difficult many times since the targets are concealed in vegetation, forests, and dense areas where people can't reach them. We compare two photos, resize them, verify the greyscale, convert it again to a binary image to check the intensity and sharpness of the image, plot the histogram of the image, and label it as the final step before we analyze the identification of foliage targets using image processing. The quantity of light that goes through an item is called it is s capacity [3,4]. For instance, wood is opaque, frosted glass is translucent, and cellophane paper is completely transparent. Picture processing includes image cement and information extraction processes. When a picture is inputted, it may result in either a better image or characteristics or attributes that are connected to the original image. Although there are several methods for processing images, they all share a common structure. The first thing that is retrieved is a picture of the hues of red, green, and blue. A new pixel is created using these intensities and inserted into the send to the location in the blank picture as the original. Averaging all pixel intensities results in grayscale pixels, which are another feature. Then, by setting a threshold, they may be transformed into black or white.1. Image preprocessing – This is the initial stage of an image's preparation procedure [4-7]. To preprocess and retrieve pictures from a source, hardware is typically needed. 2. Picture enhancement - the task of recognizing an image and target is called image enhancement. This can entail adjusting the contrast or brightness, but the image must still be appropriate for future processing. 3. Image brings back refers to the process of improving the image's accuracy and deleting any unnecessary or unsuitable materials. 4). 16-bit colored image processing using color multisampling isn't, once, color modeling correction is carried out using RGB and RGBA [7-9]. Wavelets are used to represent pictures at various resolution levels in wavelets and multi-resolution processing (number 5). To compress data and display it as a pyramid, images are subdivided into ever-tinier sections. Images are split point by point in wavelets and multi-resolution processing Image compression is required to images to other devices or due to computational storage constraints [10]. They are unable to be kept in their original size. This is important for how photographs are shown online; for example, a Google thumbnail is a significantly reduced version of the genuine image [11]. Once you click on the image, it only appears at its true resolution. This process reduces the servers' bandwidth [12]. When doing image compression, two input pictures are compared, the images are resized, and then the image compression process begins. Morphological Processing: Image components that are useful in the representation and description of the form must be retrieved with further processing or other activities. Morphological processing offers the tools to do this, which are essentially mathematical procedures [12-20]. For instance, erosion and dilation techniques can be used to either sharpen or blur the edges of objects in a picture. at this stage Segmentation of Images - The performance of detecting change and accuracy is evaluated in the segmentation of the picture. In this step, an image is divided into various key components to make it simpler and to modify the characterization of the input to make it relevant and useful. Picture segmentation enhances the efficiency of automated systems by allowing computers to concentrate on the most important portions of an image while disregarding the delay [21-25]. Depiction and Representation (Step 9), which frequently comes after image segmentation techniques, include determining whether the segmented region should be portrayed as a margin or as a whole region.[26] The goal of description is to identify those characteristics that provide quantitative information of interest or are crucial for separating one class of objects from another. the decision to refer to and portray the whole territory in description and representation 10[27]. Object Segmentation and Recognition: After the objects have been extracted from a picture and the representation and description stages have been completed, the automated system must then assign each object a label, such as "car" or "person," etc., so that the living person can understand what has been detected [27-32]. It is challenging to determine the precise target since the target is dislocated and shifting. In the future, when different targets move, such as tanks and tankers, we can canal targets, such as drones and birds, but object recognition is not always the same [32-42].

II. TYPE OF IMAGE PROCESSING

1. Visualization: Finding items that are hidden in a picture through visualization. 2. Recognition-During the recognition phase, we accurately distinguish or locate things in the image. 3. Sharpening and Restoration—From the main input, create an expanded picture. taking place during the abrasion and repair measure the numerous patterns that surround the items in the picture to perform pattern recognition. This is how pattern recognition works. 5. Recoverin Recover in Browse and look for photographs that like are original images in a sizable library of digital pictures. 1. Visualization: Finding items that are hidden in a picture through visualization. 2. Recognition - During the recognition phase, we accurately distinguish or locate things in the images [43-47].

Challenges to detecting targets in foliage

1. First of all, Target to detect here is a hidden terrorist, Weapon, or any undesired change so as trees and brushes, if the target and trees appear to have the same dielectric frequencies, it will make it hard to differentiate between forest clutters and the desired target.

2. As we know that the surface of forest trees, brushes, and land (soil) land use LU/ land cover LC, are different as in spike, rough, circular surfaces this will lead to having a lot of scattering effect and multipath propagation effects.

3. Foliage is a time-variant changing environment. After some specific time, the Atmosphere or land will change (After rain the soil will change its texture, on sunny days it will be dry, etc.). This all will affect to detection of hidden targets.

III. FOLIAGE TARGET DETECTION AND CLASSIFICATION

Image processing, comparison, detection, and change procedures should take place on the given processed image to find targets hidden in the foliage (forest). Firstly, it should be clear what is our targets, we will get that from the classification of foliage targets. Classification is required to not get unwanted or useless signals in images. With help of FOPEN radar, the area of foliage can be monitored and can be detected

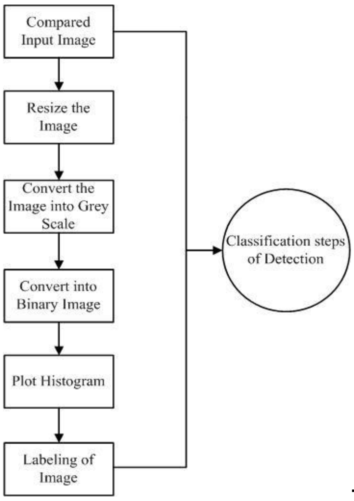

Fig1 Image processing

IV. IMAGE PROCESSING FLOW

The process of image or target processing is based on various methodologies [48]. After image processing change in image, we detect the change in two images we find detection and recognition to find out the change in input we get one image of that present object various change detection methods are present today firstly we compared to images that we have taken then we resize that images resized means we compressed that images because we want the accurate output of image and object than we check the grey scale of images than we convert input images into binary images because to check the intensity of images then also we check again converted image and compared then we histogram gram of images and then do labeling and the final result is come we find out some major-minor change in detection from adjusting and collecting image[49,50]. we use various radars for input a for the transmitter in this project we used SAR means synthetic aperture radar then after some years we use FOPEN foliage penetration radar for transmitting input and the target transmitted signal going into denes valley our target is present the forest and that target is moving and dislocated in the forest we used various bands in this project the c band and x band does not get accurate output then we used l band for this project we used various antenna for this project SAR antenna long-distance target and multifrequency antenna for short distance target the multi-frequency linear SAR antenna then we get some output and do image processing and then detect the change and then we collect data[51].

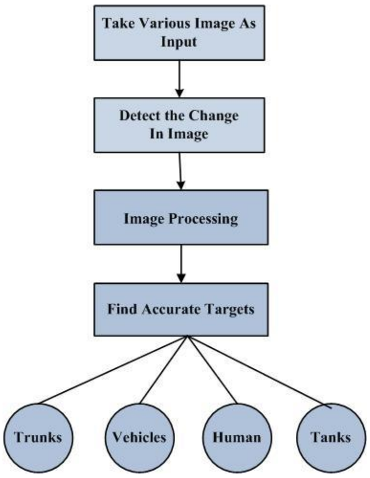

Fig.2 Detection steps

V. CHALLENGES IN IMAGE PROCESSING

1. The first thing to keep in mind is that the target we are trying to find is a hidden terrorist, weapon, or other unwanted change, such as trees and brushes. If the target and the trees appear to have the same dielectric frequencies, it will be difficult to tell the difference between the unwanted target and the forest clutter.

2. Since the soil, forest trees, and brush all have diverse surface characteristics, such as spikey, rough, and round surfaces, this will result in a significant amount of scattering and multipath propagation effects.

3. The habitat of foliage changes over time. The terrain or atmosphere will change after a certain amount of time (After rain the soil will change its texture, on sunny days it will be dry, etc.). All of this [52-58].

VI. RADAR DISPLAY (VGA INTERFACE) AND DATA LOGGING (ETHERNET INTERFACE)

IBM created tide graphics (VGA), a video display standard that was unveiled in 1987. It is extensively supported by PC displays and graphics gear. The VGA interface protocol divides the image into a variety of tiny picture components called pixels. Each pixel holds a piece or sample of the picture. The display monitor swiftly controls individual pixels with the proper values to color them as it constantly scans the entire screen. A regular VGA cable may be used to connect the DB15 VGA display port directly to PC displays or flat-panel LCDs. The primary signals in the VGA port are the individual grounds (6th, 7th, 8th, 9th, 10th, and 5th pins), as well as Red (1st pin), Green (2nd pin), Blue (3rd pin), Horizontal Synchronization (HS) (13th pin), and Vertical Synchronization (VS) (14th pin). Video signals are tube signals. The pixels on a VGA display are typically 640 by 480. Pixel values need to be continually regulated at a specific frame rate it displays images on the LCD monitor. "000" stands for black, "001" for blue, "010" for green, "011" for cyan, "100" for red, "101" for magenta, "110" for yellow, and "111" for white. The RGB values for a single colorant a pixel i"100" for red, "101" for magenta, "110" for yellow, and "111" for white. The VGA's connection to the FPGA information [52,53]. They include I direct configuration, (ii) 3a -bit setup, and (iii) Digital Analog Converter (DAC) configuration for configuring the VGA to interface with the FPGA. In the 3-bit design, a 3-bit current divider network is utilized to create the analog voltage at the RGB pins. In the direct arrangement, the RGB pins are linked to the FPGA using three 270 resisters. Simply feeding different values, from "000" to "111," to the RGB pins will change the analog voltage. There are 511 possible color choices in this setup, ranging from 0 to 511.

(R0R1R2G0G1G2B0B1B3) has possible values ranging from "000000000" to "111111111." In the DAC setup, a VGA driver DAC IC connects the VGA connection to the FPGA (ADV7123). The ability to send 0 through 255 various colors into each RGB pin with the aid of this driver IC allows for a more accurate presentation of ocular pictures. The VGA port's additional two pins (HS and VS) are directly linked to the FPGA [60,61]. The RGB pins can only be programmed with the standard code, "000" through "111," thus if we want to draw graphics with many colors, we must use a current divider circuit or a video DAC device (ADV7123). The start and finish of a line (left to right) and the frame (top to bottom) pixels are controlled by the HS and VS, respectively. As the picture is being displayed, the scanning, also known as horizontal scanning, must be begun from row 0, column 0, or the top left corner of the screen and moved to the right until it reaches the final column. As demonstrated in Fig. 8 by the dotted lines, as the scan reaches the row's last pixel, it returns to the start of the subsequent row and continues scanning there. Returning to the beginning of the subsequent row is the procedure's official name retrace. The scanning procedure is repeated once it reaches the last pixel, which is the one in the bottom right corner of the screen, by going back to the pixel in the top-left corner from which it started. The refresh rate, often known as the rate at which the entire screen is updated, must be at least 60 times per second [65-68]. The HS and VS signals regulate the entire scanning operation. The color of a pixel at a certain point on the screen is controlled by the combined video signals or RGB. They have voltages ranging from 0.7 to 1 V and are analog signals. The video color must be turned to black for the duration of the retrace time. the period before beginning the HS/VS retrace of the front porch, or right/bottom edge of the display region is called a pulse. Similar to the back porch, the display region's left/top border is formed by the blanking interval that follows the application of the HS/VS. The video signal has to be turned off in these areas. The design settings that are required to display the image on the screen are all displayed here. Because it takes time to move back to the left and start moving ahead on the next row after applying the HS retrace pulse, we must wait a particular amount of clock before transmitting the pixels value to the screen. For instance, when the beam advances, we must count the horizontal pixels up to 640 and then wait a certain length of time after the 640th pixel. In other words, front porch time, and then state the HS. The VS control signal follows the same rules. One counter may be used to track a location's horizontal position, and the other counter can track a location's vertical position. The vertical counter should increment once for every complete horizontal scan, while the horizontal counter should count to 25MHz clocks. The time synchronization module creates the

HS/VS control signal for the VGA video display and the row/column address to the picture creation module in any configuration. The FPGA or external RAM stores the necessary picture or video that we want to display on the screen. These data are accessible via the picture pattern circuit, which sends them via VGA into the display screen. by using the VGA DAC, the column and row addresses are provided by the column/row circuit. The VGA timer/control the row by which the circuit delivers the HS and VS signal and the row/column circuit's column data. This allows for the integration of the VGA with any radar pattern and the FPGA is compatible. Seen on the computer's monitor. The Port for configuring Ethernet to log data outlined in a specification for IEEE 802.3, coaxial cable, or Ethernet LAN is commonly unique twist pair wire grades. Eternities the CSMA-CD access mechanism (Carrier Sense Multiple Access with Collision Detection) to manage concurrent requests. The most widely used Ethernet system, known as 10BASE-T, can transmit data at up to 10 Mbps.A CSMA-CD protocol is used to compete for access among devices that are connected to the cable. Fast Ethernet, also known as 100BASE-T, supports workstations with 10BASE-T cards and offers transmission speeds of up to 100 Mbps. It is primarily used for LAN backbone systems. At 1000 Mbps, 1Gbps, or, 1Bbps, gigabit Ethernet offers an even greater degree of backbone capability. To use the open-source Ethernet core to send raw radar data and outcomes to a PC environment, a quick, effective Ethernet core must be created on an FPGA [70-74]. This work enables the Jumbo frame capacity to pack and send up to 9000 bytes in a single packet. Since User Datagram Protocol (UDP) does not require handshaking signals between the host and client, it is recommended as a transport layer protocol since it is appropriate for high bandwidth real-time data transmission rates. In contrast to Delivery Control Protocol (TCP), UDP delivers data regardless of whether the destination gets it or not and does not check the transfer of data with the client after each transmission. TCP/IP permits a limit of 1500 bytes in a single packet at a time but retransmits the data if the receiver has not received it. TCP/IP is therefore not suitable for real-time applications. The UDP protocol is chosen with the aforementioned caveats, but a packet labeling system is built to verify that the data packets are entirely received on both the P and C sides. The packet header is hard coded at the top of the Ethernet buffer and is never changed. It comprises information such as protocol type, data length, MAC addresses, IP addresses, and checksum. This header is always followed by the data that will be transmitted. The Tethered module activates the Ethernet state machine when the radar state machine does. appends the contents of each pulse memory and any results stored in memory to the Ethernet buffer underneath the Ethernet header file, one at a time, to enable the PC to receive both the raw data and the calculated results. label, such as Along with the data, a label—the number of pulse memory—is appended to the Ethernet buffer and transferred to the PC. Because the PC program can anticipate the arrival of the following package label, this labeling aids in the detection of dropped products on the C side. Since earlier cables cannot be used between a PC and an FPGA board, version Cat6 shielded Ethernet cable is recommended; packet losses are inherent at a 1Gbps transfer rate. The radar for matter unit organizes the incoming data such as displaying them appropriately on a LED monitor and logging them in a data-logging computer. All the measurement raw and processed data are logged in the PC for offline analysis [67].

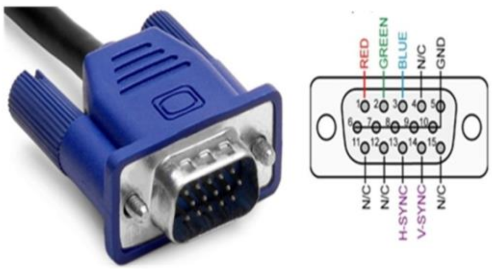

Fig.3 VGA (DB15) and Ethernet (RJ45) Connectors

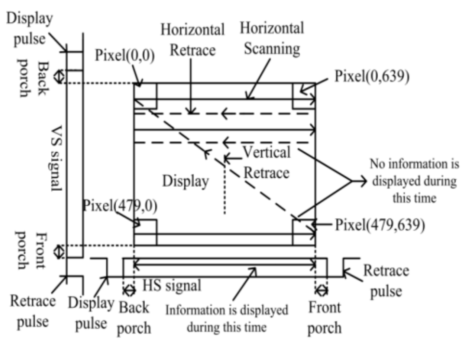

Fig.4 The device showing Images on the 640x480 display

For accurate foliage target detection, the open is used After seeing the technology behind SAR and its uses, SAR will be among the best suited for FPR. SAR - BEST SUITED FOR FPR In summary, the qualities are described as follows 1. Possibilities for high resolution.2. Unaffected by weather 3. functionality for day and night.4 4 Signals generated by polarization can be used.5. It may always be used in combination with advanced optical systems.5. The topography of the land can be measured [75,76]. for accurate target detection, the fan can find out hidden targets in foliage and dense area where human beings can't reach out The FOPEN radar has a high range and a large area covered in less time Having a low false alarm rate Simple operation and implementation work, and maintaining the FOPEN is environment-friendly Fixed fragments in the radar FOPEN with unique and outstanding capabilities [78,79].

VII. CONCLUSION

This paper of a review of an image processing algorithm for foliage target detection and classification along with the data, a label of the number of pulse memory—is appended to the Ethernet buffer and transferred to the PC. Because the PC program can anticipate the arrival of the following package label, this labeling aids in the detection of dropped products on the C side. Since earlier cables cannot be used between a PC and an FPGA board, version Cat6 shielded Ethernet cable is recommended the research aims to strengthen our defensive capability as well as our various forces like the army. Finding an accurate target is difficult many times since the targets are concealed in vegetation, forests, and dense areas where people can't reach them. We compare two photos, resize them, verify the greyscale, convert them again into a binary image to check the intensity and sharpness of the image, plot the histogram of the image, and label it as the final step before we analyze the identification of foliage target using image processing [80-86].

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