A NEW METHOD FOR DISASTER VICTIM DETECTION USING YOLO ALGORITHM INDEX

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ABSTRACT: Post-disaster environments resulting from catastrophic events, leave sequels such as victims trapped in debris, which are difficult to detect by rescuers in a first inspection. It is very important to maximize the chances of detecting trapped persons in collapsed buildings. Our designed system with the meteoric embedded systems along with microcontroller is preventing deaths and providing safely guided measures. We focus on the detection of such victims using deep learning, and we find that state-of-the-art detection models pre-trained on the well-known COCO dataset fail to detect victims. This is because all the people in the training set are shown in photos of daily life or sports activities, while people in the debris after a disaster usually only have parts of their bodies exposed. The aim is to find if deep learning can successfully distinguish between marine life and synthetic debris underwater. Many of those recent research articles discuss automated machine learning approaches to extract disaster indicating posts, useful for coordination from various social media posts.. This research proposes the development of a method for the detection of victims of natural disasters that aims to assist the SAR team and natural disaster volunteers in searching for victims who are in hard to reach places. The You Only Look Once (YOLO) method is implemented. We use a piezoelectric plate to sense the vibration created by trapped person in disaster area so the microcontroller connected is to collect the data and sent the data to the data collecting unit (DCU) by using Wireless transmission. We propose a framework to generate harmonious composite images for training. We first paste body parts onto a debris background to generate composite victim images and then use a deep harmonization network to make the composite images look more harmonious. We select YOLOv5l as the most suitable model

Index Terms: victim detection; deep learning; unsupervised learning; Deep learning Artificial intelligence Neural network Ocean pollution Marine debris

1. INTRODUCTION

Effective crisis management and coordination through social media platforms following a disaster event are possible when useful time-critical information is delivered to the disaster victims. During an emergency situation, there is a need to make quick decisions to help or save lives [1]. Disasters in any form are detrimental to the health and welfare of the affected population, but mass disasters disproportionately affect a large number of victims [2]. Natural and man-made disasters are classified according to whether they are the result of an environmental, medical, industrial, or terrorist event [3]. Thus when a disaster strikes, a rapid and effective response is critical to assisting the populace, reducing the number of victims, and mitigating the economic impact [4]. YOLO is a one-stage detection method By dividing the input image into regions and predicting the boundary box coordinates and class probabilities for each region by turning the object detection problem into a regression problem, which can truly achieve end-to-end detection [5]. YOLO is one of the fastest object detection methods with good performance and high accuracy [6]. A qualitative and quantitative study of the resulting multispectral images has been performed to define the best index for both indoors and outdoors [7]. Once the best index has been defined, a data-set of indoors and outdoors has been generated and manually labeled from reconstructed post-disaster scenarios [8]. Feeding a camera on the end of a flexible pole into the collapsed building - this shows where people are and how much of the building's structure is left the usability of such devices and their efficiency depend on the structure of collapsed building and besides, when the victim is detected it is difficult in the most cases to determine its actual position [9]. In addition, the colors of the victim's skin and clothes are often close to the colors of the surrounding dust and soil. These differences lead to the fact that the human detection models trained on normal datasets such as COCO cannot achieve satisfactory results in the detection of disaster victims [10].

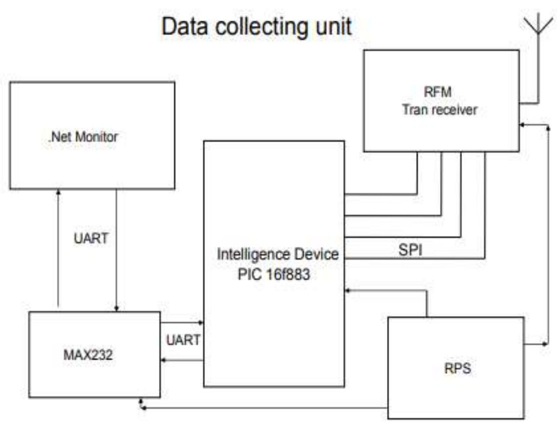

Figure. 1: Data Collecting Unit.

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2. RELATED WORK

Traditional methods usually detect objects in three steps. They first select some regions that may contain objects and then extract features from them. Finally the features are fed into a classifier to yield the detection. HOG [10] and SIFT [11] features are commonly used, and the classifier is mostly SVM [12]. These methods are computationally expensive, slow in operation, and low in accuracy. They used a two-fold approach testing both the Faster RCNN and YOLOv5 architectures. The authors found that YOLOv5 outperformed FRCNN with the quantity of objects detected and with the smallest object size they report this could be due to the hyper-parameter settings they applied [13]. Machine learning (ML) is an approach that is used to achieve Artificial Intelligence (AI) automation in computational systems in order to improve user experience. The

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ISSN: 1005-0930

utilization of computer science and statistics concerned with automatic improvement over time leads to machine learning that helps in decision-making under uncertainty [14]. Accurate data collection may be extremely difficult in an emergency situation due to the lack of coordinated actions by various agencies during a disaster [15]. Nonetheless it has been suggested that in order to improve disaster management efficiency, new methodologies and technologies are required to conceptualize systems that incorporate a combination of telecommunication tools, remote sensing, and spatial/ temporal-oriented databases [16].

3. SYSTEM MODEL

The signal conditioning unit accepts input signals from the piezoelectric plate and gives a conditioned output of 05V DC corresponding to the entire range of each parameter. Operations performed in signal conducting unit are filtering [17]. It is primarily utilized for data acquisition, in which sensor signals must be normalized and filtered to levels suitable for analog-to-digital conversion so they can be read by computerized devices. Signal amplification performs two important functions: increases the resolution of the imputed signal, and increases its signal-to-noise ratio [18]. Our proposed network for deep harmonization these harmonious images are finally used to fine-tune a victim detector It also covers a broader spectrum of items rather than focusing on specific categories at a specific depth [19].

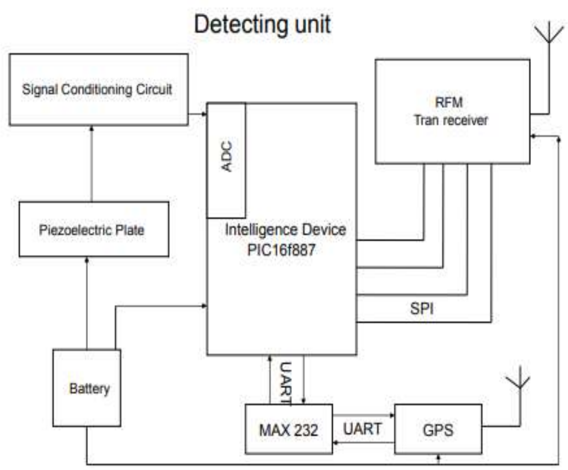

Figure. 2: Detecting Unit

4. PROPOSED SYSTEM

The purpose method applied to the system is described at the stages used as a reference as a framework for the analysis of object recognition of disaster victims. Two post-disaster scenarios (indoor and outdoor) have been recreated for data acquisition purposes [20]. The data acquisition has been carried out using a tele-operated quadruped robot with the Altum camera anchored The images are periodically stored in memory with a period. These crystals readily release the current when the orientation of crystal is disturbed by mechanical vibrations. The piezo element can detect

Vol. 21, No. 1, (2024)
ISSN: 1005-0930

slightest vibrations to make it useful to detect Seismic waves Useful, cheap and can be used for many applications [21]. There are several steps taken in the process of detecting objects using the YOLO method. The following stages of detection of disaster victims use the YOLO method.

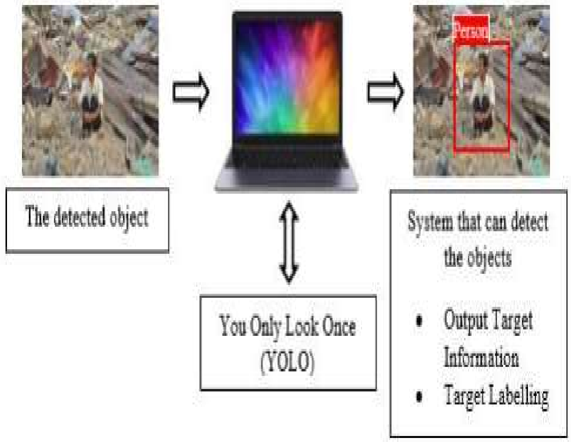

Figure 3. Object detection flow diagram

5. YOU ONLY LOOK ONCE (YOLO) ALGORITHM

YOLO is an object recognition method based on Convolutional Neural Network (CNN) [9]. The YOLO algorithm for detecting objects is the first input image that is zoomed. YOLO is a method that divides image input into grids of S × S size. Convolution will be carried out from the input image to get a bounding box. Bounding boxes have x coordinates, y coordinates, width (height), height (height), and confidence score. The bounding box will be nominated from 0 to 1. The x and y coordinates are normalized to adjust the upper left point in question. The height and width will be normalized according to the image size [22].

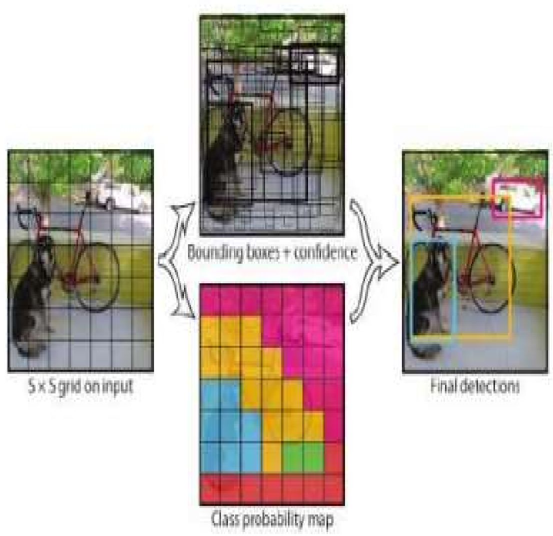

Figure 4. Illustration You Only Look Once (YOLO)

Vol. 21, No. 1, (2024)
ISSN: 1005-0930

Proposal of new multispectral indexes

Initial testing with state-of-the-art indexes once the methodology for adjusting the images has been determined, the existing indexes are preliminary evaluated to determine if any of them can be used as a starting point for detecting victims. Works to detect people in the state-of-the-art directly use one of the Nir or Red Edge bands, but analysis of indoor-outdoor scenarios is not contemplated, as well as an adequate environment differentiation in the obtained image. A histogram is used to visualize the distribution to visualize the distribution of pixels throughout the image shows the number of pixels present in the image for each intensity value [0, 255] and allows evaluating in a first inspection the concentration of pixels corresponding to the environment and the victim [22].

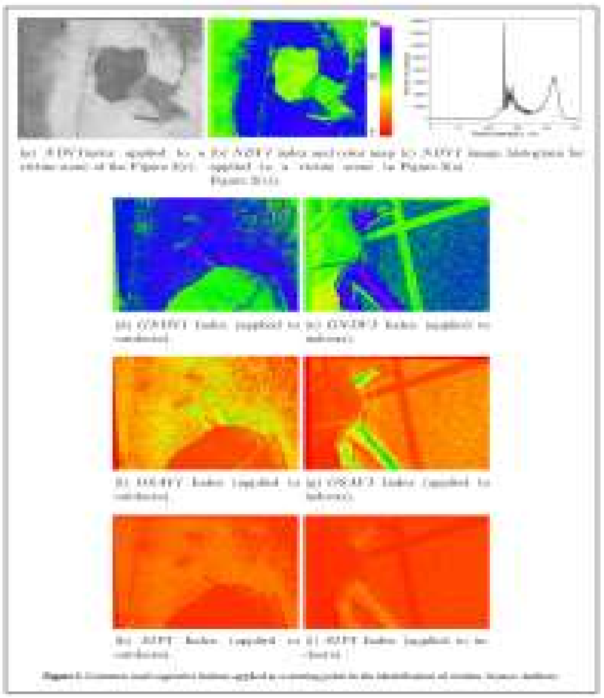

Figure 5. Improved Image of the Victim

Something similar is shown for the figures where it is challenging to differentiate the environment of the victim. An improvement can be observed in figure, but the information corresponding to hands and the head has been lost.

Training a Disaster Victim Detector Using Harmonious Composite Images

We introduce the proposed pipeline of victim detection in detail our pipeline consists of three steps. First we collect some background pictures of earthquakes and building collapses. We randomly cut out body parts from a character image and paste them on a background image to obtain a composite image. The composite image is fed into our proposed network for deep harmonization. These harmonious images are finally used to fine-tune a victim detector. Some sample images in the LIP dataset . We manually check and delete many low-resolution, blurred, monochrome, and non-exposed body part images, as they are not suitable for composite victim images some good images that we can use to generate victim images [24].

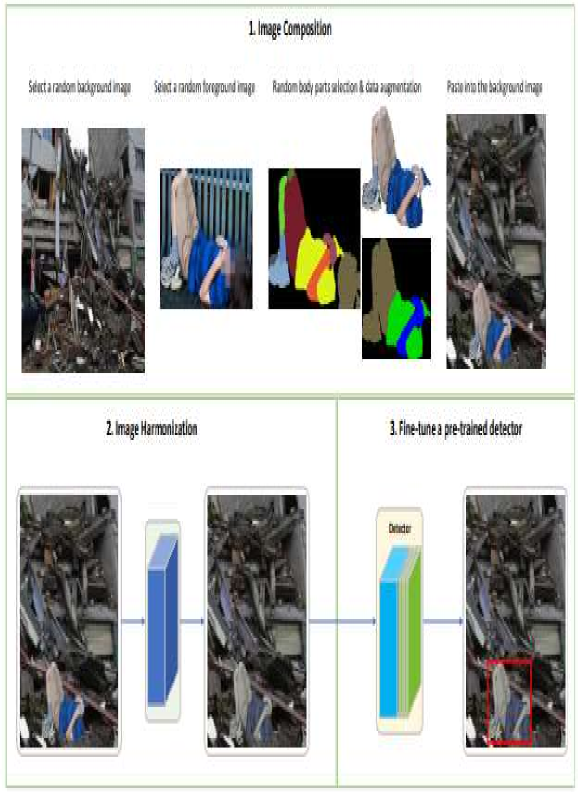

Figure 6. Our proposed framework consists of three steps: (1) image composition, (2) image harmonization, and (3) fine-tune a pre-trained detector

6. RESULTS

Analysis for the best proposed index For this phase 20 data-set have been defined. The indexes evaluated by using these images and discarding by visual inspection those indexes that did not show effective results to highlight representative characteristics of the victim concerning the environment. Histograms have been extracted from the remaining ten indexes as an auxiliary tool to quantify From these data been generated, which is representative of the process carried out. That table shows the intensity of the mean colour of the victim and the environment, as well as their difference divided by 255. The complete results of this process obtained from the indexes. After applying this procedure to the 20 sample images for ten indexes, 200 results were obtained. The analysis of the results highlights that Index8 is the one that presents the best results in terms of consistency, despite not being the best either in the open or in the closed scenarios.

Vol. 21, No. 1, (2024)
ISSN: 1005-0930

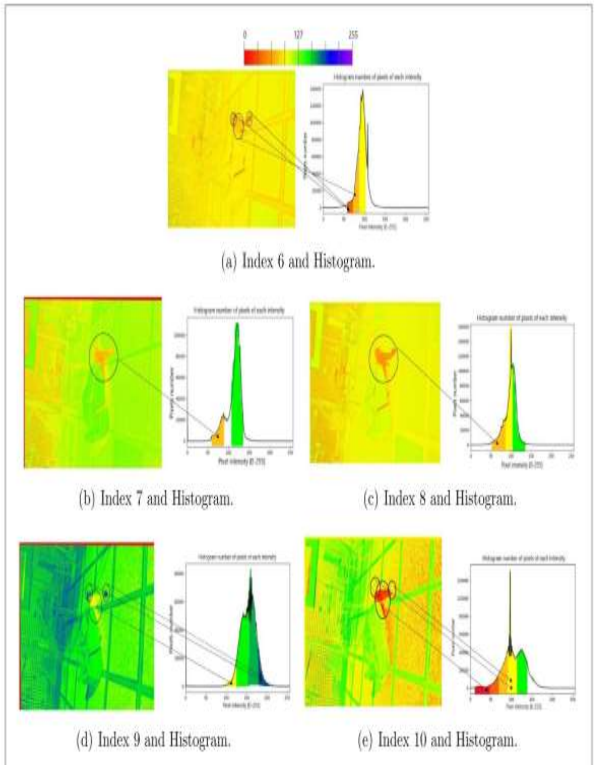
(a) Index 6 and Histogram.
(b) Index 7 and Histogram.
(c) Index 8 and Histogram.
(d) Index 9 and Histogram.
(e) Index 10 and Histogram.

Figure 7. Results

7. CONCLUSION

The effectiveness of multispectral images for detecting victims based on the combination of their different spectral bands captured by a multispectral camera and application of new indexes proposed by the authors and the convolutional neural networks. The vibration data from the person's body is properly distinguished by the piezoelectric plate, so that the person is alive or dead can be easily detected. explored of composite images to fine-tune an effective victim detector. Our motivation comes from the fact that the existing state-of-the-art detectors trained on the COCO dataset cannot successfully detect disaster victims, and the real victim images for training are hard to obtain. We propose to generate composite victim images by copying and pasting human body parts onto a debris background. Further considerations include asking if it would be able to handle more complex situations Cleanup are doing a fantastic job of mapping patches of debris within the gyre, could we test our method on retrieving large quantities of underwater debris without picking up . The next research is expected to be able to develop to solve these problems in order to achieve more efficient results in assisting the SAR team in evacuating victims of natural disasters.

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