Development of an Algorithm to Identify the Locations of Flood Victims Using Digital Image Processing

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Abstract— Floods are regular disasters that cause for the greatest economic losses in the world. Due to that, victims from flood disaster monitoring and the damage estimates are important to the population, government authorities also the insurance companies. Global demand for unman aerial vehicles has increased significantly by the emerging economics and it is capable enough to act it a vast area of tasks which are considered dirty, dull, or dangerous by the humans. UAVs provide a platform to minimize human involvement and speediness the process of identifying and locating the causalities, the mission of analyzing of gathered images can be given to a computerized algorithm which examines the images. Acomputerized algorithm which can determine and geologically identify the locations where flood victims can be originate is required to identify the victims in a shorter time to direct rescue teams towards them, it will reduce the death toll due to flood disaster. This document describes the unique solution built on hybrid networks and image processing by using the aerial photographs. As a first innovation, capturing the flood situation, converting and overlapping image processing is used. Color and spatial information extracted from simultaneous color matching and fractal quality dimension matrixes are also used. The experimental results of the real task finally show the effectiveness of the method and the performance of the algorithm.

Keywords— **Flood, Aerial photographs, Image processing**

I. INTRODUCTION

Background of the Study

In the event of a disaster, accurate information about the disaster must be obtained to save lives. Floods are the most common natural disaster in the world and the main cause of death because of natural disasters. There are thousands have been displaced and hundreds killed by the floods in recent times in Sri Lanka. The reason for increased death toll is the difficulty in reaching out of affected people. There is several relief operations are carried out by DMC (Disaster Management Center). But they are not efficient enough to identify and locate the victims. Because there are no road signs or the same signs in the flood situation in Sri Lanka. By using UAVs (Unmanned Ariel Vehicle) can capture the Arial photographs and by using an automated algorithm rescue teams can detect victims locations within short period of time.

In this study, the most important goal was to develop software by using hot aerial photographs to identify and locate victims in flood disasters in Sri Lanka. By developing a software, researcher focus to reduce human intervention and accelerate the search for causality: the analysis of the collected images can be added to a programmed algorithm that analyzes the images.To identify a victim, an algorithm is needed that identifies the location and geographically determines the location where the human body can be found. If hot air photographic available, it can be installed on the drone and install the drone in the affected area. When exporting the coordinates of the delivery location, the coordinates must be relative to the known base point. For this purpose, the area must be examined in advance. The route planning algorithm includes a trajectory and an aviation area. The UAV was needed to fly the drone according to below figure 1.2 on a familiar path to collect data. For a more accurate output, the camera must have a stabilizer to prevent the camera from being affected by sudden changes in the level of the drone. We can also create digital surface models and provide information about water levels and other relevant information.

Anonymity and confidentiality obligations, limited time, Short-term projects and long-term impact, Vulnerable Groups, Correctness of results, guaranteed ballot, Respect for privacy and Verifiability of related party results are few

Ethical concerns while handling this kind of project. The aim of this study was to develop software that enables victims of a short-term flood disaster in Sri Lanka to identify and locate victims using hot air photography. We develop software to reduce human intervention and speed up the search for causal relationships. The analysis of the collected images can be transferred to an automated algorithm for image analysis. An algorithm can be identified and found to locate the human body to identify the victim. When we collect photos of hot air, we can install a camera on the drone and install the drone in the affected area. If the coordinates of the victim position are to be determined, the coordinates must be relative to the known base point. For this purpose, the area must be investigated beforehand. The route planning algorithm consists of a route and an aeronautical area (Figure 1.). We must fly with the drone to collect data based on the below figure on the known route. For a more accurate output, it must have a stabilizer that prevents the sudden change in UAV height from affecting the camera. We can also create a digital surface model that provides information about water levels and other relevant information.

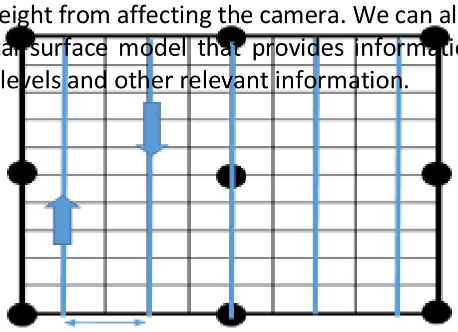

Figure1. Drone Route

II. Methodology

Input to the system is an original image which has taken by the drone (Figure2.).

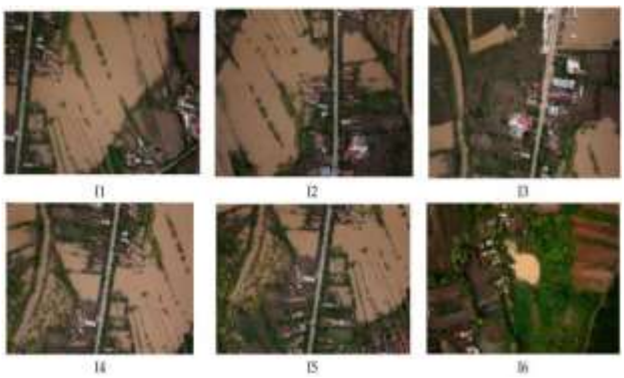

Figure2. Images taken from the drone

Images taken from the drone are converted in to black and white images as shown in below figures 3 and 4. Then converted images are overlapped by B & W images. Finally find out the Victims from this overlapped image area analysing.

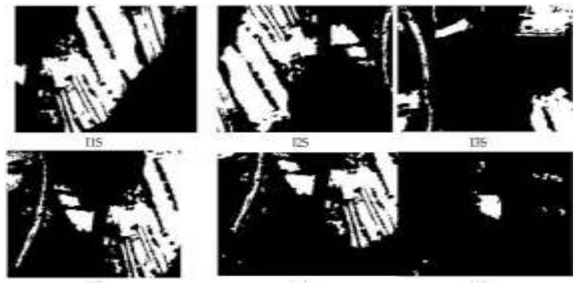

Figure3. Images segmented for flood evaluation. White—flooded areas; black—non-flooded areas.

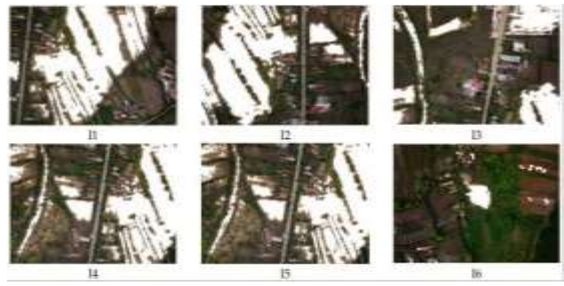

Figure4. Overlap of RGB images with the segmented images.

The system will convert the detected image in to black and white and identify the places and people separately.

Features of the proposed system

- This system able to detect the Victims who faced to the flood situation.
- Easily identified flooded and non-flooded areas.
- Any person can use read the images without having any knowledge.
- User friendly system

1) Image-Based Flood Victims Detection System

For completing detection of the submerged area, the task of segmentation and estimation, as in the previous section, takes a continuous image at a constant speed in a predetermined area. To estimate the submerged surface, use patch-based segmentation. Therefore, each image is divided into small boxes using an image mapping algorithm (for example, a 50 x 50 pixel segment in our application). Note that the size of the patch is select based on the image resolution and plot of segmentation area (in study case, tides). From the manually selected patch cluster (boxes), a series of effective flood detection functions are determined based on performance metrics.

The obtained images are combined and processed to produce a front light level without overlapping, and no empty space is generated. This requires an intersection of 60% between two adjacent images to produce an orthophoto. They are then numbered in chronological order as ID numbers and distributed as the learning phase. Each patch is assigned to the F or NF class using equality criteria based on the functionality selected in the learning phase. Finally, (estimation phase), first, each spot of F is marked white and returned to the original image, and on the other hand, a binary patch matrix (BMP) is executed with logic 1, if the spot corresponds to F and 0, it is still present. Calculate the "1" of the BMP and evaluate the relative flood area considering the total number of patches.The characteristics of the image may vary depending on the distance from the ground and the tilt of the camera relative to the vertical axis. To avoid these problems, the drone must contain a number of additional restrictions:

(a) The height rests the same (even in some zones there may be different altitudes, we use the water level as a reference and remain unchanged). The distance between the tide and the drone is approximately the same, i.e., if the flight plan is closely monitored, the resolution remains approximately the same for a given reference altitude.

(b) The payload chamber must be oriented so that the lens is perpendicular to the earth's surface.

By the time of been difficult and expensive to get exact data of the flood area in a small zone by the airborne photograph. Therefore image overlapping is used in here to eliminate the drawback and find out the solution.

Data Analysis

From the taken images it has analyzed 10 images to identify the victims (Figure 5.). According to that below no of detected people are founded and as per the above no's only 1 image have shown there are 4 people in a place but in actual situation the number of people are 0. Therefore, the system has a certain percentage of accuracy, but it is not a fully accurate system.

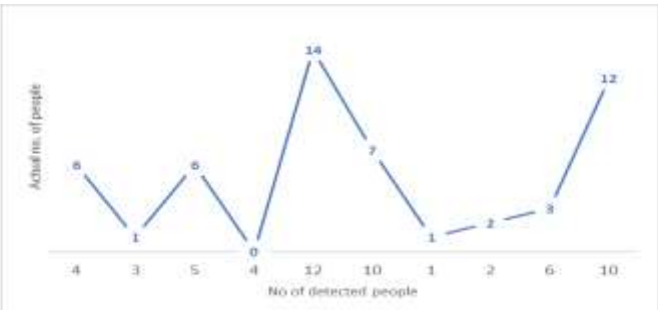

Figure5. No of people detected through the image vs Actual no of people founded

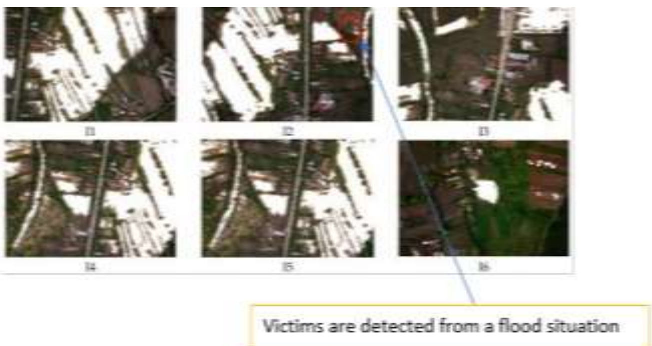

Figure6. Victims are detected from a flood situation

III. Results and Discussion

The final test phase of the drone and the system begins with the laboratory tests of each subsystem. Integration into the entire system has been completed and completed, and some results have been determined through various tests. This activity includes the time needed to evaluate the integration and overall results of various system components: navigation, imaging, communication, and more. There are some examples from the literature that help to find the result. The final series of missions was finally successful due to the strong involvement of local civil protection authorities in the project. To demonstrate how the system should be used in the floodplains of research and victims, a path is defined in the area where the artificial target is located, which determines the identification of the artificial subsystem with the correct accuracy. The selected area has a size of approximately 200 x 300 meters and defines a patrol scan mode (as a typical photogrammetric task) for scanning tasks. The platform flies at a speed of 4 m/s on a straight line parallel to a few meters above the ground. In carrying out this study, we used two examples: one uses the system and the other does not use the system. Finally find out following results.

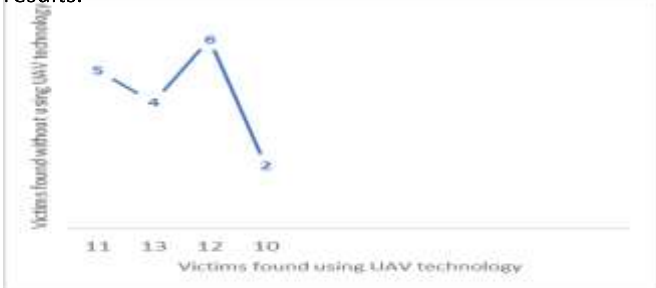

Figure7. Victims found with and without using UAV Technology

As per the above results this system is most suitable to find the victims who faced to a flood situation.

Conclusion and Recommendation

In this study, an unmanned aircraft system (UAV) was demonstrated the ability to support the post-disaster SAR mission. We can use drones as a data acquisition system contains with several sensors for retrieving and collecting geographic data in single flight. This system is able to decrease the cost of extensive searches, increase efficiency, and decrease the workload of end users. In addition to that this will support in human activities while finding victims when they are in a bad situation.

In this document, I propose an algorithm to identify targets with a self-tuning threshold that applies to unmanned aerial vehicles. In view of this calculation, numerous projects were advanced and tested on simulated topic of research. The test outcomes demonstrate the reliability and efficiency of this new automaton framework. Another revision was carried to advance image processing for people who faced to flood situation identification and target recognition and to reduce unintentional reporting goals. This is a simple and effective way to manage the limited CPU capacity of an integrated processor. Often most commercial software is too big to use on the onboard equipment. Reducing computing power during post-processing is not important because super computers can be replaced this phase. To improve and evaluate the performance of the target recognition algorithm after processing, parallel computational techniques are implemented and further studied with respect to the developed commercial software.

In this study, it is assumed that the camera scale and the world coordinates are linear. This assumption can lead to errors at the destination. While developing the software researcher tried to reduce errors by choosing images whose targets are near the centre of the image. Although the system provide several errors and those errors provide the clear path and strength to improve this system which is having a more percentage of accuracy than today.

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