A Survey of Human Detection Drones

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Publication Info

Article history:
Received : 12 February 2020
Accepted : 18 May 2020

Keywords:
Calamitis, Debris, GPS, Rubble, Survivors, UAV, Wi-Fi.

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Abstract

As of due to the many natural calamities like tornados, earthquakes, floods, and collapsing of the buildings, many peoples loses their lives. In these situations, the rescue team was not able to locate the survivors under the debris as early as possible, and they face many problems while finding the human under the rubble. To solve these problems, we introduced a smart human detecting rescue system. The system equipped with drones has sensors like a passive infrared sensor and the ultrasonic sensor. Wi-Fi module is for the communication between firebase and mobile.

1. INTRODUCTION

Nowadays, the demand for drones has widely increased because of technological breakthroughs, which give better features such as tracking the location, built-in camera, multifunctional sensors. These drones are also used for military operations, and for the management of the disastrous conditions like tornados, earthquakes, etc. The rescue teams in such situations were not able to locate the survivors as earliest, and this may lead to a lot of people losing their lives.

There are few existing systems available for these situations, but they are controlled by the robots, which are not quite effective.

To overcome such problems in disastrous conditions, we developed ‘A smart human detection rescue system’ which can save people’s lives. Then the system contains drones and sensors like the PIR sensor, ultrasonic sensor, and the Wi-Fi module to communicate between firebase and mobile. This system will work efficiently to search the peoples trapped under the rubble as well as sending alerts to the rescue team so that they can save the lives in a specific time.

2. RELATED WORK

Many systems were developed to solve this problem. Let’s discuss some of them.

[1] The first one is the ‘Live human detection robot.’ It is a commonly known technique. Depending on the application, numerous human detecting robots were sketched. For e.g., if the building collapsed, then it is difficult to find the human being under the debris and rescue them. In such situations, the detection of the human in a given time is very crucial. This article provides an implementation of a robot that detects humans, and it preoccupies a lot of time.

Following are the components of the circuit:

- AT89s51 microcontroller.
- Passive infrared sensor (PIR).
- Radio Frequency transmitter and receiver.
- L293D Integrated Circuit.
- Program Counter.
- Robot framework
- Max232 Integrated Circuit.
- Battery 9V.
- Motors.

2.1. Working of the system:

- Firstly the code is intensively processed in the micro-controller.
- Then, organizing the robot framework.
- Connection of transmitting and receiving modules.
- Organizing the connection between the robot and the transmitter.
- Connection and receiver and PC.
- Assigning the character ‘F’ in the active terminal of the PC.
- The above process causes the movement of the robot in the forward direction.
- Then accessing the character ‘B’ that causes the movement of the robot in the reverse direction.
- Enter the character ‘L’ to move the robot in the left direction

- Enter the character 'R' to move the robot right directions.
- If any instance of human is detected by a controlling robot, the buzzer is switched on.

2.2. Applications:

- To save the lives of humans under the debris, this robot can be used.
- This can also be used in emergency situations.
- This system can also be used in surveillance.

2.3. Drawbacks of the Circuit

- The passive infrared sensor fetches to detect humans out of its range.

[2] Second is the 'Post-disaster rescue facility: human detection and geolocation using aerial drone' focuses on the execution of the detecting the humans and showing their location on the map. This system consists of sensors modules as well as the camera module to capture the images and videos too. The capture module consisting of thermal and optical cameras and for the location modules, it uses built-in GPS. For the sensing of the human body temperature thermal sensor is used. Target is detected using the trained classifiers, with the help of boosted classifiers. For the retagging and mapping of the initial human calibrations are set to the reference parameter, which includes coordinates, height, and compass direction. Further, this data gets processed by the technique of triangulation method in order to locate the human. Using the Google maps, the computed latitude and longitude coordinates were plotted.

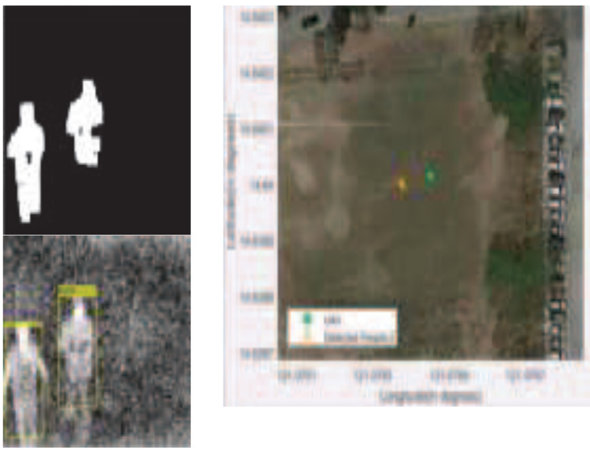

Figure 1: Human detection using thermal sensor and location tagging

The testing of detecting the human and its location using both thermal and optical sensors was done in a controlled environment. The resulting frame rate of both cameras was 3 fps. For optical images, the modularity of the system was tested on the DJI Phantom 3 pro. Thermal detection using the thermal sensor shows higher accuracy for finding the victims at night time and optical sensors in

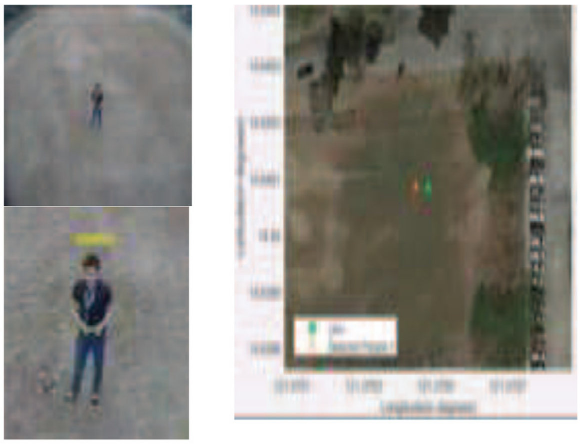

Figure 2: Human detection using optical sensor and location tagging

Figure 3: Illustrating rescue operation overview

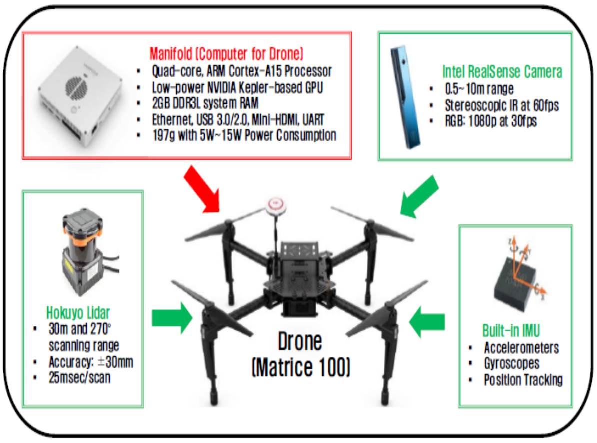

Figure 4: Drone hardware specification

the daytime. The geolocation capability of the system is about 10 meters detection radius.

This system shows the best results than live human detection robot.

[3] Third one is the 'Drone assisted disaster management: finding victims via infrared camera and lieder sensor fusion.' This paper concentrates on survivors (human beings) at the provoked site. The merging of the IR camera and lieder sensor happened. The mapping module is not used in this system to show the location of the victim.

The Figure. 3 mentioned above describes the overview of the system. The emergency execution team collects the data from the site where the destruction occurred and then proceeds to the rescue operation. The live view of the image was projected on the screen at the monitoring center.

2.4. Robot hardware architecture:

DJI matrices 100 are used. The drone is more reliable as well as it is supportive of multiple ports. Dual battery standby time is up to 40 minutes, and the quadcopter can lift weight up to 1 kg. The maximum speed is 20 m/s. The reliability measure of the lieder range is up to 30 meters. The depth camera measurement is up to 10 meters with real-time RGB and IR cameras.

2.5. Sensor application

A quadcopter equipped with the camera sensor, lieder sensor, IR depth camera, and built-in IMU to perform the mapping task. The lieder sensor provides the two-dimensional plot of the surrounding structure, and then the robot makes use of a depth camera to show a local three-dimensional view. At night the stereoscopic IR camera is used to detect survivor. Using IMU, the drone shows the global mapping of disaster scenes. Three hundred sixty cameras are utilized in a smartphone connection for assembling the visual data from the outside environment in detail without limited lightning conditions.

The above Figure. 4 depicted the overview of the drone and proposes the hardware with sensors for rescue operations. This system was tested in the bright light, and limited lightning situations and ROS provides local maps for the surrounding environment. The sensor plotted on drones has a successful range to detect the human under the rubble as earliest.

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