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IDENTIFYING AND DETECTING REAL-TIME OBJECTS USING DRONE CAMERA

HARSH SINGHAL
Department of Computer., Sandip Institute of Engineering and Management, Nashik, India
hsinghal247@gmail.com

POOJA DANGLE
Department of Computer., Sandip Institute of Engineering and Management, Nashik, India
danglepooja58541@gmail.com

SHUBHANGI RAJPURE
Department of Computer., Sandip Institute of Engineering and Management, Nashik, India
shubhangirajpure97@gmail.com

RUCHITA BADGUJAR
Department of Computer., Sandip Institute of Engineering and Management, Nashik, India
ruchitabudgujar97@gmail.com

PROF. PRAMOD PATIL
Department of Computer., Sandip Institute of Engineering and Management, Nashik, India
pc.patil@siem.org

ABSTRACT
As per the need of the time, there is tremendous increase in the application of Unmanned Aerial Vehicle (UAV) which is publicly known as Drone. In this paper we present a system which detects and counts number of people in real time using drone camera. Also there is growing interest in video-based solutions for detecting, monitoring and counting in business and security applications. Compared to early used classic sensor-based solutions the video based ones allow more versatile functionalities ,improved performance with lower cost.In this paper, we present a real-time system for people counting based on single low-end non-calibrated video camera.
The main challenge of aerial image analysis includes: 1] the size of an object/human in aerial image can be very small, 2] the object in aerial images are tilted outward due to perspective projection deformation, which makes the humans hard to recognize in aerial images, and 3] the error is likely to occur whenever multiple persons move closely, e.g. in shopping centres.

KEYWORDS: Video analysis, Human detection, drone, background estimation, segmentation, object tracking.

INTRODUCTION

In recent years, there has been increasing interest in autonomous UAVs and its applications. Visual object detection is an important component in such applications of UAVs. Many UAV studies have tried to detect and track certain types of objects such as vehicles, human crowd etc.Focusing on crowd analysis, knowing the exact number of persons in a building, building-floor, or a single room can be critical for the success of business or rescue operations. Therefore, shopping centres, are required to know the exact number of persons that are present in premises. Thus, they often purchase and implement both people-counting and video surveillance systems. Each of these systems is typically dedicated to a single task; either counting or monitoring the people within a certain area. Even though they are operating within the same area and performing related tasks, they usually do not interact in anyway and thus do not benefit from the information collected by the other system.

Additionally, people-counting systems typically estimate the number of people passing through a gate by counting the number of times a beam of light, e.g. infra-red light, is interrupted. Even though it is very simple, such a system can be very efficient in scenarios where no two persons, or objects in industrial production lines, pass through the monitored gate at the same time. They fail, however, to accurately count the number of people passing through a gate of a shopping mall which is typically wide enough to allow several persons to enter at once.

Figure 1. Drone

LITERATURE SURVEY

1) Fast Object Detection for Quad copter Drone using Deep Learning.

Authors of the paper have researched on development of object detection using deep learning based on drone camera. Their purpose to make develop this project was to deliver medical aids for patients in emergency situations. So basically it's a deliver drone which flies from a starting point and reach the target position and detects the goal position through object detection module and GPS.
In this system they have used Mobile Net and Single Shot Detector (SSD) framework for fast and efficient deep learning based method of object detection. Their system comprises of Parrot AR Drone with camera, object detection module MobileNetSSD with deep learning technology and GPS module. [1]

2) Objects Detection and recognition system using artificial neural networks and Drones

In the paper authors have presented about digital image object detection and recognition system using artificial neural networks and Drones. In this system face was the key object of detection and using an application which was used for learning process and another one for pattern creation, the system was developed to recognize digital images.
Histogram equalization and normalization of input images was done, learning and detecting by neural networks was followed, several pattern generation was done and comparing the images by intelligent system the whole working was done and the desired results of detection were generated. [2]

3) Pedestrian Detection in Aerial Images using Vanishing Point Transformation and Deep Learning

Drones are well-liked nowadays and formally known as Unmanned Aerial Vehicles (UAV) or unmanned aircraft systems.However, deep learning models for object detection still cannot have high detection rates for pedestrians in aerial images even though they already show high precision on PASCAL VOC 2007. The main challenges of aerial image analysis are: I) the size of an object in aerial images can be very small.II) the objects in aerial images are tilted outward due to perspective projection deformation, which make the pedestrians hard to recognize in aerial images. In this paper, Author utilize image partition and vanishing point transformation to overcome the above challenges.And also the experimental results done by them demonstrated that such pre-processing methods can increase the detection rates significantly for some deep learning models.[3]

4) Human Crowd Detection for Drone Flight Safety Using Convolutional Neural Networks

In this paper a novel human crowd detection method is used, which utilizes deep Convolutional Neural Networks (CNN), for drone flight safety purposes. The aim author is to provide light architectures, as imposed by the computational restrictions of the application ,that can effectively find difference between crowded and non-crowded images, captured from drones,and provide crowd heat maps that can be used to semantically to enhance the flight maps by defining no-fly zones. At the end they did two things: I) Propose to adapt a pre-trained CNN on task, by totally discarding the fully-connected layers and attaching an additional convolutional one, and transforming it to a fast fully-convolutional network that is able to produce crowd heat maps.II) They also propose a two-loss-training model, which aims to enhance the separability of the crowd and non-crowd classes. The experimental validation is performed on a new drone dataset that has been created for the specific task, and indicates the effectiveness of the proposed detector. [4]

5) Identifying and Detecting Real-Time Objects using Drone Camera

This was our review research paper for this project and in this paper we have mentioned all different methodologies and algorithms that can be used for the development of this system.
Estimation of algorithms and framework planning of the project was done in this paper. In this paper we proposed an idea to develop an embedded system which connects the drone to the system and then it can perform function to identify and count humans and this can be used in various applications.[5]

EXISTING SYSTEM

Existing system works poor for detecting multiple humans moving at a time. Existing counting methods often adopt regression based approaches and cannot accurately localize the target objects, which finds further analysis. Also most of the prior work mainly focus on counting objects in static environment with fixed cameras. The focus of previous research was to detect and track moving objects using images and videos generated by vision sensors (cameras) on board moving platforms like UAVs (Unmanned Aerial Vehicles).
The increase in the diversity and availability of electronic information led to additional processing requirements, in order to retrieve relevant and useful data: the accessibility problem. This problem is even more relevant for audiovisual information, where huge amounts of data have to be searched, indexed and processed. Most of the solutions for this type of problems point towards a common need: to extract relevant information features for a given content domain. A process which underlies two difficult tasks: deciding what is relevant and extracting it.

SYSTEM ARCHITECTURE

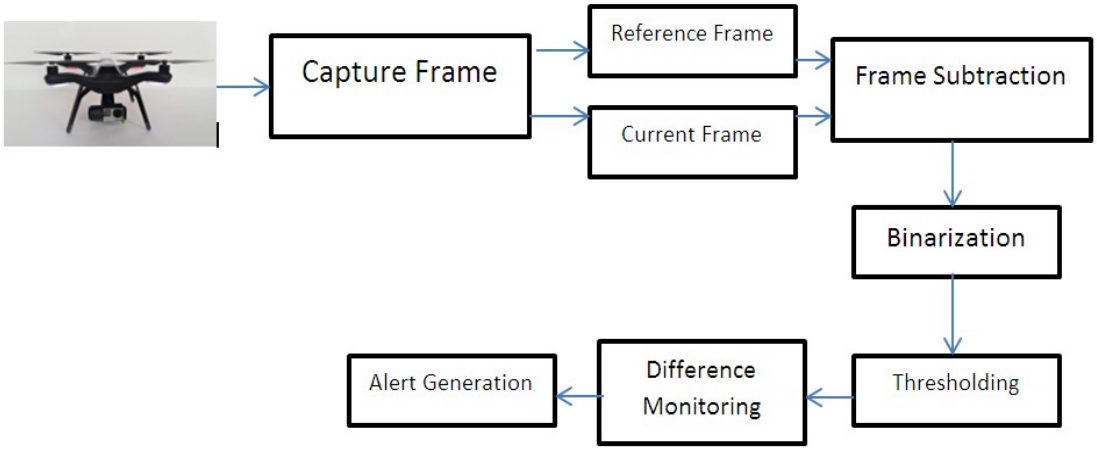

Figure 3. System Architecture

MATHEMATICAL MODEL

Problem Description

1. Hardware Embedding
2. Camera Video input
3. Image Preprocessing
4. Compare Frame
5. Motion Detection
6. Count Human Object

Let the system be described by S,

S = {HE, CI, IP, CF, MD, CH}
Where
S: is a System.
HE: Hardware Embedding
CI: Camera Video input
IP: Image Pre-processing
CF: Compare Frame
MD: Motion Detection
CH: Count Human Object

Activity

D= {d1, d2, ……., dn}
F= {f1, f2, ……., fn}
Y= { HE, CI, IP, CF, MD, CH}
D is the Set of Dataset
F is the set of Function.
Y is a set of techniques use for **Sys**tem

State Diagram

Figure 4.State Diagram

Fn1: Camera Video Input
Fn2: Image processing
Fn3: Compare Frame
Fn4: Motion Detection
Fn5: Count Human Object

FUNCTIONAL DEPENDENCIES

Table 1. Functional Dependencies

Table	Fn1	Fn2	Fn3	Fn4	Fn5
Fn1	1	0	0	0	0
Fn2	0	1	0	0	0
Fn3	0	0	1	0	0
Fn4	0	0	0	1	0
Fn5	0	0	0	0	1

Fn1: Camera Video Input
Fn2: Image processing
Fn3: Compare Frame
Fn4: Motion Detection
Fn5: Count Human Object

RESULTS

Our system has a user friendly and simple GUI which has a display which shows the real time footage and in this the analysis is done and human count is displayed as shown in Figure 5. Multiple human detection and counting is done and displayed as shown in Figure 6.

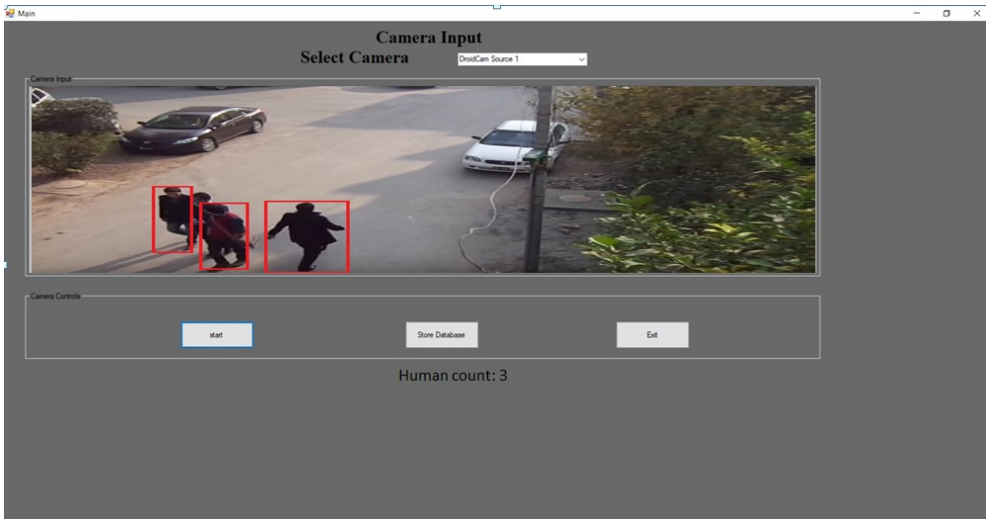

Figure 5. GUI of our System

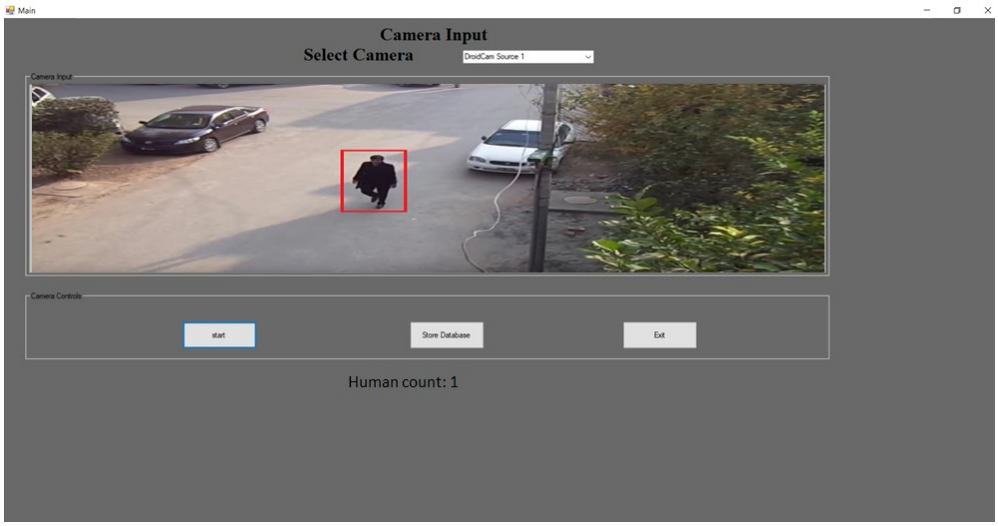

Figure 6. GUI of our System

CONCLUSION

While developing this system, the research confirms that nowadays not only the knowledge about rules of operating efficient algorithms but also the knowledge about hardware platform which will be used for implementation purposes is very important. Familiarity with multi-thread processing and skills in converting seemingly serial algorithms to parallel versions is fundamental for creating efficient and fast algorithms, which we use in real time processing systems

In this paper we have presented a method to track and count people in scenarios at frame rate: such as background changes or crowds moving in or out together. We can say that our proposed system performs relatively well especially in situations where traditional people counting systems fail: such as crowds moving in or out simultaneously. But our current version is able to recognize humans in the scene with some less accuracy so it can sometimes lead to some erroneous count. The second improvement could be implementing a human recognition in order to improve the counts. Additionally, such systems have the advantage of allowing for more functionalities at low additional costs therefore making them more cost effective. It has been concluded that human detection algorithms used herein has the capability to detect and distinguish people from other surrounding environment. More technology will be added and in future many more applications will be developed.

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