

A Literature Survey on Animal Detection Methods in Digital Images

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Abstract—Animal detection based researches are useful for many real life applications. Animal detection methods are helpful on the research related to locomotive behavioral of targeted animal and also to prevent dangerous animal intrusion in residential area. There are a few branches of research related to animal detection. Therefore, this paper will survey some of these branches.

Index Terms—Digital image processing, animal detection, natural scene.

I. INTRODUCTION

Researches regarding animals in image processing have been an important field to numerous applications. Many algorithms and methods have been developed by human being in order to have a better understanding on animal behaviour. Besides, these applications also can act as a warning system to human being from intrusion of dangerous wild animal for early precaution measures. These applications can be narrowed down to three main branches, namely detection, tracking and identification of animal.

The first branch, which is the animal detection, has been applied in various fields of real life application. For example, a detection algorithm has been developed for light detection and ranging (LIDAR) data to enable fisherman to find the right location of fishes in deep sea [1]. Researchers in [2] used airborne remote sensing images to detect moving wild animals. Work in [3] on the other hand, used micro-Doppler signals to maintain the human security by detecting potential dangerous animal intrusion to residential area.

The second branch, which is the animal tracking, is the main topic in monitoring animal locomotive behaviour and its interaction with the environment. With the technology of sensor, radio-frequency identification (RFID), and global positioning system (GPS), one of the applications is the development of new zoological systems for animal trace ability, identification, and anti-theft for the management and security of animal in zoo [4]. By tracking the animal movements, it helps human to have a better understanding on living creatures on earth, especially on how the animal interacts with its environment.

The third branch, which is the animal identification, is used to identify the detected animal. It has been used in health monitoring system for domestic herds. Animal care management becomes an important issue as animals have a

direct impact on human psychological and physical health. Even though there are a lot of solutions, maltreatment of animals and risks in animal health are increasing. To better manage the animals in dynamic information retrieving, location tracking, and RFID-based mobile monitoring system (RFID-MMS) has been designed to help users over a wireless network [5]. Identification of animal has helped human being to monitor and manage their animals easier.

This paper will give more attention and review for animal detection methods. The review also limited to the methods that use digital images or digital video. This review will be given in the next section.

II. METHODS FOR ANIMAL DETECTION IN IMAGE PROCESSING FIELD

The researches on animal detection have been a major topic for various applications. Animal detection methods are useful on the research on locomotive behavioural of targeted animal and also to prevent dangerous animal intrusion in residential area.

A. Researches on Animal Detection by Human Eyes

Early researches on animal detection are to observe how fast human eyes can detect the presence of animal in natural scene. Animal detection by human eyes has been considered as the most reliable detection method if seen from the computational point of view. This is because the image structure in natural images is complex. In [6], it is found that a human observer is able to decide whether a briefly flashed animal scene contain an animal as fast as 150ms. In [7], median reaction time results indicate a speed accuracy of 92 percents for reaction time of 390ms and increase to 97 percent of correctness for 570ms. Though human detection is effective and achieve satisfactory level, human eyes can easily get tired causing decreasing of effectiveness. Furthermore, human eyes cannot work 24 hours a day to perform animal detection. These flaws can be curbed by applying computer vision in image processing for animal detection.

B. Researches on Power Spectral

The researchers also have tried to find whether the presence of animal in the image scene will change the power spectral of the image or not. The power spectral can be defined as the amplitude of the signal in the frequency domain. This can be constructed by transforming the images from spatial domain into the frequency domain, by using transformation function such as the Fourier transform. The main idea is to help the human observer to realize the presence of the animal in the scene by inspecting the power

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spectral. Work in [7] found that the human observer will not prefer to use this approach if they want to quickly detect the animal.

C. Animal Detection Using Face Detection Approach

For research regarding locomotive behaviour of wild animal, method combining detection and tracking of targeted animal faces has been applied in [8] using Haar-like feature and Adaboost classifiers. The video recorders is only turn on when it is positive that targeted animal been detected to prolong battery life time and to ensure recorded video contain research value. This method especially crucial in situation whereby video man is not suitable to present at the recording scene for safety issue or video man might scare off some timid animal away. The animal faces are measured by utilizing face detection method with different local contrast configuration of luminescence channel to detect the image region of animal faces

D. Animal Detection Based on Thresholding Segmentation Method

Target extraction from background can be performed by using threshold segmentation method. In [9], the object is found by using background subtraction method after obtaining the background image. In [10], threshold segmentation method based on the pixel values is performed. However, in this technique, researchers should carefully choose the threshold value as they also should consider the negative value obtained at certain pixel point by direct subtraction.

The idea of threshold segmentation is simple, which pixel of gray that greater than threshold are set to white (i.e. intensity 255) and those less than the threshold value will be set to black (i.e. intensity 0). As stated in [10], it is difficult to select the threshold accurately as the background image periodically changes. Therefore, different appropriate threshold should be chosen for different background scene.

III. SUMMARY

There are a lot of problems need to be considered in developing an animal detection algorithm. First is the lighting problem, in which a sudden change of lighting effect mostly in indoor application can affect the effectiveness in

detecting the presence of animal intrusion. Besides, luminance problem with changes of natural environment from day to night at outdoor surveillance system can also affect the detection. Furthermore, moving background, such as leaves by wind might be regarded as foreground image and some inactive animal which remain static for a long time can be mistakenly interpreted as background image by the algorithms.

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