

An Application of Image Processing for Conservation of Natural Life[#]

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Abstract: In this study; a station has been set up containing three cameras, a wifi antenna, a solar power panel and a wind tribune in the wild sheep natural preservation area. To store and process the data collected by the system a unit consisting of a wifi receiver and computer are established in Technology Faculty of Selcuk University. The study are performed on the transferred images in the central unit by using image processing techniques of MATLAB software. In this study, image enhancement process are performed and the best images focused on Anatolian wild sheep are acquired. Improved static images are used for the determination of where the Anatolian wild sheep on the picture, area occupied by the sheep in pixels and number of the sheep by using the techniques of picture partitions.

Keywords: Image processing, Anatolian wild sheep, image segmentation, hybrid alternative energy.

1. Introduction

Image processing is to examine real-life, steady or active images which are converted to digital pictures as inputs and to obtain new pictures by changing their properties [1]. By using image processing, images with noise are studied and the errors are eliminated. Nowadays, image processing methods are being used in various areas such as medical, electronics and industry like counting the variables in blood cells or license plate recognition[2-6]. The technology of image processing has not been used yet for the protection of wild animals or species that becomes extinct and preventing the destruction of natural sources.

It is necessary to use intelligent control systems for the protection of natural life in a global world that are harmed by humans with intent or negligence, to leave a healthy world to new generation as an inheritance and to protect the species that are important for the ecological balance of the nature. It is important to realize a real application for these purposes.

The purpose of this study is to keep abreast the protected nature areas using image processing techniques and to provide protection for wilder life and natural sources which are in danger from human beings. For this purpose, a computer system application of image processing is developed for the protection of the wild sheep in the area of Bozdag, Konya and all the data are transmitted to a central computer trough Wi-Fi.

2. MATERIAL AND METHOD

Necessary electric network for the system to work in the area chosen for the study, Natural life protection area of Bozdag, Konya, is non-existent so instead, a system is set up working with photovoltaic energy. As it is seen from Fig. 1, a hybrid solar cell energy system with wind turbine addition is used considering the conditions which are the necessary daily radiation values for 1 m² area and the number of rain y, snowy days in winter.

Before all else, the area where the wind and the solar energy

systems are working with maximum efficiency is determined, because it is important for the continuity of the camera tracking and tracing system and for providing the necessary energy. For this purpose, measurements were done in the area with wind gauge and the most efficient place was determined. For solar panels, the angle and the framework placements were determined to protect PV from harm and also to provide them the maximum sunlight.

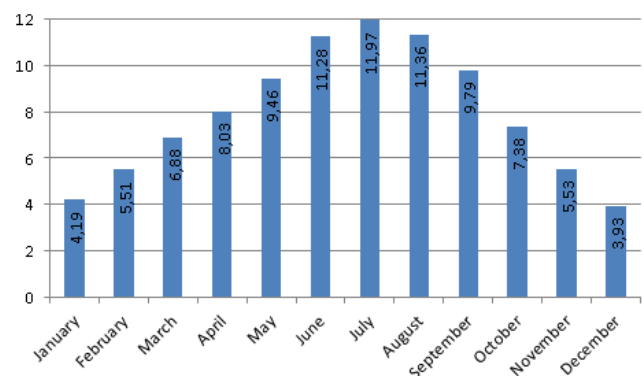


Figure 1. Konya sunshine duration values [7].

Power consumption of the wireless transmitter antenna of the cameras were calculated used for transmitting the data obtained from the cameras. The system was designed so that it can produce 2,2kW daily power because total power consumption is 2kW daily according to the calculations.

Necessary energy was provided using 2 units of 180A gel battery and an inverter. For this purpose, solar panel and the wind turbine were set up as a hybrid structure. The charge regulator of the energy obtained from this hybrid structures feeds the batteries.

The energy system chosen of which the calculations were performed was established on the determined area. The camera station was set up on the area closest to the energy system. IP cameras and the active cameras with determined angles were set up so that they could scan the chosen area.

For system establishment, solar panel, wind turbine, cameras, antenna and system box were set up on the chosen area, in Bozdag. (Fig 2)

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Figure 2. General view of the system on the protection area in Bozdag

3. IMAGE PROCESSING METHODS

In the study, instant images were obtained from the video images using the software "Capture" and they were processed with image processing methods in MATLAB. For this operation, the resulting images had been firstly converted into gray image formats. Because the resulting images were compatible with the color tones of Anatolian wild sheep in accordance with light angle and intensity, as well as land formed by the vegetation and geographical features (soil, stone, rock and so on.), they were subjected to histogram correction, sharpening, blurring and filtering operations.

One of the images obtained in gray image format in MATLAB is shown in Figure 3.

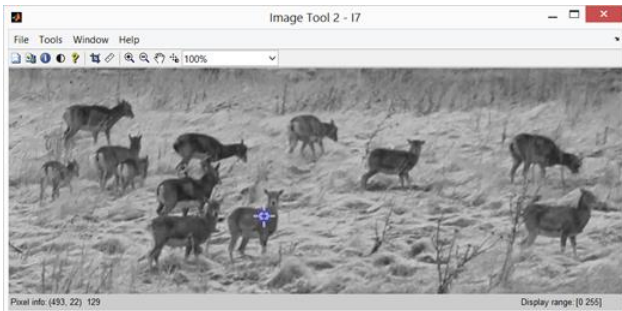


Figure 3. Instant image taken from the cameras in Bozdag area

Histogram graph of the instant image in Figure 3 is shown in Figure 4.

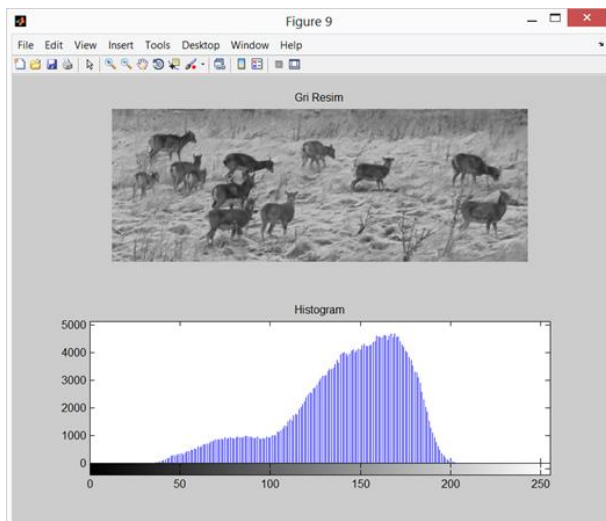


Figure 4. Grayscale image obtained with MATLAB and its histogram

A new and balanced image is obtained by modifying the histogram graph of a previous image (Figure 5).

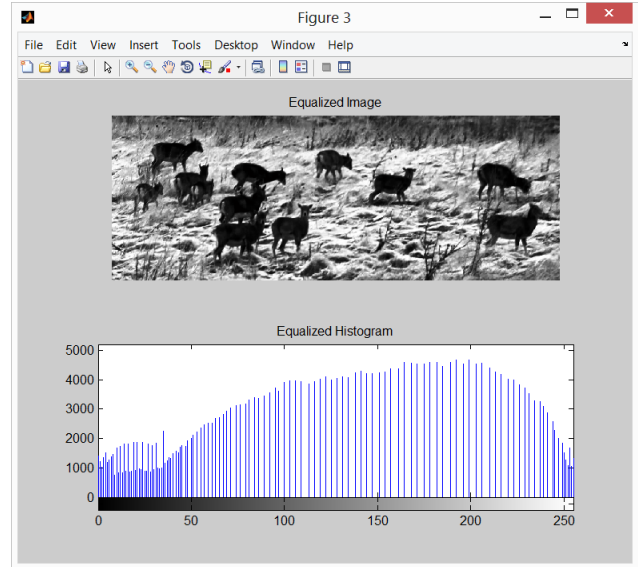


Figure 5. Visual and histogram graph of a grayscale image obtained by using a balanced histogram.

Thus, determination of the locations of the wild sheep, size comparison and edge capture processes are performed and the number of the wild sheep is determined by applying image processing properties such as; background extraction, inversion, object substitution, object destruction according to the area size on the obtained image.

First, the instant image chosen is converted grayscale format to make transactions on it. We have to model a background, because certain areas of the image are in the best light while the others are not. Morphological closing process applied on the image and as a result, the image is subjected to substitution process by using a written code to highlight the wild sheep in the remaining white areas. As an example, the differentiated digital photo is obtained as in Figure 6.



Figure 6. The new image obtained by taking the difference between two pictures

It is seen from Figure 6 that Anatolian wild sheep are close to white whereas the background is close to black. The threshold value is determined on this image. According to the image, the threshold value is subjected to logic operations on the basis of a certain threshold value. The values above this logical threshold value are "1", while those below are "0". (Figure 7)



Figure 7. The images leveled and converted to black and white

4. Conclusions

Considering the Fig. 7, The areas on which the wild sheep are found were determined. The objects in the picture were counted and the count numbers were written by positioning them at mid-point. (Figure 8).



Figure 8. The image with printed numbers on the objects

The process shown above has been applied to different pictures to test its success with herds of animals. The image with grayscale format and the background cleaned image with histogram is shown in Figure 9.

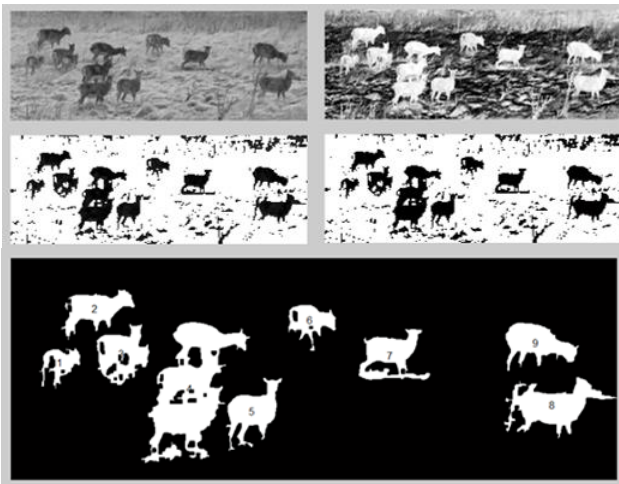


Figure 9. Image processing on the Anatolian wild sheep herd

Image processing techniques on the images obtained were carried out by using MATLAB program. In this study, image enhancement process is applied firstly and the best images were created to provide focus on the Anatolian wild sheep. Location of the Anatolian wild sheep on the image, identification of the areas in pixels and the number of the wild sheep were determined by performing improved image segmentation on the instant images.

It is seen that it can be possible to determine the actual weight and height of the Anatolian wild sheep by creating a reference point in the chosen area. Also, thanks to the determination of the weight of the animals, it is provided to identify and monitor the pregnant animals.

Acknowledgements

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