International Journal of Research in Advanced Engineering and Technology
ISSN: 2455-0876; Impact Factor: RJIF 5.44
www.engineeringresearchjournal.com
Volume 2; Issue 6; November 2016; Page No. 05-07

A study of cow detection and extraction using feature of contrast rate

Kosuke Sumi, Thi Thi Zin, Thu Zar Tint, Tin Myint Naing

Department of Information and Communicate Technology, University of Technology (Yatanarpon cyber city), Pyin Oo Lwin, Myanmar

Abstract
In this day, people who become livestock farmers that workload is big are decreasing. When the cow especially acts the calving behavior, livestock farmers need to watch it for a long time. Therefore, the research is aimed for developing cow calving monitoring system to reduce burden of livestock. In the cow calving monitoring system, cow detection and extraction play a vital role. In this paper, the cow detection and extraction are focused on. In order to implement it, image obtained from video camera was analyzed and identified by using techniques of image processing. In the paper, black-haired cows from video sequences are detected and extracted based on inter-frame difference method and contrast rate features. Sobel edge detector and morphological operation are employed to complete results. The experimental results show strong points and weak points of the system.

Keywords: cow calving system, inter frame difference, feature of contrast rate, sobel edge detector

1. Introduction
In this day, popularity of Japanese beef is increased by influences such as BSE (Bovine Spongiform Encephalopathy) problem. However, people who become livestock farmers that workload is big are decreasing. When the cow especially acts the calving behavior, livestock farmers need to watch it for a long time. Therefore, the purpose of my research is that burden of livestock farmers is reduced by developing automatic carefully system for calving system. Recently, it is developed by using cow's temperature sensor to solute this problem. This management practice controls condition of cow by inserting temperature sensor into the womb. When the cow acts the calving behavior, it is decided that the sensor is excreted whether or not. By using it, there is the report that accident rate was reduced by 92%. However, the cow gets stressed by the sensor is in womb. Therefore, cow calving process monitoring system is implemented. In the system, image obtained from video camera was analyzed and identified by using techniques of image processing. In this paper, the cow detection and extraction which is first step in this careful system are focused on. Recently, it has been promoted this research [1-4]. In this research, Inter-frame difference is used to obtain rough position information and region of cow is extracted by using feature of contrast rate.
The rest of this paper is organized as follows. Section 2 presents the overall of proposed method and details. Section 3 shows experiment environment and results. Final section is the conclusion.

2. Methodology
In the small-scale livestock farmers, it is difficult to move cows for getting background image. Thus, Inter-frame difference is used to obtain region of cow without using background in this research. The overall of proposed method is shown in figure 1. At first, inter-frame difference is performed by subtracting previous image from input image. And, if the cow doesn't move, the previous result produces. In second step, the range for processing is set. Then, region of cow is got by using feature of contrast rate and edge processing. Finally, noise removal morphological operations are performed.

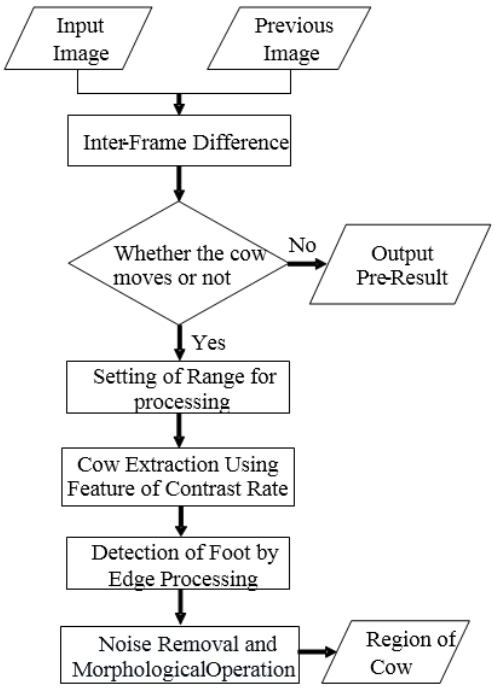
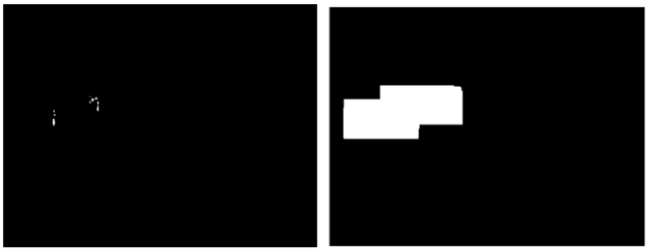


Fig 1: The overall of proposed method

2.1 Inter-frame difference and setting of range for processing
Inter-frame difference is method which doesn't create particular background model. In this research, cow is detected from difference image which is obtained from temporally continuing images. In this time, the resultant image is converted to the binary image by using manual threshold. In addition, input image is transferred into gray image. After processing, salt-pepper noises are generated. Therefore, these noises are removed with 3×3median filter. Then, if the cow moves, it is needed to decide the range of processing. In order to decide the range, the dilation process

is performed using the structuring element which is 50×150 array. The sample result of removal and dilation processing are displayed in figure 2.



(a) Median filter (b) Dilation processing

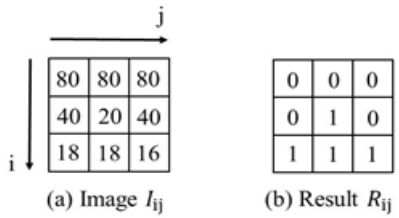
Fig 2: The sample of removal and dilation processing

2.2 Cow Object Extraction using feature of contrast rate

The contrast rate of cow is lower than other objects. The extraction of cow region is performed by using the following feature. At first, white pixels obtained from inter-frame difference were focused on. Then, the following formula is calculated by using white pixel and neighbourhood pixels. Then, white pixel and neighbourhood pixel are brightness in image. This process was repeated 100 times.

$$\text{Neighbourhood pixel} = \begin{cases} 1, \text{ if } |\text{white pixel} - \text{neighbourhood pixel}| < \text{Th} \\ 0, \text{ otherwise} \end{cases} \quad (1)$$

The sample of object extraction is shown in Figure 3. In next step, a better result is generated by using threshold. Threshold value was 100. This result is shown in Figure 3.



(a) Image I_{ij} (b) Result R_{ij}

$* \text{Th} = 10$

$R_{11} : |20 - 80| = 60 \Rightarrow 0$ $R_{23} : |20 - 40| = 20 \Rightarrow 0$
$R_{12} : |20 - 80| = 60 \Rightarrow 0$ $R_{31} : |20 - 18| = 2 \Rightarrow 1$
$R_{13} : |20 - 80| = 60 \Rightarrow 0$ $R_{32} : |20 - 18| = 2 \Rightarrow 1$
$R_{21} : |20 - 40| = 20 \Rightarrow 0$ $R_{33} : |20 - 16| = 2 \Rightarrow 1$

Fig 3: Sample of object extraction

2.3 Detection of foot by edge processing

In section 2.1 and 2.2, the foot of cow couldn't be completely detected. Thus, the edge processing is performed to detect the foot of cow. In this process, it is carried out it in range that is added Trisection on the vertical of object region to it. The range of processing is shown in figure 4. This is to consider the case where the foot isn't able to detect all. The Sobel edge detector is applied on vertical of it and superimposed edge image of foot to object image. After processing, noise removal processing is carried on with morphological operation. At the end of this step, the complete cow region is detected and extracted. The final result and edge process are shown in figure 5.

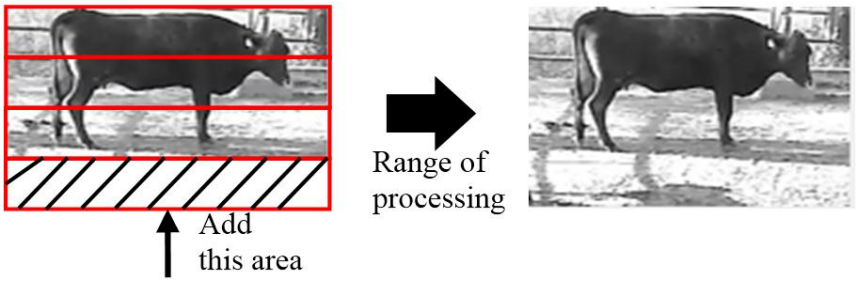


Fig 4: The range of processing

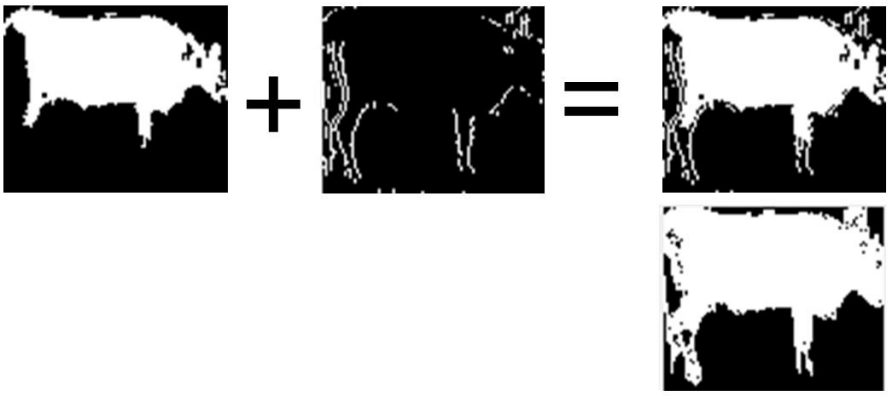


Fig 5: The final result and edge processing

3. Experiment Environment and result

For experimental setting the image are taken in the University dairy farm. Installation location of camera is about 3 meters high from ground. We performed experiments by method which is explained in section 2. The good and bad results are shown in figure 6. (a), (b),(c) is good result, result some bad, completely bad result.

(a) Good result (b) Result with some bad (c) Completely bad result

Fig 6: Experimental results

4. Conclusions

The paper presented a new method for detecting of black-haired cows from video sequences. In the paper, inter frame difference and feature of contrast rate are used for detection and extraction. The system can detect and extract the regions of cow which are displayed in experimental environment. However, in experimental section, some video produced bad result due to lighting condition and inter-frame difference. In order to solve, it is necessary more robust methods to control illumination condition.

5. References

1. Porto SMC, Arcidiacono C, Anguzza U, Cascone G. Detecting cows at the feed barrier by means of an image analysis algorithm", International Conference RAGUSA SHWA 2012, Ragusa – Italy. 2012, 266-272.
2. Zhao Kaixuan, He Dongjian. Target detection method for moving cows based on background. Int J Agric & Biol Eng. 8(1):42-49.
3. Jaemin Son, Yasushi Makihara, Yasushi Yagi, Morito Shiohara. Image Registeration for Gait Analysis of Farm Animals, IPSJ SIG Report. 2014; 191(28):1-8.
4. Carlos Martinez-Ortiz, Richard Everson and Toby Mottram, Video tracking of dairy cows for assessing mobility scores, Joint European Conference on Precision Livestock Farming. Leuven, Belgium. 2013.