

# The Study on Classification Methode of Cattle's Behavior Patterns

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**Abstract.** The purpose of this study is to find and classify the determinants of cattle's behavior patterns. Many researchers have studied similar researches as this topic. However, the accuracy of the data analysis is still insufficient. In this paper, we attempt to improve the accuracy of existing classification methods by analyzing the data of previous researchers and proposing a classification method of new cattle's behavior patterns. To improve the accuracy of cattle's behavior patterns that we are tried to extract the frequency and value of the each signal by Fast Fourier Transform, and then we input the frequency and value to classify cattle's behavior patterns at the designed Support Vector Machine. We can get high accuracy of classification of the cattle's behavior patterns.

**Keywords;** Cattle's Behavior Patterns; insert livestock health care; smart farm; Support Vector Machine;

## 1. Introduction

Nowadays, the size of dairy farms is bigger than in the past, and some dairy farms want to take care of many livestock in their farms. However, one or two workers in farms could not take care of all of them. So many researchers have studied the dairy care system which is not need human resources. One of the dairy care systems is RumiWatch Halter (RWH) which is made by Itin and Hoch GmbH.[1] The RWH can be notified the rumination state of cattle in day. The rumination state of cattle is important thing to check the cattle's health. But, only rumination is not enough to

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check cattle's health. Therefore, some of engineers have tried to use acceleration sensors and biosensor to find cattle's behavior patterns. In this paper, we define the cattle's behavior patterns and propose a classification method for acceleration sensors system.

## 2. Methods

To check the cattle's behavior, we need data sets of each action from cattle's behavior. Therefore, we use the acceleration sensor to get the data from cattle's behavior. We develop the system with acceleration sensor as fig. 1. And we located it on neck of cattle. In addition, we had established the camera to observe cattle's behavior on pasture. We check both of data, the video and acceleration sensor data. Then we defined three actions that are classified cattle's behavior. The three actions are "STAND", "MOVE" and "LIE".



Fig. 1 The system with acceleration sensor

Table 1 is showed the one of action's data from acceleration sensor with correlation value of x, y, z. We will use the correlation value of x, y, z to find out the action behavior discrimination.

Table 1: The data from acceleration sensor system

Time	X	Y	Z	Correlation Value
2018-xx-xx xx:xx:xx.xxx	8,584	11,876	152	14,654.27
2018-xx-xx xx:xx:xx.xxx	9,060	13,332	1,552	16,193.66
2018-xx-xx xx:xx:xx.xxx	5,636	15,308	1,272	16,362.07
...	...	...	...	...

To find the characterization of data, we use the correlation value of x, y, z. We can get the correlation value of x, y, x by eq (1). After that, we use Fast Fourier Transform to find feature point of the data of each behavior pattern.

$$\text{Correlation Value} = \sqrt{x^2 + y^2 + z^2} \quad (1)$$

We use the characterization of data set (“STAND”, “MOVE”, “LIE”) which is used the input data for training the developed SVM. The fig. 2 shows the process of the determining the behavior pattern of cattle.

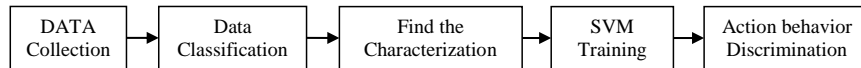


Fig. 2 Action behavior discrimination method

### 3. Results

We have gotten over 2500 test cases for cattle behavior and tested it. We had used the proposed method to achieve up to 90% accuracy in cattle behavior.

### 4. Conclusion

We can get a good result using our proposed Support Vector Machine method on this testing. But, only acceleration sensor is not enough to know cattle’s behavior and health. So, next studying, we will combine the biosensor (Pressure, Temperature sensors and so on) with acceleration sensor to check the cattle’s health which can be notified cattle’s health status, notifying pregnancy cycle and so on.

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