

Automatic Detection of Large Intestine Site Using Machine Learning in Abdominal Ultrasonography

機械学習を用いた腹部超音波画像における大腸部位の自動検出

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1. Introduction

Abdominal ultrasonography is one of the most useful methods for visualizing the large intestine and its internal conditions, and several studies have been reported [1].

In the future, telemedicine may become more widespread. Accordingly, there may be more opportunities to use portable medical ultrasound imaging machines to diagnose their own bodies at home. In order for a doctor or artificial intelligence to diagnose the ultrasound images, the target area must first be captured correctly by patients themselves. However, with current methods, it is difficult for those without knowledge or experience to even locate the desired location.

Recently, the development of machine learning has been developing at a tremendous pace, and various applications have been proposed in the field of medical ultrasound imaging [2–5].

The goal of this study is to automatically detect the large intestine region in abdominal ultrasound images using machine learning. A number of abdominal ultrasound images with and without large intestines are prepared as a dataset, and the images were classified using a convolutional neural network (CNN).

2. Method

Four subjects were examined by abdominal ultrasound and videos were acquired. Still images are extracted from the videos and unnecessary parts were trimmed. The input size is set to 224×224 pixels. Examples of the extracted still images are shown in Fig. 1.

A total of 5203 images (3369 images with large intestines and 1834 images without large intestines) were prepared as a dataset. The weak annotation is used for annotation, and the images are

classified based only on whether or not they contain the large intestines. GoogLeNet is used as the CNN model [6].



(a)



(b)

Fig. 1. Examples of trimmed abdominal ultrasound images (a) with and (b) without large intestines.

3. Results

The test data are categorized into those with and without large intestines. The results show that the accuracy before the training is 34% and the accuracy after the training is 88%. **Table 1** shows the results of three trials.

Table 1.the results of three experiments.

trial number	Accuracy (%)	
	before train	after train
#1	34	88
#2	34	88
#3	36	79

4. Conclusion

To automatically detect the area of the large intestine from abdominal ultrasound images, machine learning was used to classify the images so that the colon could be easily detected. The results showed an improvement in the results compared to before the training.

In the future, the classification of the characteristics of the stool in the large intestines will be performed at the same time as detection of large intestines [7].

References

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