

# Hand motions recognition based on LSTM

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**Abstract**—Making electronic devices more intelligent is what we are looking forward to. Among all technology, body motions recognition is widely used in daily life. Furthermore, hand motions recognition which based on electronic devices' sensors can make our life more convenient. In this paper, we apply LSTM deep learning model which is updated from RNN model to train and test on our dataset in order to improve accuracy and quality of recognition.

**Index Terms**—Hand motion, sensors, LSTM learning model

## I. INTRODUCTION

Hand motions recognition can help us in lots of conditions. We can use a simple gesture to replace complex interactions and make our action more intelligent. In order to recognize our gestures accurately and efficiently, we need to form a deep learning model for recognition. In the field of deep learning, Recurrent Neural Network (RNN) is widely used. However, RNN model can't handle well with long term action. Thus, Long-Short Term Memory (LSTM) is updated from RNN and has a more accurate performance than RNN model.

In this paper, we will collect gestures' data and build up the LSTM deep learning model so that we can train it and make it more accurate by adjusting parameters inside the model.

Gestures' data are mainly collected by smart phones which are daily used. Two categories of data that we mainly collect is accelerations in three-axes and angular velocity from gyroscope.

For LSTM model, we apply keras and tensorflow packet which support our LSTM model to build up our training environment.

## II. RELATED WORK AND METHODOLOGY

Recurrent neural networks (RNNs) have been widely adopted in research areas concerned with sequential data, such as text, audio, and video. However, RNNs consisting of sigma cells or tanh cells are unable to learn the relevant information of input data when the input gap is large. By introducing gate functions into the cell structure, the long short-term memory (LSTM) could handle the problem of long-term dependencies well. [1] We review the LSTM cell and its variants to explore the learning capacity of the LSTM cell. Furthermore, the LSTM networks are divided into two broad categories: LSTM-dominated networks and integrated LSTM

networks. In addition, their various applications are discussed. Finally, future research directions are presented for LSTM networks.

LSTM does a good job in hand motions recognition but sometimes missing will happen which leads to poor performance. So researches also shows that applying RNN and LSTM together to build bilinear LSTM can get a better result [3]. Movement prediction also increases accuracy of recognition. [4]

We will apply methods mentioned above to build up our deep learning model and try to improve its efficiency and accuracy.

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TABLE I  
TABLE TYPE STYLES

Table Head	Table Column Head		
	Table column subhead	Subhead	Subhead
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<sup>a</sup>Sample of a Table footnote.

Fig. 1. Example of a figure caption.

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## ACKNOWLEDGMENT

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## REFERENCES

- [1]Yu Y, Si X, Hu C, et al. A review of recurrent neural networks: LSTM cells and network architectures[J]. Neural computation, 2019, 31(7): 1235-1270.
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## REFERENCES

- [1] M. Shell. (2007) IEEEtran homepage. [Online]. Available: <http://www.michaelshell.org/tex/ieeetran/>

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