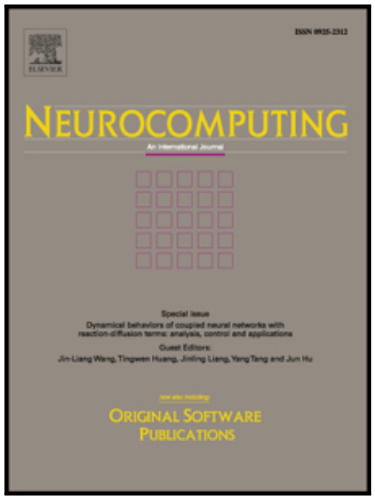
Communicated by Dr. Lei Zou

Accepted Manuscript



A Novel Robust Algorithm for Position and Orientation Detection Based on Cascaded Deep Neural Network

Weiyang Lin, Xinyang Ren, Tiantian Zhou, Xiaojing Cheng, Mingsi Tong

PII: S0925-2312(18)30501-0
DOI: 10.1016/j.neucom.2018.04.061
Reference: NEUCOM 19534

To appear in: *Neurocomputing*

Received date: 29 January 2018
Revised date: 14 April 2018
Accepted date: 27 April 2018

Please cite this article as: Weiyang Lin, Xinyang Ren, Tiantian Zhou, Xiaojing Cheng, Mingsi Tong, A Novel Robust Algorithm for Position and Orientation Detection Based on Cascaded Deep Neural Network, *Neurocomputing* (2018), doi: 10.1016/j.neucom.2018.04.061

A Novel Robust Algorithm for Position and Orientation Detection Based on Cascaded Deep Neural Network

Weiyang Lin[a], Xinyang Ren[a], Tiantian Zhou[a], Xiaojing Cheng[a], Mingsi Tong[a,b,*]

[a]*Research Institute of Intelligent Control and Systems, Harbin Institute of Technology, Harbin, 150001, China*

[b]*School of Mechatronics Engineering, Harbin Institute of Technology, Harbin, 150001, China*

Abstract

Estimating position and orientation of the object by using machine vision is essential in industrial automation. The traditional canny operator and Hough transform edge detection algorithm is widely used, but its accuracy and real-time object recognition in complex backgrounds are very limited. Other algorithms such as SVM and BP network are usually inaccurate for regression issues. In this paper, the method of a cascade of convolution networks is proposed which results in high precision pose estimates. SSD is utilized to obtain the bounding box of the object to narrow down the recognition range. Convolution neural network is utilized to detect the orientation of the object. This method can extract weak features of the sample image. In generally, the proposed method possess a greatly improved accuracy and recognition rate compared with the traditional algorithm.

Keywords: Object detection, Convolution neural network, Mixed deep neural network

1. Introduction

Computer, Communication and Consumer Electronics (3C) industry[1, 2] become more and more important in the rapid developing technology. 3C industry is the combination of computers, communications and consumer electronics. Industrial robots are one of the most important devices in smart manufacturing, such as carring, 3C assembly, welding and so on. It will hold a large share of the global market in the coming years, making the demand for industrial robots[3] increasing urgently and the robot industry booming. In the process of controlling the robots intelligently, it is particularly important to obtain the position and orientation of the object[4]. This prevalent trend of development has resulted in the algorithm of object recognition becoming a heated focus of research.

Many scholars have done a series of researches in this area. For object recognition, more and more researchers are using the neural network to obtain the position and category of the object in complex backgrounds. For instance, multi-frequency antenna array SAR is

*Corresponding author: Mingsi Tong

Email addresses: wylin@hit.edu.cn (Weiyang Lin), tongms@hit.edu.cn (Mingsi Tong)