An approach to 2D/3D registration using deep reinforcemenr learning
(ACDDE 2017)

Eungjune Shim

UST, Center for Bionics, Korea Institute of Science and Technology, Seoul, Korea

Youngjun Kim,*

Center for Bionics, Korea Institute of Science and Technology, Seoul, Korea

2017-05

Abstract

Deep Q Learning method is a novel approach to approximate value functions of reinforcement learning. This has been successfully applied to solve problems such as robot control, elevator scheduling, telecommunication networks. We applied this method to control a simple image-based visual servoing simulator. The simulator environment has been virtually organized in three-dimensional space, with four target points. The purpose of this simulator is to reduce two-dimensional error between projected target points and pre-defined four ground truth vectors. Our deep neural network takes eight digits as input values, and predict the possibilities of six outputs. Each outputs mean actions for camera to move forward, backward, top, bottom, right, left. For each steps, the neural network predict actions, and gets state rewards according to error vector. Our method made the simulator to decide actions from each states, and find its optimal transformation. Compare to conventional method, our method still need to areas to improve, but it has a lot of possibility to develope. Firstly, there are many neural networks proposed and deviced to deal with images, such as Convolutional Neural Network(CNN), we can simply replace our network that can take the whole projected camera images, not eight-digit 2D point error vectors. Secondly, we can also optimize the transform vector and range to speed up, by combine all actions' predicted possibilities, or just simply put more varoius actions.

Key words: Deep Q Learning, Reinforcement Learning, 2D-3D Registration, Visual Servoing

1. Introduction

This file describes the template of Asian Conference on Design and Digital Engineering (ACDDE 2017). Authors who want to submit a paper should follow the format presented in this file.
This is the beginning of Section 1. The official language of papers in this journal is English and there is no exception for this requirement.

2. Equations

Equations may be included within a line of text as $O(n \log^2 n)$ and $O(nc^{\sqrt{\log n}})$, or they may appear in a separate line as

$$y = f(x). \tag{1}$$

In the case that an equation appears in a separate line, the equation should have an equation number in an increasing order.

---

*Corresponding author email: junekim@kist.re.kr

3. Figures

There could be a number of figures, which are possibly in color, in the paper. The figures should be located at an appropriate place in the middle of the paper as the readers may feel convenient. The figures should not be located at the end of the paper. An example of figure is the following as shown in Fig. 1. Each figure should have an appropriate caption at the bottom of the figure and also be numbered in an increasing order with Arabic numerals
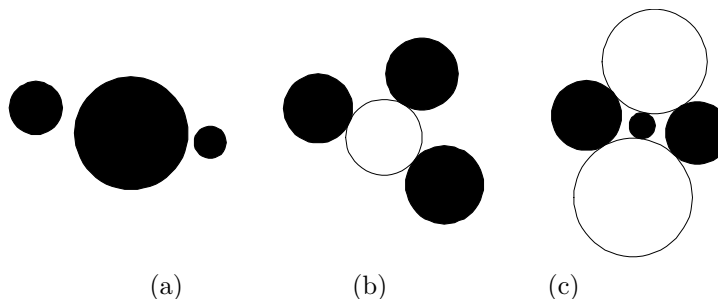

(a)　　　　(b)　　　　(c)

Figure 1. Circumcircles. (a) no circumcircle exists, (b) one circumcircle exists, and (c) two circumcircles exist.

4. Tables

Tables, if any, should be also located at the appropriate places in the middle of the paper. The place can be decided by the author based on the convenience of readers. The tables should be also numbered in Arabic numerals with appropriate captions.

Table 1. An example of table.

A	B	C
Aa	1	3
Bb	2	12
Cc	4	5
total	7	20

5. References

The detail information of the references, which are appropriately quoted in the paper, should be provided in References section. The unquoted references should not be included in the References section. The list in the section should be numbered in the alphabetic order of the names of the authors as shown in the examples in References section of this template. If a paper published in a regular journal is quoted, it should be listed in the References section as shown in the examples of [1, ?]. If a book is quoted in the paper, it must be listed as shown in [?, ?]. If a web-site is referred, the URL should be followed by the date that the site is most recently checked by the author(s). The example is shown in [?]. An example for a cited paper from a conference proceedings is shown in [?]. example [?]

Acknowledgement

Authors may express their gratitude in Acknowledgement section, if they want.

References

[1] G. Li, T. Rudy, M. Sakane, A. Kanamori, C. Ma, S.-Y. Woo, The importance of quadriceps and hamstring muscle loading on knee kinematics and in-situ forces in the acl, Journal of biomechanics 32 (4) (1999) 395–400.