

Depth-Hybrid Speeded-Up Robust Features

Hyungjin Kim^{1†}, Donghwa Lee^{2†} and Hyun Myung^{1*}

¹Urban Robotics Lab, KAIST,

291 Daehak-ro, Yuseong-gu, Daejeon 34141, Korea ({hjkim86,hmyung}@kaist.ac.kr)

²Division of Computer & Communication Engineering, Daegu University,

201 Daegudae-ro, Jillyang-eup, Gyeongsan-si, Gyeongsangbuk-do 38453, Korea (leedonghwa@daegu.ac.kr)

* Corresponding author, [†] these authors contributed equally to this work.

Abstract: This paper presents a novel feature detection algorithm called depth-hybrid speeded-up robust features augmented by per-pixel depth information in the speeded-up robust features (SURF) algorithm. We propose a keypoint detection method with less variation of the standard deviation by using depth data from a red-green-blue depth (RGB-D) sensor for computation time reduction. The proposed algorithm was verified in image matching compared with four-octave and one-octave classical SURF.

Keywords: SURF, feature matching, SLAM, RGB-D sensor

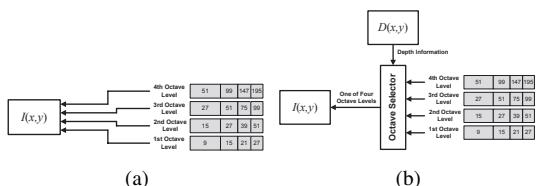


Fig. 1 Overview of applying box filters. (a) Classical SURF algorithm. (b) Depth-hybrid SURF algorithm.

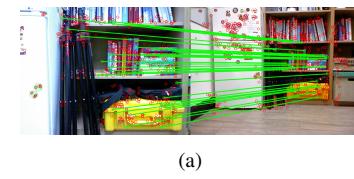
1. INTRODUCTION

The problem of finding correspondence in images from different views is an important issue. Recently, keypoint feature detection and matching algorithms such as scale-invariant feature transform (SIFT) [2] and speeded-up robust features (SURF) [1] have become popular because of their invariance under scale and rotation transformations. In SURF algorithm, multiple-octave scheme is utilized to make scale invariant feature. This paper proposes a novel depth-hybrid feature using one octave selected from depth value of keypoint.

2. PROPOSED METHOD

The classical SURF algorithm using four octaves is shown in Fig. 1(a). The proposed method selects one octave from the depth value as shown in Fig. 1(b). Therefore, the proposed method has advantage to reduce computation time by selecting one octave and also makes scale invariant feature.

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(a)



(b)



(c)

Fig. 2 Feature matching results. (a) Classical SURF (using four octaves). (b) Classical SURF (using one octave). (c) Depth-hybrid SURF.

3. EXPERIMENTS AND RESULTS

Fig. 2 presents the result of feature matching for classical SURF (using four octaves and one octave) and depth-hybrid SURF. The proposed method successfully matches and reduces computation time while one-octave SURF algorithm does not match well.

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