An Analysis of Simultaneous Image Matching on Various Datasets for Person Re-identification

Nik Mohd Zarifie Hashim [1,2], Yasutomo Kawanishi [1], Daisuke Deguchi [1], Ichiro Ide [1], Hiroshi Murase [1]
[1]Graduate School of Information Science, Nagoya University, Japan. [2]Universiti Teknikal Malaysia Melaka, Malaysia.

1. INTRODUCTION

Person re-identification is becoming a focus topic in many discussions recently. It becomes a vital role in public surveillance for identifying people across the street, inside supermarkets, and airports. Person re-identification aims to match person images captured at several non-overlapping camera views. For this reason, many advanced types of research had been competing to cope with the best solution for identifying multiple persons. Due to the redundant and mismatching which occurred in the traditional individual image matching scheme, the simultaneous image matching [1, 2] provides a solution which could avoid this downside. In this study, we analyze the performance of the simultaneous image matching on various datasets. We also evaluate a new image mask for feature extraction of SDALF.

2. ANALYSIS

We conduct a broader analysis on the performance of simultaneous image matching from our previous person re-identification work [1] by using several datasets. The evaluation followed the procedure conducted by Farenzena et al. [3], which averages the matching rates on randomly sampled ten sub-datasets for the final matching performance calculation.

2.1. Datasets

Other than VIPeR dataset, which is analyzed in [1], in this paper, we extend the analysis to the CUHK01 and iLIDS-VID dataset, whose image variation are more diverse. These datasets provide 632 persons in VIPeR [5], 300 persons in iLIDS-VID [6], and 971 persons in CUHK01 [7]. The setting for evaluation followed Zhang's work in [2].

2.2. Comparative methods

Image matching scheme in Person Re-identification could be categorized into two, individual and simultaneous image matching. The former one is considered as the baseline. For the latter ones, we selected greedy algorithm (GA), Hungarian Matching (HM), PRiSM [2], and PRi-SMA (HSV + SMA) [1] for the analysis.

2.3. Features

We focus on two types of image features; one is the HSV color feature, and the other is a well-known image feature for person re-identification, SDALF [3]. We modify image masks for feature extraction in SDALF and named the method as Mask-improved SDALF (MSDALF). We utilize the Mask R-CNN [4] for replacing the original SDALF masking. Examples of masks for MSDALF is illustrated in Figure 1, where the mask image was improved from the original mask images.

2.4. Results

The evaluation results are summarized in Table 1. The top two rows are individual image matching method using SDALF and ours (MSDALF). We confirmed our method outperformed the baseline.

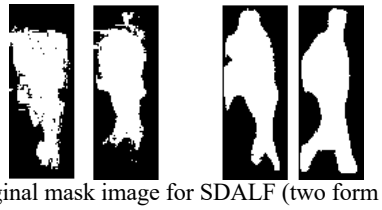

Fig. 1 Original mask image for SDALF (two form the left) and mask images for MSDALF (two from the right)

Table 1 Comparison on Matching Rate with comparative methods on several person re-identification datasets (*: Ours)

Comparative Method	VIPeR [5]	iLIDS-VID [6]	CUHK01 [7]
SDALF [3]	19.87 %	-	-
* MSDALF	**20.47 %**	**14.30 %**	**22.80 %**
PRiSM [2]	36.71 %	20.00 %	**50.10** %
HSV + GA	5.70 %	0.67 %	1.61 %
HSV + HM	34.21 %	13.33 %	13.24 %
* HSV + SMA [1]	**40.44 %**	17.93 %	27.03 %
* MSDALF + GA	14.53 %	7.00 %	4.79 %
* MSDALF + HM	39.18 %	**34.40** %	16.39 %
* MSDALF + SMA	40.32 %	34.33 %	21.73 %

Among the rest rows of the table, ours (MSDALF + SMA) showed a competitive performance compared to the HSV + SMA on VIPeR dataset. The results showed that the MSDALF helped the matching rate performed better. Ours (MSDALF + HM) is ranked at first on the iLIDS-VID dataset compared to other comparative methods. This result confirmed that MSDALF, which using Mask R-CNN for image masking achieved a significant improvement on the matching performance. On CUHK01 dataset, the matching performance did not achieve a good result.

3. CONCLUSION

We showed that the modified image mask could improve the matching performance of the simultaneous image matching via Stable Marriage Algorithm. The MSDALF have the potential to gain better performance in Person Re-identification with various methods. We expect that the proposed method could be evaluated with more aspect for proving and showing the proposed method's reliability in the real-life application, e.g., computational time in image matching.

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