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Pedestrian Detection Algorithm in Nighttime Environment Using the Cascade HOG in Lab Space

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Abstract. In this paper, an algorithm to track night pedestrians in real time is proposed. First, data is converted into a night L * a * b * color space, and then the L area is extracted. This data combined with image subtraction creates pre-processing data. Then, using the Cascade Histogram of Oriented Gradient (HOG) algorithm detects the pedestrian at night.

Keywords: L*a*b*, Cascade Histogram of Oriented Gradient (Cascade HOG)

1 Introduction

In existing circumstances, methods involving using infrared cameras at night for pedestrian detection are expensive; therefore, a method using a visible spectrum range camera where the camera is installed to illuminate the installed place is often used. However, few researchers have analyzed the methods using the camera application.

In this paper, to address these problems, a Lab color space and Cascade HOG algorithm are used to detect pedestrians.

2 Related Theory

2.1 Lab color space

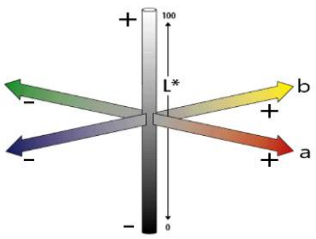

Fig 1. L*a*b* color space

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The Lab color space is illustrated in Figure 1. The three coordinates of CLE LAB represent the lightness of the color (L* = 0 indicates black, and L* = 100 indicates diffuse white; specular white may be higher), its position between red/magenta and green (for a*, negative values indicate green, while positive values indicate magenta), and its position between yellow and blue (for b*, negative values indicate blue, and positive values indicate yellow)[1][2][3]

2.2 HOG

The HOG descriptor has a few key advantages over other descriptors. Since it operates on local cells, it is invariant to geometric and photometric transformations, except for object orientation. Such changes would only appear in larger spatial regions. Moreover, as Dalal and Triggs discovered, coarse spatial sampling, fine orientation sampling, and strong local photometric normalization permit the individual body movements of pedestrians to be ignored so long as they maintain a roughly upright position. The HOG descriptor is thus particularly suited for the detection of pedestrians in images.[4][5][6].

3 Proposed method & Results

Fig. 2. Proposed method

As shown in Figure 3, first, after removing the noise through the Lab color space by image processing, the whole process of acquiring nighttime pedestrian data is possible. In addition, sufficiently trained Cascade and HOG is used to track pedestrians.

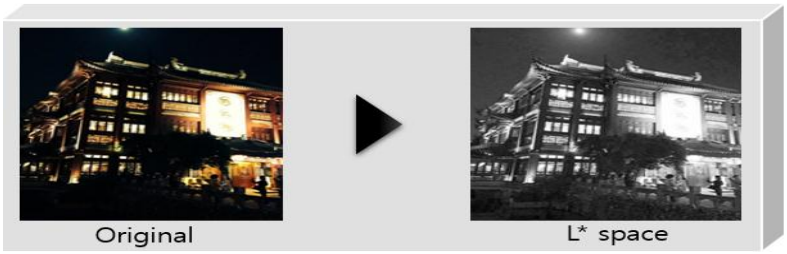

Fig. 3. Lab transform

Fig. 4. Result of proposed algorithm

Fig. 3 shows the result of the proposed algorithm: Using a pretreated Lab space, a person on a dark road may also be easier to identify with the naked eye. Preprocessing, as shown in Fig. 4, is used to detect the person using the Cascade HOG algorithm.

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