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Human Edge Segmentation from 2D Images by Histogram of Oriented Gradients and Edge Matching Algorithm

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Abstract: ***Current research performance is limited to segment precise human edge. In this paper, we proposed an edge matching algorithm for human edge segmentation from 2D images by means of the histogram of oriented gradients technique and SVM classification. The algorithm having four steps, namely image sequence acquisition, human detection, edge segmentation and human edge segmentation. Data was collected from 710 full body human images. Based on the finding of this work, error results of the human edge in the parts of head, neck, body, and leg were 9.86, 13.60, 6.63, and 6.37 pixels, respectively. The advantages of this proposed method is this method can segment human from image by using only one image and a small group of databases.***

Keywords: Edge segmentation, Histogram of Oriented Gradients, Image sequence acquisition

I. INTRODUCTION

Human segmentation is an important process in applications of computer vision, visual surveillance and machine learning. Robots can understand human activities and interact with human from computer vision techniques. Human activities in segmented human area in each image are analyzed.

Therefore, a method to segment human precisely is necessary to develop effective robots.

Existing methods of Human segmentation can be divided into two categories according to number of segmentation frame and size of database. First is the methods using two image frame and small group of databases to segment human in an image, Other methods use one image frame and large group of databases to segment human in image.

In existing methods using two image frames and a small group of databases, Hagaetal proposed a method to classify human by using spatial uniqueness of image motion, temporal uniqueness of human motion, and temporal motion continuity. K-mean algorithm and color were proposed to identify human by H. Engandetal . A shape base for classification of objects was proposed to identify human by Lee and etal. Zhou and Hoang proposed a feature vector of object which is created from the mask image and the boundary of human body.

The distance from the boundary of human body to the left side of boundary box is used as feature vector. These methods used background subtraction technique. Therefore, area of human is extracted..

In existing methods using one image frame and a large group of databases, these methods can divided into two categories based on human area and segmentation human edge. Sidenbladh had proposed method to detect human in a square area by using the optical flow pattern database combine with the Support Vector Machine.

A. Review Stage

The existing methods uses two image frames and a small group of databases classified human by use spatial uniqueness of image motion, temporal uniqueness of human motion, and temporal motion continuity. K-mean algorithm and color were proposed to identify human.

B. Final Stage

After performing Histogram of Oriented Gradients and Edge Matching Algorithm to the image ,it segments and detects all the Human beings present in the Image with differentiated pixels of the body parts obtained from the two algorithms. Thus the number of humans present in a 2d image input image is identified.

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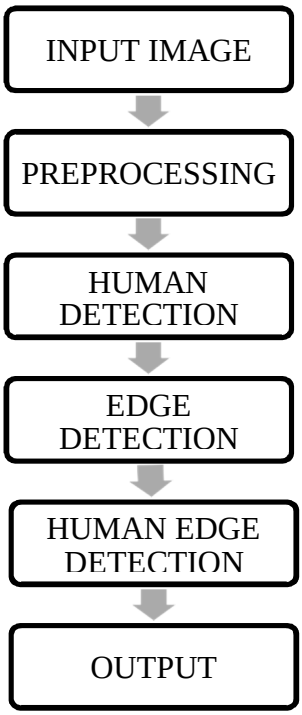


Figure 1:Block Diagram of the Project

II. PROPOSED SYSTEM

In this paper, we propose a new method of human edge segmentation from 2D images by histogram of oriented gradients and edge matching algorithm. The algorithm consists of four steps: image sequence acquisition, human detection, edge segmentation and human edge segmentation. The histogram of oriented gradients (HOG) is a feature descriptor used in computer vision and image processing for the purpose of object detection. The technique counts occurrences of gradient orientation in localized portions of an image. This method is similar to that of edge orientation histograms, scale-invariant feature transform descriptors, and shape contexts, but differs in that it is computed on a dense grid of uniformly spaced cells and uses overlapping local contrast normalization for improved accuracy.

Edge matching algorithm was used to segment human. The matching areas are divided into four parts which start matching from head, neck, body, and leg. The template was matched from lines to lines of white pixel on the image. Matching position the template was going to match unit cover all matching area in head edge segmentation. In the other three parts positions that each part template connected with the previous template was chose to matching.

III. RELATED WORK

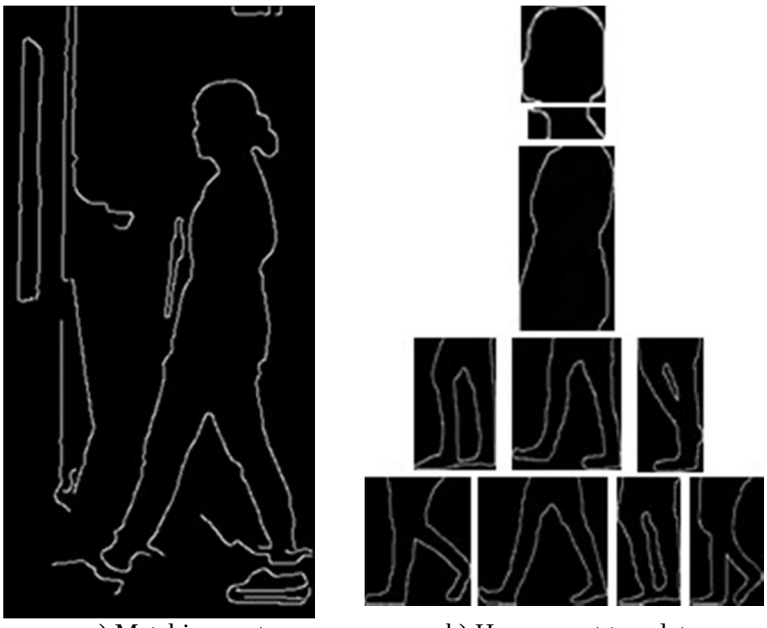
A. Image Aquisition

Data is collected in indoor. Each frame from videos input is an image in RGB color space with image size of 640×480 pixels. Input is converted to grayscale color. Distance from camera to subject is about 3.25 meters. Subject walked from a side from image to another side as shown in fig

Figure 2: Captured image

B. Human Detection

All images are cropped with the pixel size of 240×470 pixels, and then resize to 128×256 pixel. Cropping is started at left edge and have distance 10 pixels to next crop area with overlapping area is 97.87%. Subarea images are shown as fig. Support vector machine (svm) is used to classify feature vector calculated by using block size 4×4 elements and cell size of 24×24 elements from Histogram of Orient Gradient (HOG) [7]. Subarea images have two group, namely image with human and without human. Red square border is subarea image with human as shown in Fig 3a. Max score of SVM prediction is used to define the best human crop area of each image sequence. Red square border is surround the best human area as shown in Fig



a) Matching part areas b) Human part templates

Figure 3: Matching areas and templates

C. Edge Detection

Canny edge filter is used to detect all of object edge in subarea image. The object edges are show as white pixel and the other are black pixel

1) *Human Edge Segmentation and Edge Matching Algorithm:* The Edge matching algorithm was used to segment human. The matching area are divided into four parts which start matching from head, neck, body, and leg. Matching area and human part templates are shown in Fig 3 a. and b., respectively. The template was matched from lines to lines of white pixel on the image. Matching position the template was going to match unit cover all matching area in head edge segmentation. In the other three parts positions that each part template connected with the previous template was chose to matching. 360 degree of unit circle matching technique was use to arrange the matching between white pixel on template and image in from 0 degree to 359 degree in head and neck edge segmentation. The center point of unit circle (X1,Y1) is the center of head and neck template which derived in Eq. 1-2. Degree of white pixels are derived in Eq. 3-5.

$$X = (WT/2) \quad (1)$$

$$Y = (HT/2) \quad (2)$$

where WT is wide of template and HT is height of template.

$$Dy = (Y1 - Y2) \quad (3)$$

$$Dx = (X2 - X1) \quad (4)$$

$$\theta = \arctan(Dy/Dx) \quad (5)$$

Where Dy is distance between center and white pixel on Y-axis and Dx is distance between center and white pixel on X-axis (X1, Y1) is the coordinate of center, and (X2, Y2) is the coordinate of white pixel. θ is degree of white pixel that compare with center point which shown in Figure 4.

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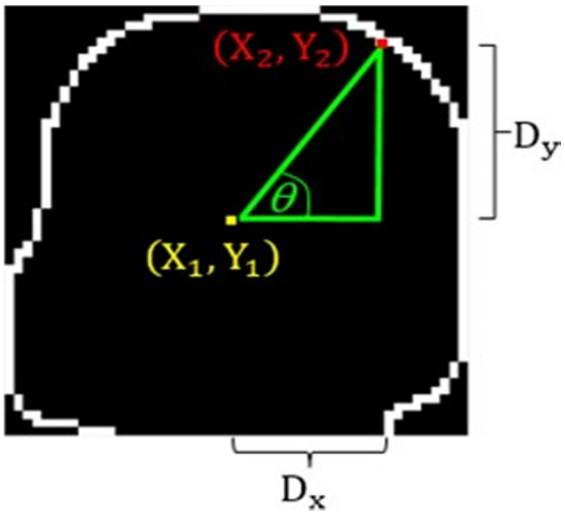

Figure 4: Degree of white pixel

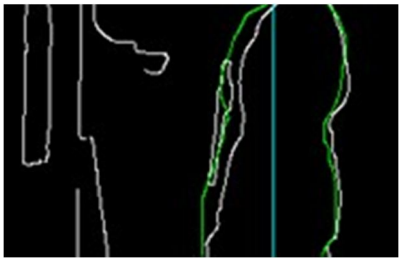
Figure 5: Middle line of body template

In head and neck edge segmentation, the white point on image was paired to compute distance by degree range as 15 degrees at head and 10 degrees at neck from each based-on template white point. In body and leg edge segmentation the distance was compute in same line form.

Top of the head center line (THC line) is position of red line. Top head edge pixel is set as the real middle line of human to check the choosing line to be edge on body and leg


Figure6: Top head center line is represented by red line and average leg template distance is represented by yellow lines.

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IV. FUTURE SCOPE

For the future work, we plan to incorporate 3D depth information based on stereo vision algorithms. The study and the research work will mainly focus on the stereo disparity and stereo matching algorithms to increase the efficiency of the stereo vision detection of motion objects.

V. CONCLUSION

In this paper, we propose a new method of human edge segmentation from 2D images by histogram of oriented gradients and edge matching algorithm. The algorithm consists of four steps: image sequence acquisition, human detection, edge segmentation and human edge segmentation. Performance of the method is tested by using 710 full body human images. Error results of the human edge segmentation in the parts of head, neck, body, and leg were 9.86, 13.60, 6.63, and 6.37 distance of pixels, respectively. Cause of error occurs from color intensity, and wrong matching template. The advantage of this method compares to the previous is this method is segmented human from image by using only one image and a small group of databases. The proposed method show effective performance.

A. Software Used

MATLAB 7.0

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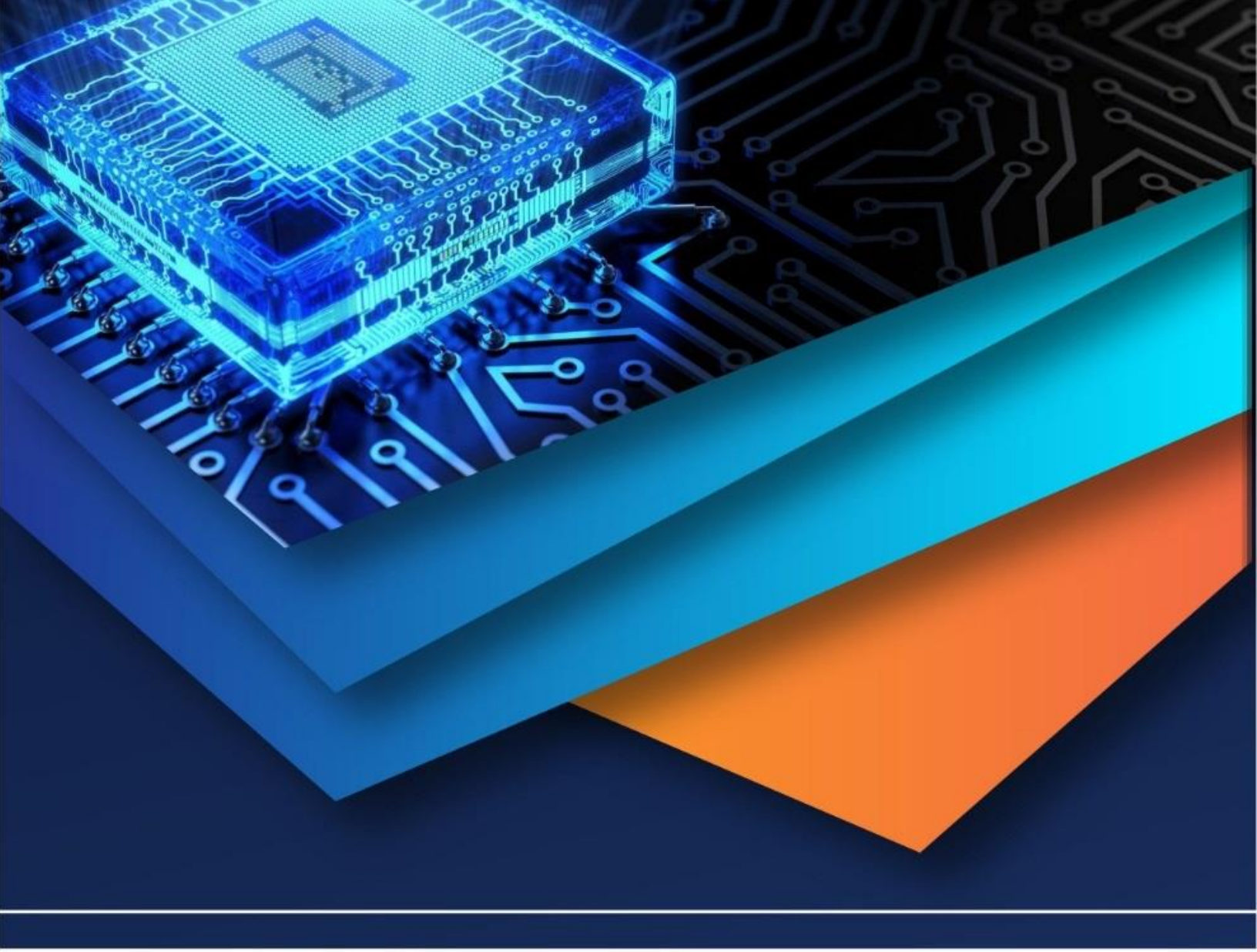

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