International Journal of Advanced and Innovative Research (2278-7844) /
Volume 7 Issue 2

Persons Characterization into Image Sequences Using a Shape Measure

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***Abstract*—The characterizingof persons in real time is a topic of interest in computer vision. In this work we develop an methodof persons characterization. Particularly, the proposal is divided in 3 stages: 1) In a first stage, Mixture of Gaussians (MOG) is used to detected each objectin movement,the contour of the foreground isanalysed with the radius distribution. Finally, for each block a measure of dispersionbased in radius distribution, considering the maximum sparse criterion is proposed.**

***Keywords*— persons, characterization, method, tracking.**

I. INTRODUCTION

Object recognition is a topic of great interest in many areas. This processcan be conceived as the process of extracting information related to the interest object. In the literature several approaches are useful to describe and to characterize a variety of objects. However many factors as sudden changes in illumination, noise, and overlapping rendering causes an inefficient characterization, beingimpossible to characterize partially visible objects.

The most popular methods to characterize objects moments and commonly uses invariant features images global.In general, the majority of approaches have been classified in :
1)Global Features.Includes shape descriptors and contours analysis.
2)Local Features. It is based on a sparse set of local measurement
3)Combination local and global Features. It employed global and local representations.

In general, previous research have been proposed to characterize objects. In [1] the authors exploits a method based on the dominant spatial structure (Known as gist descriptors)is proposed. In [2] the authors describedan approach for reconstructing images based on a local descriptorwhich provided the geometrical information of the objects(size, orientation). In [3] the authors using a set of descriptors(Visual word Histogram, known as BoVB) where the original image is reconstructed from features.Zeiler and Fergus [4] studying convolutional neural networks model. Zhang et al. [5] uses classes and histogram of characteristics to predict the presence of the object. Mahendran and Vedaldi[6] exploitSIFT, Bag of Visual Word to Convolutional Neural Networks(CNN). Their approach is based on gradient descent improvement visual features from CNN.

In this work, we present an approach based on the geometry information of the objectin movement and the dispersion of the boundaries of the objects in real time defined in a two dimensional.The proposal consist of exploiting properties of measurement, preserving statically information of the objects in movement. Additionaly, the presence of group of persons is detected.

The rest of paper is organized as follows. In section 2, the step of the proposed methodology is presented together with their main characteristics. In section 3, results and comments are discussed. Finally, conclusions are presented.

II. METHODOLOGY

In this section we describe our methodology to characterize the objects in real time. Fig. 1 shows the steps employed. The detailed method is given below.

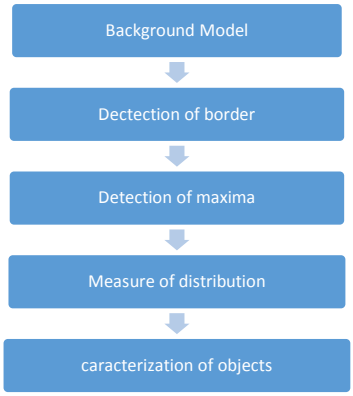


Fig. 1. Flowchart on each frame from a video sequence.

To detect objects in real time a background subtraction model was computed , particularly, the Gaussian Mixture was used for modelled the intensity of each pixel. The dynamic of each $pixelI(x) = \sum_{i=1}^{n} \mathcal{M}$ is characterized by the parameters $\{\mu_0, \sigma_0\}$, such as $\mathcal{M} = \alpha_i G_i(\mu_i, \sigma_i)$.

The initial values $\{\mathcal{M}_i\{\mu_0, \sigma_0\}\}$ for the initial set of model $\Phi = \{\mathcal{M}_1, \mathcal{M}_2 \ldots . \mathcal{M}_n\}$are fixed with the first acquitted image. [8].

2.To detect the contours of the objects, a gradient operator is defined. This operator consist of two operator morphological : a dilation$\delta_B$and an erosion ε_B, respectively. The gradient operator is described as:

Let $I(x)$ be a function defined in Z^2 and $B$the structuring element of $3x3$. This transformation is defined as:

$$\nabla_B \mathrm{I}(\mathrm{x}) = \delta_B(I(x) - \varepsilon_B I(x) \qquad (1)$$

For simplicity, the border of the persons in movement is computedby $c^{'} = \{x_1, x_2 \ldots \ldots, x_n\}$, where the centeris represented with the expected value. The radius is defined by a distance functionas:

$$c = E\{x_1, x_2 \ldots \ldots, x_n\} \qquad (2)$$

the radius distribution is defined as follows:

$$r = \{d_k(c, x_1), d_k(c, x_2), d_k(c, x_n),$$

Supopose that the pdf $r \sim f(r)$

$$\Pr(C^{'}) = \int_n^m f(r)dr \qquad (3)$$

such that $c^{'} = \{x_1, x_2 \ldots \ldots, x_n\}$, and $x_i \epsilon \mathbb{R}^n$ where a and b represent aninterval of confidence.

Where then$n$ and m values are defined as:

$$E[f(r) - g_1(r, k)] \text{ and } E[f(r) - g_2(r, k) \qquad (4)$$

Hence, the functions $g1$ and $g2$ representthe maximum sparse criterion[8].

RESULTS

In general, after background modelling in sequence of images, each block in the sequence of videos is calculated. In a pedestrian detection, the sparse criterion of the distribution can be similar. The distribution of the distance of agroup of people thedistribution can be more complex than a Gaussian. Particularly, the histogram of distribution for the overlapping may cause the distribution change. Hence, that when the dispersion around the mode is greater denote the presence of a group of people. It means, that , the mode represent a better radius estimator than the single average when we havea multimodal probability density function (mpdf). In addition, it is possible detecting the presence of a group of persons, estimating the expected value and the radius r . When the majority area surrounding the expected value is very it denotes the presence of a group.
Fig. 2 illustrates the detection of people in real time, whereas Fig. 3 show the persons after applying, connected operators.

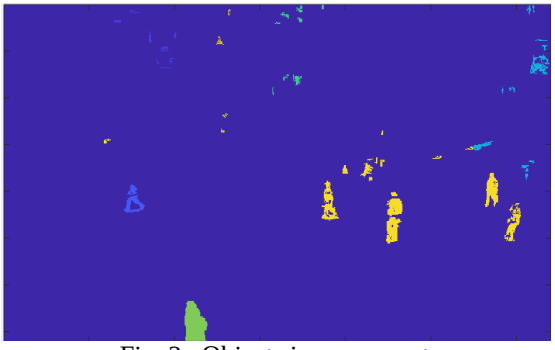
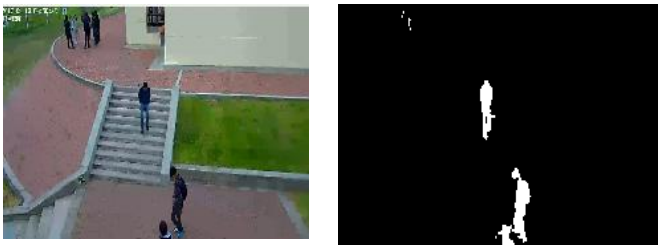


Fig. 2 . Objects in movement

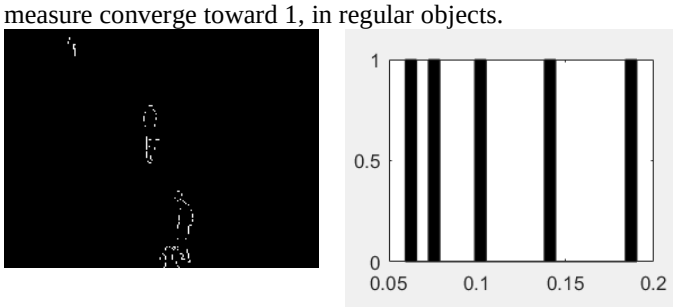
The importance of a statisticestimator is useful to represents the area of the distribution which represents information surround structure.



(a) (b)

Fig.3. (a)Original image, (c) Detection of people in real time.

Fig 4 (a) shows the contours of the people, after applying morphological filters. Fig. 4 (b) illustrates the results obtained, after applying the measurement. Particularly, note, that the measure converge toward 1, in regular objects.



(a) (b)

Fig. 4. (a)Detection of contours, (b), distribution of objects in movement.

CONCLUSIONAND FUTURE WORK

Geometrical descriptors are suitable as geometrical descriptors of blobs for object characterizations. Its structure allows to define metric criterions which can be used as shape criterion for characterize objects. That is the case of pedestrians, as main experimental results showed in this paper. With this novel approach it can easily extended to new shape measures.

ACKNOWLEDGMENT

The author, Ana Marcela Herrera would like to thank PRODEP (Programa para el DesarrolloProfesionalDocente) for financial support.

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