People Counting System Using Video Camera

Jesús Peña-Ruiz
University of Las Palmas de Gran Canaria, Spain

Jesús B. Alonso
University of Las Palmas de Gran Canaria, Spain

Carlos M. Travieso
University of Las Palmas de Gran Canaria, Spain

INTRODUCTION

Nowadays, and thanks to the progresses made in artificial vision systems, many great results are being achieved in the automation of video surveillance tasks in environments such as entrances to buildings, highways, parking, etc. These systems consist of one or several video cameras strategically distributed and a unit of images processing those analyses the videos to detect situations of interest (Wang, Wang, & Jao, 2011). This way, the security operator just needs to visualize the recording fragments in which the mentioned situations occur, confronting only to the relevant information, saving time.

A people-counting system consists of an application that allows the counting of people as of video images. It is framed in the context of security increase in the access control to enclosures, automating the monitoring of the access points (Byungrak, Yong-Sork, Kyuwon, & Jung-Gyu, 2007).

By means of an immobile camera located in a superior plane, images are captured in the visible spectrum or in the infrared spectrum, and by means of digital images processing techniques, the entry of people is detected through an imaginary line (Leonardi & Macci, 2008). It is common to use references in the scene to determine the direction of the movement and carry out the counting of people.

Recently, the Kinet device of X-Box has been started to use in order to capture depth images to facilitate the sector of the objectives and increase the system´s performance.

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BACKGROUND

The security in the quotidian life is the main objective of the video surveillance systems that are established to look after and have consciousness of everything that happens around. These systems, through numerous cameras and control units, are the responsible for monitoring everything that happens, in order to have a total knowledge of the things that happen in the places where the mentioned systems are implemented (Karmann & Brandt, 2007).

The video surveillance systems have obtained more demand in numerous applications every time. Thanks to the technological evolution, it has been achieved that the fact of installing video cameras do not require of high economic investments, which has made possible that the majority of banks, stations, airports, parking lots, highways, stores, etc., (Hashimoto, Morinaka, Yoshiike, Kawaguchi, & Matsueda, 1997), can add in their installation the mentioned security systems, with a more or less complexity and precision, based on the video surveillance.

The main idea of this article is the counting of people through a video surveillance system (Xing, Ai, Liu, & Lao, 2011). Numerous are the authors who have developed this idea in the environment of the video surveillance systems, either supported by visible cameras, infrared, thermic or other techniques of capturing images (Li, Huang, & Liu, 2011).

A classification of the diverse current systems based on the counting of people can be established, according to the type of camera being used, the number of cameras used to capture images, the places where the counting is made, either indoors or outdoors, etc.

Visible Spectrum

The visible spectrum is the one, which we perceive directly with the eye. It is about a very common spectrum, which can give great results at the time of doing counting people systems. Despite of this, it has some limitations, because it will be impossible to make an optimum recording with this device under conditions of limited brightness.

Nevertheless, it can give us in real time information about the people flow very useful for security applications based in the video surveillance.

The use of stereoscopic cameras in the visible spectrum has also given very good results in daytime conditions (Terada, Yoshida, & Yamaguchi, 1999). The term "stereo" makes reference to the presence of two cameras, separated between them by a few centimeters. Also with the use of this type of cameras, the dynamic region and the static region in the obtained of images, can be satisfactory segmented.

The main challenge in the following of people in a video scene with visible spectrum is being able to trail the objectives in occlusion conditions (Chih-Chang & Hsing-Ha, 2011). Here, a plan to make an automatic following and being able to count people in a surveillance system based on the visible spectrum recording is presented.

The devices that record in visible spectrum have more or less effectiveness, greatly depending on the recording place and the light conditions at which it is submitted.

For interiors, it is possible to create a strong method for the counting of people (Qing, 2010). The people counting method by visible spectrum present also another great advantage. It is about a low cost system, because just with the only use of a single camera is very effective and presents a high rate of recognition in a relatively stable environment.

In order to try to resolve the problem of luminosity in the interior, the transformed of Hough can be applied, to try to detect this way the outlines of the people (Wusheng, Mengfen, & Chunglin, 2008). It will be enough to analyze the different frames and make a statistic analysis of the flow of people.

In the exterior, is where the most number of complications show up, because the exterior conditions are variable and occlusion situations can appear. Nevertheless, a study of the number of people in an open area, such as a park or station, can be made. All this, with the advantage of using a single camera (Nguyen, Huynh, Ba & Dinh, 2012), with the consequent low cost that this will mean. (see Figure 1)

IR Spectrum

Unlike the visible spectrum, the infrared is a type of light that cannot be perceived by the eye, because it can only see what it is called as visible light. The infrared light offers us special information that cannot be obtained with the visible light.

The infrared sensor is an electronic device capable of measuring the body´s infrared radiation, due to that they are situated in the range of the spectrum just underneath the visible light.

Figure 1. Images in visible spectrum