MOVING HUMAN OBJECT TRACKING, ESTIMATION, BACKGROUND SUBTRACTION AND SHADOW REMOVAL TECHNIQUE

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ABSTRACT

In this paper we present the technical advances and system development for multiple human objects tracking on motion estimation, background subtraction and shadow removal technique. It includes technique which corrects errors in the image after shadow removal using a reconstruction process. Most shadow detection and segmentation methods are based on image analysis. Shadow detection and removal in various real life scenarios including indoor our door scenes and computer vision system remained a challenging task.

A reference frame is initially used and considered as background information. While a new object enters into the frame, the foreground information and background information are identified using the reference frame as background model. Most of the times, the shadow of the background information is merged with the foreground object and makes the tracking process a complex one. The algorithm involves modeling of the desired background as a reference model for later used in background subtraction to produce foreground pixel which is deviation of the current frame from the reference frame. In the approach morphological operations will be used for identifying and removed the shadow. In our experiments, we evaluate both shadow detection and shadow removal results. For shadow detection the system detects and tracks the moving objects exactly. In this example we covert moving object into frame. Now one frame as a static background is considered thus it may suffer from dynamic scene change such as an extraneous event in which there are new objects deposited into the scene and become part of the background scene. Video sequences will be captured and will be detected   with the proposed algorithm.

Keywords: Human object tracking, shadow removal, morphology.

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1. INTRODUCTION

A shadow is an area where direct light from a light source cannot reach due to obstruction by an object. Shadow detection and removal is an important task in image processing when dealing with the outdoor images. Shadow occurs when objects stop up light from light source. Shadow often degrades the visual quality of images. Shadow an object with two type of shadow self-shadow and cast shadow. Self-shadow is objects itself and another is cast-shadow. Self-shadow usually have a higher brightness than cast shadows.

Human object tracking can be defined as the process of segmenting an object of interest from a video scene and keeping track of its motion, orientation, occlusion etc. in order to extract useful information. Moving object tracking process follows the segmentation step and is more or less equivalent to the 'recognition' step in the image processing. Detection of moving objects in video streams is the first relevant step of information extraction in many computer vision applications, including traffic monitoring, automated remote video surveillance, and people tracking.

In applications using fixed cameras with respect to the static background (e.g. stationary surveillance cameras), a very common approach is to use background subtraction to obtain an initial estimate of moving objects. Basically, background subtraction consists of comparing each new frame with a representation of the scene background significative differences usually correspond to foreground objects. Ideally, background subtraction should detect real moving objects with high accuracy, limiting false negatives (objects pixels that are not detected) as much as possible; at the same time, it should extract pixels of moving objects with the maximum responsiveness possible, avoiding detection of transient spurious objects, such as cast shadows, static objects, or noise.

In this paper, we present a shadow removal technique which effectively eliminates a human shadow cast from an unknown direction of light source. Our algorithm improves the shadow detection accuracy by imposing the spatial constraint between the foreground subregions of human and shadow.

The existence of human shadows is a general problem in tracking and recognizing human activities. Shadows not only distort the

color properties of the area being shaded but also complicate the edge structure of the figure as a whole. There are several factors that together determine the appearance of a shadow, for example, the view point of camera, the angle of incidence, the light intensity, and the number of light sources, etc. Further, under the sun, the dominant orientation of a human shadow changes as a function of time. Therefore, a human tracker becomes more prone to miss the target, and the motion pattern of a single action varies considerably.
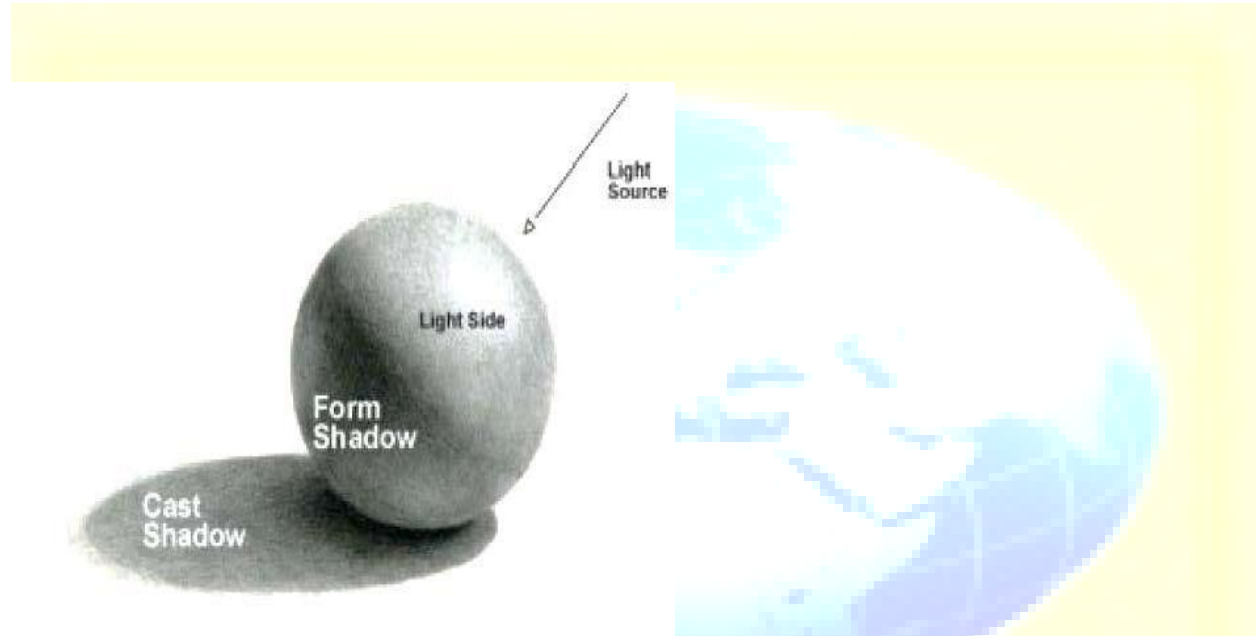

Fig 1: Shadows can be Broadly Divided into Cast and Self-Shadow

1.1 Shadow Removal approach

To remove shadow properly, average frame is computed to determine effect of shadow in each of the three dimensions of color. So the colors in shadow regions have larger value than the average, while colors in

non-shadow regions have smaller value than the average values. Images are represented by varying degrees of red, green and blue(RGB) Red, green and blue background are chosen because these are the colors whose intensities,

relative and absolute, are represented by positive integers up to 255. Then construct a threshold piecewise function to extract shadow regions. Pixel value is separated into high and low intensity, threshold is set to distinguish between self and cast shadow.

2. DESIRED IMPLICATION

2.1 Object Tracking

Object tracking can be defined as the process of segmenting an object of interest from a video scene and keeping track of its motion, orientation, occlusion etc. in order to extract useful information.

Basic steps in Human object tracking can be listed as:

1. Segmentation
2. Foreground extraction
3. Background subtraction
4. Camera modeling
5. Feature extraction and tracking

2.1.1. Segmentation

Segmentation subdivides an image into constituent regions or objects that have similar features according to a set of predefined criteria. Segmentation is the process of identifying components of the image. Segmentation involves operations

such as boundary detection, connected component labeling, thresholding etc.

2.1.2. Foreground extraction

Foreground extraction which identifies the location of object in the image. As the name suggests this is the process of separating the foreground and background of the image. Here it is assumed that foreground contains the objects of interest.

2.1.3. Background extraction

The motion detection system is the part of background subtraction that effectively extracts the shape of moving objects and subtracts average background from image. Once we know the background, extracting the foreground is matter of simple image subtraction.

2.1.4. Camera modeling

A camera is a device that capture image. Camera model is an important aspect of any object-tracking algorithm. All the existing objects tracking systems use a preset camera model. In words camera model is directly derived from the domain knowledge are required to adjust all the inputs. It needs the algorithm to model motion of all the cameras as well as to integrate results from all the cameras.

2.1.5. Feature extraction and tracking

Feature extraction methods of constructing combination of the variable to get data with sufficient accuracy. This extracts meaningful information. This is involves simplifying the amount of resources required to described a large set of data accurately. This is an area of image processing that uses algorithms to detect and isolate various desired portions of a digitized image. A feature is a significant piece of information extracted from an image which provides more detailed understanding of the image.

3. SHADOW REMOVAL TECHNIQUE

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Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A.
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3.1. Algorithm

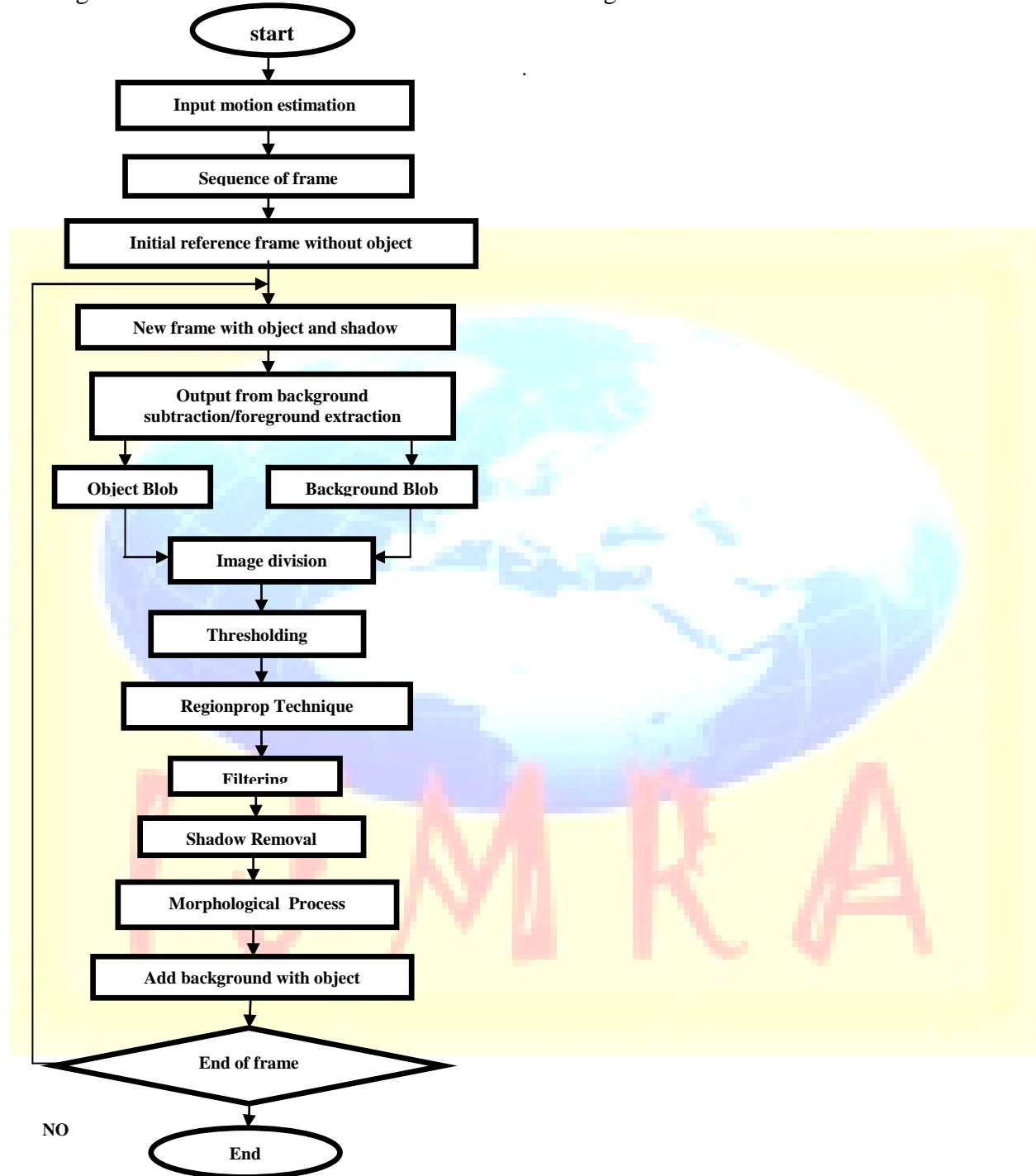The algorithm used to remove the shadow is shown in figure.

Fig 2-: Algorithm of proposed shadow removal technique.

3.1.1 Input motion estimation

In this application I using camera with respect to static background to an initial estimate of moving objects using camera.

3.1.2 Sequence of frame

The capture video converts into set of sequence of frame. The algorithm will process on each frame.

3.1.3 Output from Foreground Extraction /Background Subtraction

In this block the process of separating the foreground and background of the image on each frame, and subtract background and extracting the foreground is matter of simple image subtraction.

3.1.4 Object's blob and Background's blob

This is obtained from some background subtraction. Object blob is only part of image and background blob is shadow of that image. Both blob is input to the image division block.

3.1.5 Image Division

In this process, the object's blob is divided with the background's blob. It has been said before that the purpose of image division is to highlight the homogeneity property of shadows. Resultant image after the division process is multiplied with a constant for the purpose of increasing the signal of the resultant image.

3.1.6. Thresholding

Thresholding is used to change pixel values above or below a certain intensity value. The purpose of thresholding is to decide the shadow's blob in the resultant image after the image division process. In this proposed technique, the range has been set according to the scene and this is done by studying the histogram of the division image over a few samples.

3.1.7 Region prop Technique

Region prop is like a function to add mathematical functionality. The region prop function in matlab to get Major axis length of an image. I have some particles that I have identified in a larger image and need to parse into smaller images for each particle. I have used the region props Bounding Box function. Bounding box to draw a rectangle on the original image to return parameters value such as X, Y co-ordinates and Width and height of image of particles.

3.1.8 Filtering

The function of filtering is to suppress the high frequencies in image i.e. smoothing the image, noise reduction. The purpose of filtering is to enhance the resultant image after the thresholding process and to find the biggest blob which is predicted as the shadow's blob or shadow region. Filtering process include filling, erosion and dilation to enhance the image and labeling to predict the shadow. It is assumed that the biggest blob after the labeling process or connected component process as a shadow region.

3.1.9 Morphological Process

Morphological processing is constructed with operation on sets of pixels. Morphological is a tool for extracting image component that are useful in the representation and description of region shape such as boundaries, skeletons. Morphological is a broad set of image processing operation that processes images based on shapes. The most basic morphological operations are dilation and erosion.

3.1.10 Shadow Removal

In this work, we aim at finding a boundary which divides a human-shadow foreground blob into its ground truth subregions. We propose a 3-stage process to implement this idea. The first stage performs a binary classification on pixels of a foreground blob. Using the first stage classification results as intermediate ground truth, the second stage computes the linear boundary within the foreground blob that minimizes the classification error. For this purpose, pixel coordinates alone are used as a feature. We adopt a linear classifier to avoid the over fitting problem from a complex decision boundary. In other words, the linear classifier divides a foreground blob into human and shadow subregions by referring to stage one labeled pixel

locations. In the third stage, we in paint the detected shadow region with the estimation of an un shaded background.

3-: a) Original Image b) image with shadow blob c)Image with removed shadow**.**

4. EXPERIMENT RESULT

In our experiments, we evaluate both shadow detection and shadow removal results. For shadow detection the system detects and tracks the moving objects exactly. In this example we covert moving object into frame. Now one frame as a static background is considered thus it may suffer from dynamic scene change such as an extraneous event in which there are new objects deposited into the scene and become part of the background scene.

The algorithm performs well except on very large cast shadows where sometimes they are not completely removed. This is mainly due to the fact that brightness decreases below the brightness distortion (BD) threshold. The problem can be corrected using lower thresholds in the BD with the drawback of introducing false shadow pixel detection. See for instance in Fig. 3 and 4 a real world scenario**.** These images show the process of shadow removal and reconstruction. First one corresponds to the incoming image. The second one (the mask image) shows the original blobs extracted before any shadow removal attempt. The morphological operations are

used for identifying and removed shadow. See in the last picture the reconstructed image with original background.

Figure 4-:

a) Original Image

b) Gray level image

c)Shadow free image

d) Original background with removed shadow.

5. CONCLUSION

This paper represents the methodology to remove shadow for different background. It is an approach described capable of detecting motion and extracting object information which involves human as object. The algorithm involves modeling of the desired background as a reference model for later used in background subtraction to produce foreground pixels which is the deviation of the current frame from the reference frame. The deviation which represents the moving object within the analyzed frame is further processed to localize and extracts the information. This shows that it is possible to remove shadow from image without losing a large amount of pertinent data.

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