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Survey on SMART PRESENTATION USING GESTURE RECOGNITION

Soumya Varma[1]Nathasha.P.R[2], Meera Paulson[3],Silpa Davis[4]

[1] Assistant Professor,Dept. of CSE, Sahrdaya College Of Engineering And Technology Kodakara, Kerala,India
[2] B.Tech CSE, Sahrdaya College Of Engineering And Technology Kodakara, Kerala,India
[3] B.Tech CSE, Sahrdaya College Of Engineering And Technology Kodakara, Kerala,India
[4] B.Tech CSE, Sahrdaya College Of Engineering And Technology Kodakara, Kerala,India

Abstract: *This project deals with the development of an interactive projection technology , which provides more active and interesting viewing experience by recognizing the user's gesture in real-time. This project is a vision-based shadow gesture recognition method is proposed for interactive projection systems. The gesture recognition method is based on the screen image obtained by a single web camera. The method separates only the shadow area. Then hand shadows are isolated using the defect, convex hull, and moment of each region. Hand gestures are then distinguished .Using this method, a few interactive applications are developed. This project is implemented using Shadow interaction, Gesture recognition and image processing. In addition, in exhibition halls and museums, there is a trend toward using interactive projection systems to make viewing more exciting and impressive. They can also be applied in the field of art, for example, in creating shadow plays. The key idea of the interactive portable projection systems is to recognize the user's gesture in real-time. It's a great advance of technology which will make the presentations more attractive.*

Keywords: Shadow interaction; Hu moment; Gesture recognition; Image processing

1.INTRODUCTION

There have been the increasing demands for a more active and interesting viewing experience, and interactive projection technology has been considered as a solution to this issue. For example, if you can flip pages with a gesture when you make a presentation, or write a sentence without any manual tools, then the presentations can be more immersive and attractive to the audiences. An interactive projection system also helps people to produce more attractive artistic exhibits, such as interactive walls and floors. Lately, a lot of attempts have been made to use human–computer interaction in plays and musical performances. Namely, if appropriate events occur when an actor performs on stage, a better reaction can be obtained from the audience because such events are well synchronized with the actor's performance. Using this concept, new applications with interesting interactions are possible such as the magic drawing board or virtual combat simulation. From a technical standpoint, research on gesture recognition is a topic of interest in the field of computer vision. In particular recognizing gestures in real time is of paramount importance vision-based interactive projection system is proposed, which recognizes shadow gestures with proper precision. The process consists of detection and recognition modules of shadow gestures in real time, which are the core parts of the proposed system. Next, several novel applications based on the proposed system are presented to demonstrate the potential of the proposed method for use in various applications. Numerous studies have been conducted regarding interactive projection systems. In particular researchers are interested in generating events using hand gestures because the hand gestures can represent diverse shapes appropriate for recognition. Mistry et al. [1] proposed a portable interactive projection system, sixth sense, based on natural hand gestures. It provides a wearable gestural interface that allows the user to interact with digital information augmented around the user. The system consists of a portable projector, a camera and a mobile wearable device, which shows digital information on physical objects in real time. Grønbæk et al. [2] introduced an interactive floor support system using a vision-based tracking method. The system consists of a 12 m^2 glass surface with a projector that projects the glass upward. Limbs of users (children) are tracked and recognized for various interactions, which provide learning environments for children. Wilson of Microsoft Research [3] reported the prototype of an interactive tabletop projection-vision system, called play anywhere, which allows the user to interact with virtual objects projected on a flat surface. For

this interaction, the shadow-based finger recognition, tracking, and various other image processing are incorporated to provide a convenient but flexible tabletop projection-vision system. It consists of off-the-shelf commodities such as a camera, projector, and a screen that do not require any detailed configurations or calibration. Berard [4] developed the "Magic Table" for meetings. It has a whiteboard on the surface. It was developed to overcome the limitation of the current whiteboard by providing various operations such as copy, paste, translation, and rotation of the drawn contents. It consists of a projector, two cameras and a white board. The pen stroke and the contents on the board are captured by the cameras. The captured images are then processed to extract the position and the contents using various image processing techniques. Practically, this system allows the user to interactively create and control the contents

2.METHODOLOGY

The gesture recognition method is based on the screen image obtained by a single web camera. The method separates only the shadow area by combining the binary image with an input image using a learning algorithm that isolates the background from the input image. The region of interest is recognized with labeling the shadow of separated regions, and then hand shadows are isolated using the defect, convex hull, and moment of each region. To distinguish hand gestures, Hu's invariant moment method is used. An optical flow algorithm is used for tracking the fingertip.Fig. 1 shows the entire system consisting of a beam projector, a screen, a web camera and a computer. If a user creates a gesture, the shadow is created on the screen, which is captured by the camera. The computer then performs calculations in order to recognize the gesture through image processing. Next, the computer controls the beam projector to create an event at the proper place in real-time. The overall workflow of the proposed system is illustrated in Fig. 2. First, the computer receives an input image from the web camera. The image is processed to produce a binary image. Then, an AND operation is performed on the back-ground and the binary image in order to remove the back-ground. Shadows that are distinct from the background are detected using a labeling algorithm. The area of the hand can be obtained through curvature, a convex hull, and defect in each labeled area. The center of the hand can be recognized using the moment value. Invariant moments are used for gesture recognition. After the gesture is recognized, the shadow hand is traced by an optical flow algorithm.

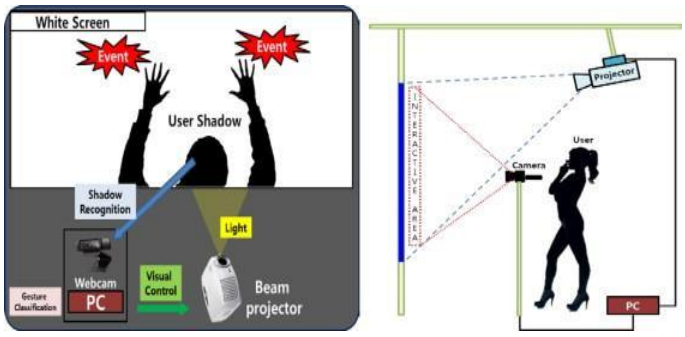

Fig. 1.
Overview of the system.

2.1 Separation And Detection Process:

Given an image, the shadow part is extracted using the background separation and shadow detection methods. Given an image, the shadow part is extracted using the background separation and shadow detection methods. The averaging background algorithm is used in order to distinguish between the background and the objects in an image. The algorithm is designed to generate a background model using the mean and variance of each pixel, and to delete the background based on the model.

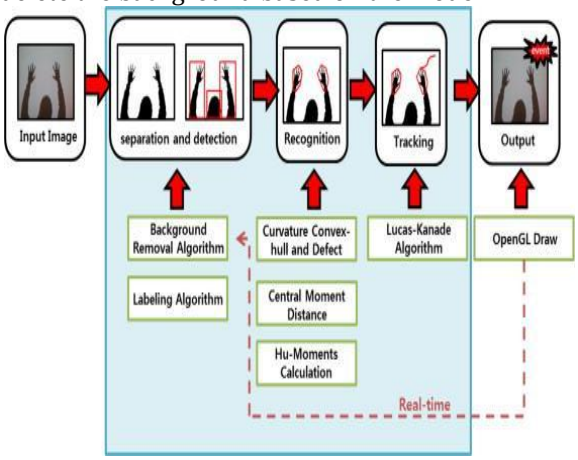

Fig. 2.
Shadow gesture recognition process.

The averaging background algorithm. It indicates that the shadow can be detected when the user's shadow appears after the background is recognized by accumulating the first 30 frames. The separated portions are divided with certainty by using a reverse binarization method provided through the open cv library[5].In addition, stationary

objects are recognized as belonging to the background, and only moving objects are detected because of the real-time updates.

2.2Recognition Process:

On the recognition of hand gestures, which may find a lot of applications in diverse areas. Detecting the hand region represented in shadows, however, can be limited in that the shadows do not have depth or color information. In order to overcome this limitation, this paper proposes a method of extracting the hand area only using convex hull and defect information. In order to extract the convex hull and defects, we need to determine the contours of the regions. The contour information is obtained using the Canny edge detection algorithm [6]. Many researchers have been studying and developing algorithms to search for convex hulls, such as Gift wrapping [7] and Quick hull [8]. The convex hull is the Shortest closed path including all points given a set of points. The Graham scan algorithm [9,10] was chosen for convex hull computation. The algorithm relies upon the principle that a point cannot be part of the convex hull when a triangle consisting of three points includes that point. To distinguish hands and other objects from the shadow, a new method that uses only the shape of the shadow is necessary because there is no depth or color information that can be utilized. Thus, we propose a method for extracting the hand area. Recognition algorithms are executed by calculating moments of ROIs. According to the uniqueness theorem [11], if it is assumed that the density distribution function f (x ; y) is piecewise and continuous, and therefore, a bounded function; it can have nonzero values only in the finite part of the x y plane, and then, the Moments of all orders exist. We extract the Hu invariant moments [12] use for the gesture recognition algorithm.The multiscale retinex algorithm is widely used for improving image differences [13]. The algorithm assumes that a scene in an image consists of two components, illumination and reflectance.

2.3Tracking Process:

We present a tracking algorithm to improve the recognition rate. Most tracking algorithms such as SIFT [14]or SURF [15] use feature points extracted from the image. However, there is no feature point in shadows because shadows only have binary images. In this paper, we use an optical flow algorithm proposed by Lucas and Kanade [16] to solve this problem. Optical flow indicates the relative movement as viewed by an observer. The optical flow in the image means that the speeds of position changes of the pixels in the frame are represented as two-dimensional vectors.

3.CONCLUSION

This survey presents a shadow gesture recognition method for use with an interactive projection system. it this paper provides a ground for various novel applications using the shadow gesture recognition concept and opens a new research topic related with an interface of a human with a virtual content. Various algorithms developed in this work can be used for engineering applications such as vision-based monitoring and management in a manufacturing site. For example, images of the current fabrication process are processed to obtain binary images, from which various features and shapes can be analyzed for checking the current status. Recognition using Hu invariant moments can be used for recognition of various products in the manufacturing process.

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