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Controlling Mouse Cursor Based on Image Processing and Object Detection

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Abstract:
Modern day computers greatly emphasize on Human Computer Interface (HCI) ie, User Interface and Experience. In this paper, an approach for Human Computer Interface is presented where it is tried to control using any object that can be viewed by webcam. The object can be anything. Mouse movement is controlled by the position of the tracked object. This method mainly focuses on the use of a Web Camera to develop a virtual human computer interaction device in a cost effective manner.

Keywords: Human Computer Interaction, Image Processing, Hand gestuere etc.

I.INTRODUCTION

Digital image processing is used, to detect object boundaries using Contour Tracking (Condensation Algorithm). Contour tracking methods iteratively evolve an initial contour initialized from the previous frame to its new position in the current frame. This approach to contour tracking directly evolves the contour by minimizing the contour energy using gradient descent.

II. RELATED WORKS

Different type of image segmentation and computer vision technology has been used to control mouse .Many research has been done with color recognition.

III.INTRODUCTION TO THE SYSTEM

In our work, it have been tried to control the mouse cursor movement by tracking any desired object through web camera. Here a real time video is captured using a Web-Camera. User has to drag and hold the object to be tracked and with Condensation algorithm the object will be tracked. The position of the image will determine the mouse cursor. The principal application is to detect and track the contour of objects moving in a cluttered environment.

IV. ALGORITHM FLOW

•Capturing Real Time Video using Web Camera.

•Processing individual image frame.

•Flipping of each image frame.

•Selection of object to be tracked.

•Initialisation of position of mouse cursor.

•Finding the object using condensation algorithm.

•Finding the centre of the tracked object.

•Finding the displacement of the object from previous frame as reference.

•Moving the mouse cursor in proportion to the displacement of the object.

•Again the process will start from processing individual image frame.

•4.1 Capturing real time video using web camera: For this system we need a sensor to detect and track the object. The web cam will serve the purpose of the sensor; it will capture the real time video at a fixed frame rate and resolution which is determined by the hardware of the camera.

•4.2 Processing individual image frame: The real-time video captured by the web camera a need to be processed, i.e the image need to be enhanced to avoid other noice and disturbances in the image.

•4.3 flipping of each image frame: When the web camera captures an image frame the image is inverted, i.e on moving the tracked object to the left the mouse pointer will move right. So flipping the image frame is mandatory for further processing the image.

•4.4 Selection of object to be tracked: The object to be tracked should be in the visible range of the web camera. The user has to drag and hold the image output of the video then the system will identify the contours and will start tracking the object.

•4.5: Initialisation of the position of the mouse Cursor: The mouse cursor's position will be initialised after the object is tracked and it will start its movement according to the position of the tracked object.

•4.6: Finding the object using condensation algorithm: Contour tracking is the detection of object boundary. Contour tracking methods iteratively evolve an initial contour initialized from the previous frame to its new position in the current frame. This approach to contour tracking directly evolves the contour by minimizing the contour energy using

gradient descent. Here the contour tracking is done by condensation algorithm.

•4.7: Finding the visual center of the tracked object: The visual center of the tracked object is calculated inorder to have a precission in the movement of the mouse cursor.

•4.8: Finding the displacement of the Object: condensation algorithm analyzes sequential video frames and outputs the movement of targets between the frames.

•4.9: Moving the mouse cursor in proportion to the displacement of the object: The movement of the mouse cursor is 'x' times proportional to the movement of the tracking object. 'x' is dependent on the size of the object. 'x' is directly proportional to the size of the tracked object.

V.OBJECT TRACKING

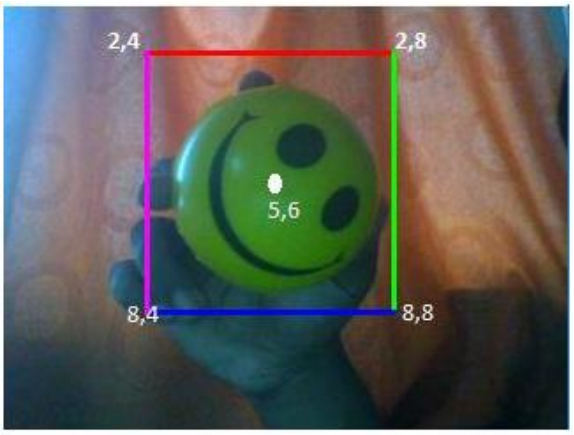
Video tracking is the process of locating a moving object (or multiple objects) over time using a web camera. It has a variety of uses, some of which are: human-computer interaction, security and surveillance, video communication and compression, augmented reality, traffic control, medical imaging and video editing. Video tracking can be a time consuming process due to the amount of data that is contained in video. Adding further to the complexity is the possible need to use object recognition techniques for tracking, a challenging problem in its own right. To perform video tracking an algorithm analyzes sequential video frames and outputs the movement of targets between the frames. There are a variety of algorithms, each having strengths and weaknesses. Considering the intended use is important when choosing which algorithm to use. There are two major components of a visual tracking system: target representation and localization, as well as filtering and data association.

VI. CONDENSATION ALGORITHM

The condensation algorithm (Conditional Density Propagation) is a computer vision algorithm. The principal application is to detect and track the contour of objects moving in a cluttered environment. Object tracking is one of the more basic and difficult aspects of computer vision and are generally a prerequisite to object recognition. Being able to identify which pixels in an image make up the contour of an object is a non-trivial problem. Condensation is a probabilistic algorithm that attempts to solve this problem. The algorithm itself is described in detail by Isard and Blake in a publication in the International Journal of Computer Vision in 1998.One of the most interesting facets of the algorithm is that it does not compute on every pixel of the image. Rather, pixels to process are chosen at random, and only a subset of the pixels ends up being processed. Multiple hypotheses about what is moving are supported naturally by the probabilistic nature of the approach. The evaluation functions come largely from previous work in the area and include many standard statistical approaches. The original part of this work is the application of particle filter estimation techniques. The algorithm's creation was inspired by the inability of Kalman filtering to perform object tracking well in the presence of significant background clutter. The presence of clutter tends to produce probability distributions for the object state which are multi-modal and therefore poorly modeled by the Kalman filter. The Condensation Algorithm in its most general form requires no assumptions about the probability distributions of the object or measurements.

VII.FINDING CENTER OF TRACKED IMAGE

The image tracked is tracked in an rectangular form to reduce computational complexity and processing time .The center of the tracked image is calculated. Let us assume the object is bounded in 4 different coordinates. The top left coordinate of the rectangle be (x1,y1) and the bottom right coordinate be (x2,y2) then the center of the rectangle is ((x2+x1) /2, (y1+y2)/2).



Here the tracked object is an yellow colour ball with x1=2, y1=4 and x2=8,y2=8 So, The centre point will be (2+8)/2, (8+4)/2 = (5,6)

VIII. CONCLUSION

In this paper, an object tracking based virtual mouse application has been developed and implemented using a webcam. The system has been implemented in Processing IDE using Boof CV library. This similar technology can be used in drones, structure modeling, simmulation, augmanted reality and biomedical fields.

IX.REFERENCES

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