“INTERACTION WITH THE COMPUTER USING VIRTUAL MOUSE AND VIRTUAL KEYBOARD”

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Abstract:
Recent changes in Technology have revolutionized Interaction between the computer world and its applications. The focus of Human Computer Interaction is to provide intercommunication between the user and the computer by making computer more easier to the user needs and allowing the user to interact with the information using natural hand gestures using gesture recognition, Augmented Reality, Computer Vision, with Virtual Keyboard, Gesture placed in Database for commands which will be initially trained for storage using machine learning algorithm. The corresponding commands access the operation from the gestures that is given as an input through colored caps which is indentified by the camera connected to a Computer.

Keywords: Camera, Gesture recognition, Pattern analysis, Computer Vision, Augmented Reality, Virtual Keyboard.

Introduction:
Gesture Technology is a revolutionary way to augment the physical world directly without using dedicated electronic chips. Gestural interface provides seamless access to the physical world around us with digital information and lets the users to use natural hand gestures to interact with the digital information through it. This technology gaining its popularity strength because of the usability, simplicity and ability to work independently in today’s scenario. Many other modern technologies are available which are widely used like touch
screen, touch pads, multi touch interfaces that not only saves the utilization time but increases the ease of usability too. The implementation of the prototype is done basically using a camera that is present in the laptop computer. Camera acts as a digital eye that captures Gesture, Patterns. The gestures are given through marker technology, Firstly we detect pre-registered markers based on normalized correlation co-efficient then we track the marker motion by employing the contrast invariant Mean Shift algorithm that in turn tracks marker. The set of templates is previously stored in database. The Camera that is used captures the Gestures given through colored caps and follow the user’s hand gestures, Once after the gestures are given it is mapped with the template database and performs pattern matching and particular user interface and applications are displayed. To evaluate the performance of the proposed interaction system, we implement ‘Drawing’, ‘Virtual Keyboard’, ‘Map’, ‘Gallery’, ’weather’, ’clock’, ’e-mail’ etc., experimental results demonstrate that the proposed gesture interface provides better interaction performance and easy access to the applications. Further the accuracy of the gesture interface can be enhanced by machine learning algorithm. Thus, supporting real time user interaction.

**Proposed system:**

Figure 1 shows the architecture of proposed user interaction system which uses live video information from the camera as a input. The proposed system requires an activation procedure which turns on the camera so as to operate the camera module of the user request. In this project activation is performed by executing the code on the desired platform. When the camera is activated it process the frames with respect to the resolution of the camera to adjust the qualities. By detecting and tracking the markers in this frame, the control system analyze the event. This information is transferred to the user interface module. Finally, applications can be controlled.
Figure 1 The overall architecture of the proposed gesture interaction system

**Input module:**

Camera acts a Digital eye that captures scene to generate raw frames which is expressed as fps (frames per second). A webcam is a video camera that feeds or streams its image in real time to or through a computer. When "captured" by the computer, the video stream may be saved. Computer vision techniques are been employed for camera-based user interface it provides users a novel experience. To acquire confirm information by camera-based user interface color detection method is used and object tracking method are used.

**Control System Module:**

The color markers are activated by identifying the RGBY colors based on their threshold values. The touchless user interaction system is based on marker detection and tracking for real-time applications. We first register a user defined marker pattern then we detect the pattern based on computer vision techniques then track the markers using invariant mean shift algorithm to extract control information under varying contrast and scale conditions based on their threshold values. Let M, N, O, and P be the markers which is pre-registered that is shown in the figure 2. In the detection module we detect the markers therefore we detect the matching color markers.
User Interface Module

The user interface is developed in .NET platform using visual studio. The user interface is basically interacted using color markers that are present at the tip of user's fingers. Once after the markers are detected the gestures are given as an input. A set of pre-loaded 2D deformable templates that are present in the template database matches with the given gesture to open particular application.

Virtual keyboard is also used to interact with the user interface, the operation is done by clicking the keys that are present in the virtual keypad. The applications are displayed by clicking the corresponding keys.

Output Module

The Events that occur has to be interacted necessarily and enable the users to perform their desired actions like cursor movement, click, scroll, zoom (zoom in and zoom out), Rotate, resize, Tile in and Tile out. Therefore to support touch less user interaction more intuitively.

CLICK: The click interface is necessary to perform their desired action. A single click operation consist of pushing the button and releasing it, in our interface, the clicking is done by flicking the color markers present in the fingers.

SCROLL: In computer graphics applications scrolling is sliding text, images or video across a monitor or display. "Scrolling", as such, does not change the layout of the text or pictures, but incrementally moves (pans or tilts) the user's view. A common special effect is to scroll credits, while leaving the background stationary.

RESIZE: Image scaling is the process of resizing a digital image. Scaling is a non-trivial process that involves a trade-off between efficiency, smoothness and sharpness. As the size
of an image is increased, so the pixels which comprise the image become increasingly visible, making the image appears "soft". Conversely, reducing an image will tend to enhance its smoothness and apparent sharpness.

ZOOM IN AND ZOOM OUT: To detect zoom-in / zoom-out operation by pinching the color markers and dragging in to perform zoom-in operation and zoom-out operation is performed by pinching out the color markers. Zooming an image, it is possible to discover the information in the image that already exists, and image quality inevitably suffers. However there are several methods of increasing the number of pixels that an image contains which evens out the appearance of original pixel. Zoom is a method of decreasing the apparent angle of view of a digital zoom is accomplished by cropping an image down to central area with same aspect ratio as that of the original image.

ROTATE: The rotation operator performs a geometric transform which maps the position $(x_1,y_1)$ of a picture element in an input image onto a position $(x_2,y_2)$ in an output image by rotating it through a user-specified angle $\theta$ about an origin $0$. In most implementations, output locations $(x_2,y_2)$ which are outside the boundary of the image are ignored. Rotation is most commonly used to improve the visual appearance of an image, although it can be useful as a preprocessor in applications where directional operators are involved. Rotation is a special case of affine transformation.

The rotation operator performs a transformation of the form:

$$x_2 = \cos(\theta) * (x_1 - x_0) - \sin(\theta) * (y_1 - y_0) + x_0$$

$$y_2 = \sin(\theta) * (x_1 - x_0) - \cos(\theta) * (y_1 - y_0) + y_0$$

Where $(x_0,y_0)$ are the coordinates of the center of rotation (in the input image) and $\theta$ is the angle of rotation with clockwise rotations having positive angles. (Note here that we are working in image coordinates, so the y axis goes downward. Similar rotation formula can be defined for when the y axis goes upward.) Even more than the translate operator, the rotation operation produces output locations which do not $(x_2,y_2)$ which do not fit within the boundaries of the image (as defined by the dimensions of the original input image). In such cases, destination elements which have been mapped outside the image are ignored by most implementations. Pixel locations out of which an image has been rotated are usually filled in with black pixels.
Working:

Our project is based on gesture recognition that are identified by the color markers these markers are identified by flood fill algorithm, the code is embedded within the software gestures with the use of webcam. The recognition system is based on marker detection uses an algorithm to detect the motion detection of markers. It uses OpenCV libraries for utilities like streaming input from webcam. The project is the combination of live motion detection and gesture identification. This application uses the webcam to detect gestures made by the users and perform basic operation accordingly.

The use has to perform particular gesture, the webcam captures and identifies the gestures recognizes it against a set of known gestures that are placed in the database and performs action according to the corresponding applications.

This project essentially has different modules

- Taking input from the webcam and converting into 2D deformable templates.
- Recognizing the gestures from the gesture database.
- Accordingly it intercepts the gesture
- The corresponding operation or application is performed.

Applications:

- Interaction with the computer using virtual mouse and virtual keyboard.
- Portability.
- Multi touch and multi use interaction.
- Provides gesture interface such as multi touch gestures, iconic gestures and free hand gestures.
Results and Conclusion:

Gesture based user interface technology is a science of tomorrow with the aim of making man-machine interface more intuitive. This technology can be used in positive ways especially by enhancing daily recognizes the objects around us, displaying information automatically and letting us to access it in any way we need by using free hand gestures. The gesture prototype implements several applications that demonstrate the usefulness, viability and flexibility of the system. Allowing us to interact with this information through natural hand gestures. The potential of becoming the ultimate "transparent" user interface for accessing information about everything around us. It could change the way we interact with the real world and truly give everyone complete awareness of the environment around us. The Gesture prototype implements several applications that demonstrate the usefulness, viability and flexibility of the system. It will definitely revolutionize the world.

Future Enhancement:

No longer are “computers” relegated to use in the home study or on an office desk. These days people travel everywhere with their smart handsets, personal media players, e-books and tablet PCs. The Touch less SDK is a set of .Net components that can be used to simulate the gestural interfaces of many devices using nothing fancier than an ordinary USB Webcam. Mouse movements and mouse click movements can be developed and these can be implemented for various gaming application. If the sensor could be made small enough, it may even find its way into cell phones and mobiles. The technology requires no special hardware and uses the standard camera that is already built into the advanced models to control functions and applications such as calls, music and video players, games, web browsing and other usability options.