Abstract

The Virtual Keyboard provides an interface for users to generate keystrokes that doesn't require a set of physical switches. Using finger tracking, color thresholding, and foreground segmentation, it is able to reliably track the user's keystroke gestures and produce a string of characters.

Procedure

1. **Threshold the Input Image**

By using a specific background color (in this case, green), we can instruct the DSP board to categorize any pixel within a certain color range as background. Any pixel not within that range is added to the foreground group.

2. **Segment Pixels in Each Key**

The largest foreground element in a given key's space should be the finger. Our algorithm searches through each key for the largest group.

3. **Identify the Fingertips**

Given that the user will use the keypad with the proper orientation, we can assume that the topmost row of the largest group will be the fingertip. In addition, our algorithm performs an area check to make sure that the identified group is large enough to be a finger, based on both its total area and its area compared to its height and width. If it passes the area tests, we pass the coordinates on to the gesture recognition function.

4. **Wait for the Finger Timeout**

To reduce false positives, our algorithm tests to make sure that an identified fingertip remains in the key's bounding box before performing gesture recognition.

5. **Perform Gesture Recognition**

Once the algorithm has identified and confirmed the presence of a fingertip, it measures the vertical velocity of the fingertip. If the velocity matches a movement model similar to a traditional keystroke (a sudden acceleration, followed by a stop), the algorithm generates a keystroke event based on the key the fingertip was identified in.