

Finger tracking in video using ridge detection

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Eye tracking is widely used in psychological research. There are many cases in which hand and finger tracking would be very useful. Fiducial markers on the fingers can be robustly tracked with a camera or electrical receiver, but this method requires special equipment, and may limit the subject's freedom of movement. Single-camera machine vision approaches are desirable for their use of non-specialized hardware, and usability in unrestricted environments, but the algorithms for these approaches are not well developed. We have adopted a ridge detection algorithm, previously found useful for medical image analyses, to enable robust finger tracking. Ridge detection is distinct from edge detection. It operates by computing the local second derivative in the direction orthogonal to the local image gradient. We used this method to quantify how long peoples' fingertips are in contact with parts of the stimuli, and how quickly the fingers are moving: analyses analogous to those done using eye tracking. Benefits of our approach are that we do not need fiducial markers or special cameras, and our algorithm is effective in a relatively uncontrolled environment. Our results suggest that ridge detection, used in combination with previous approaches such as edge detection and hue segmentation, could provide psychological researchers with an effective tool for hand and finger tracking.

The left picture is the original, unprocessed image from our experiment. The right is the processed image, with the black dots indicating the output: note that the output selects the two finger pads.

