Static and Dynamic Hand Gesture Recognition Using a Webcam

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Motivation/Applications
• Current human-computer interfaces not intuitive enough
• Hand gestures more natural than mouse/keyboard
• Human-robot interaction in future

Static Gesture Recognition
• Objective – recognize hand position and pose from webcam image
• Four poses – fist, one, two, palm
• Based on object detection with a trained classifier (random forest classifier)
• HOG descriptor

Dynamic Gesture Recognition
• Cursor control
• Objective – extract mouse position and state (clicked, unclicked) from image
• HOG descriptors performed poorly
• Subproblems
  • Skin detection
    • YCrCb color space
    • Bayesian classifier with spatial priors
  • Fingertip detection
    • K-curvatures of hand contour
  • Hand center position (cursor position)
    • Centroid of hand bounding box

Skills and Knowledge Gained
• How to approach computer vision/classification problems
• C++ and OpenCV
• Classification algorithms
  • SVM, Random forest, Adaboost, Bayesian
• Feature description
• HOG descriptor
• Image processing
  • Color spaces, morphological operations (dilation/erosion), contour detection, color histograms
• Noise reduction
  • Kalman filter

References
Random forest image: http://www.iis.ee.ic.ac.uk/~tkkim/iccv09_tutorial.html

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