Static and Dynamic Hand Gesture Recognition Using a Webcam

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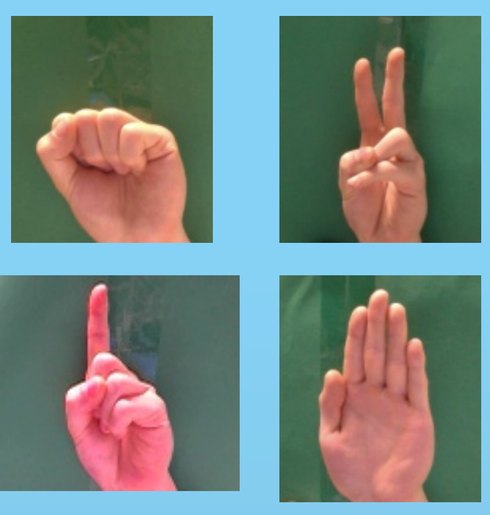
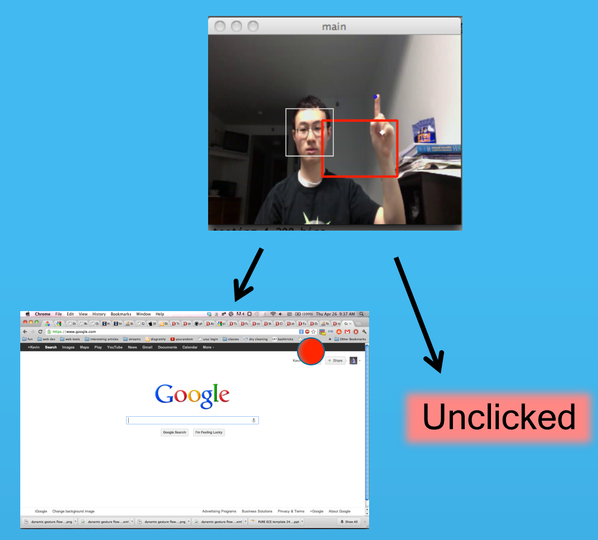


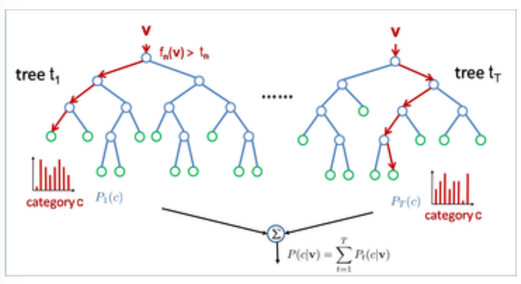
Motivation/Applications

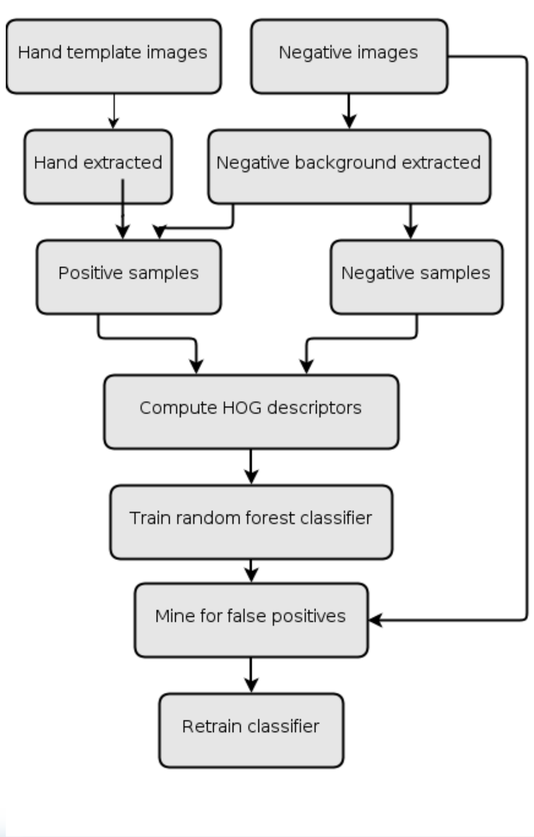
- Current human-computer interfaces not intuitive enough
- Hand gestures more natural than mouse/keyboard
- Human-robot interaction in future

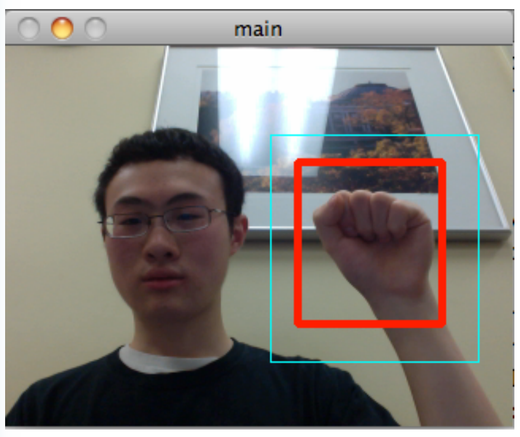


Static Gesture Recognition

- 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

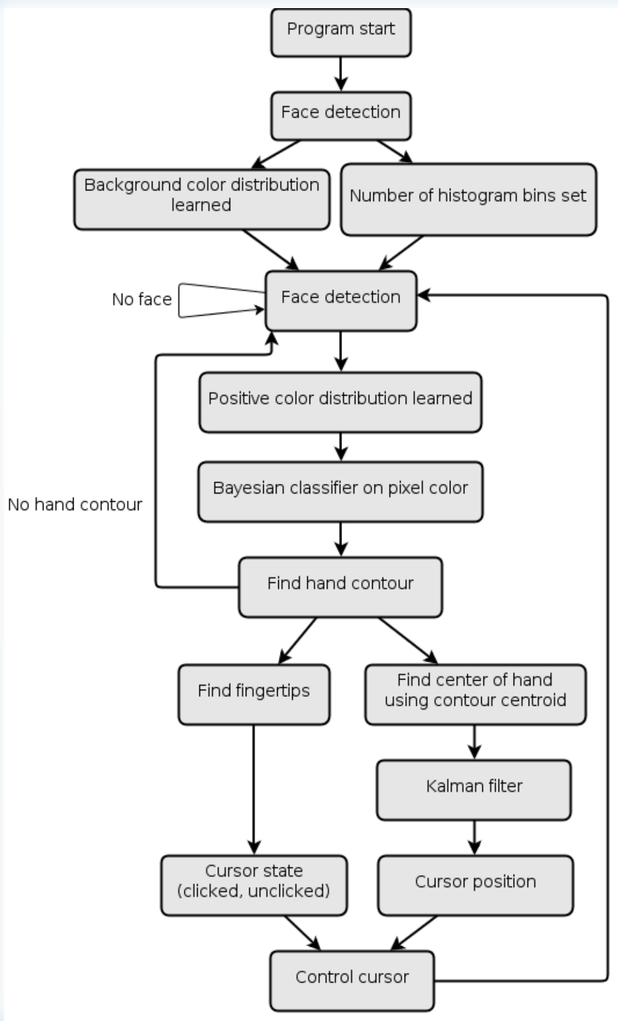


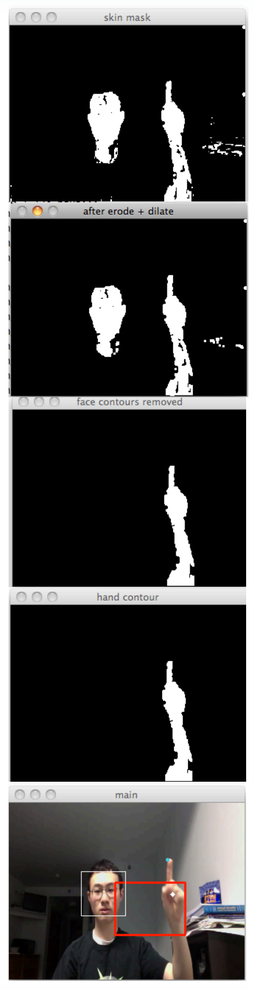




Dynamic Gesture Recognition

- 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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