Hand Detection Using Color Recognition

Object Tracking and Gesture Recognition - Shortened Version

Simen Andresen, Martin Stokkeland, Vegar Østhus

June 29, 2013

Gesture Recognition

Description

- Human Machine Interaction (HMI)
- Basic framework for hand gesture recognition
- Based on color recognition

Flowchart

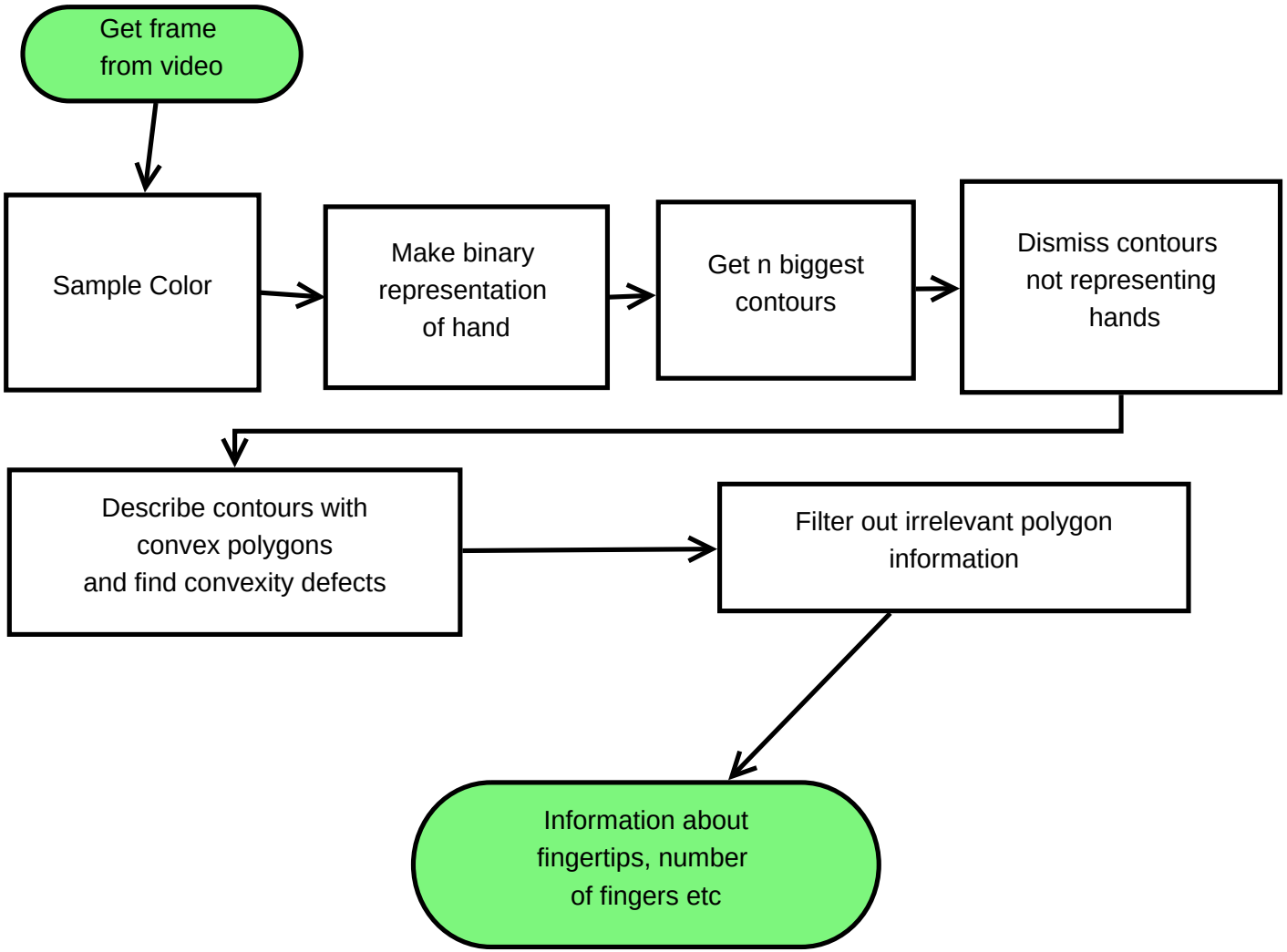


Figure: Basic flow of hand recognition

Sample Color

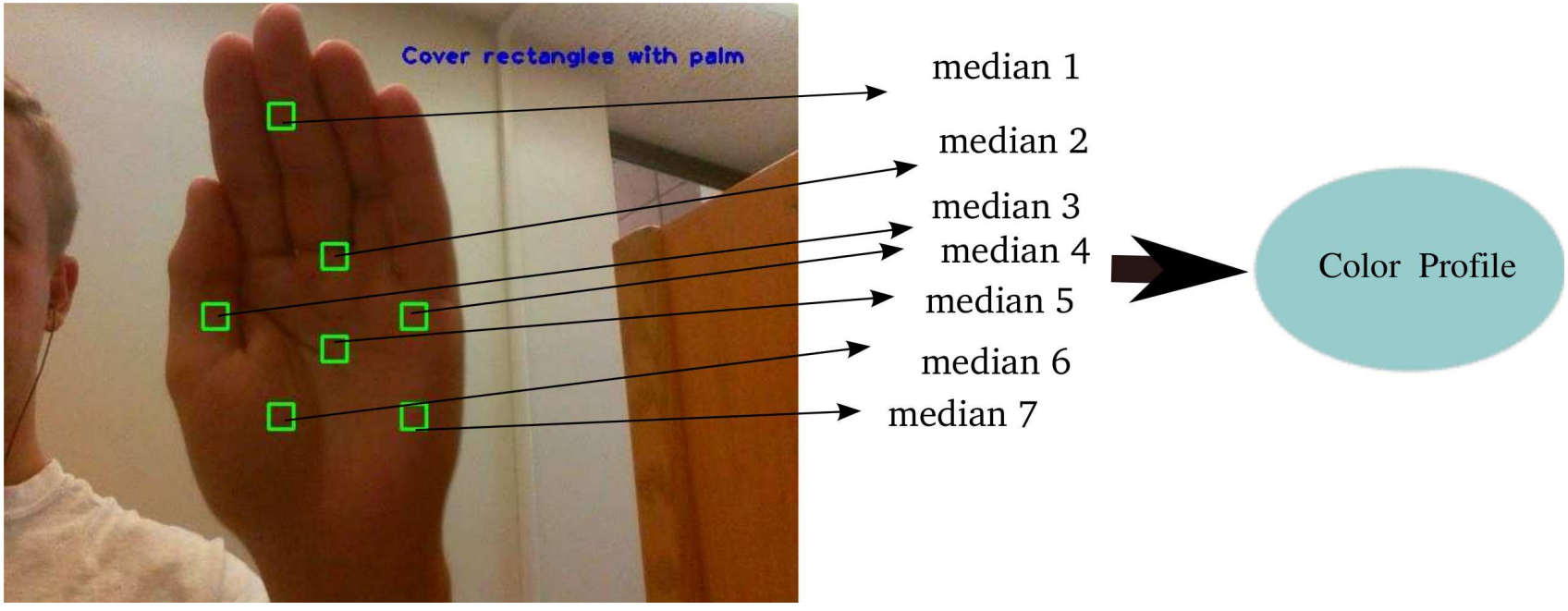


Figure: Making a color profile of hand, based on median color value sampled from different areas of the hand

Make binary representation and extract relevant contours

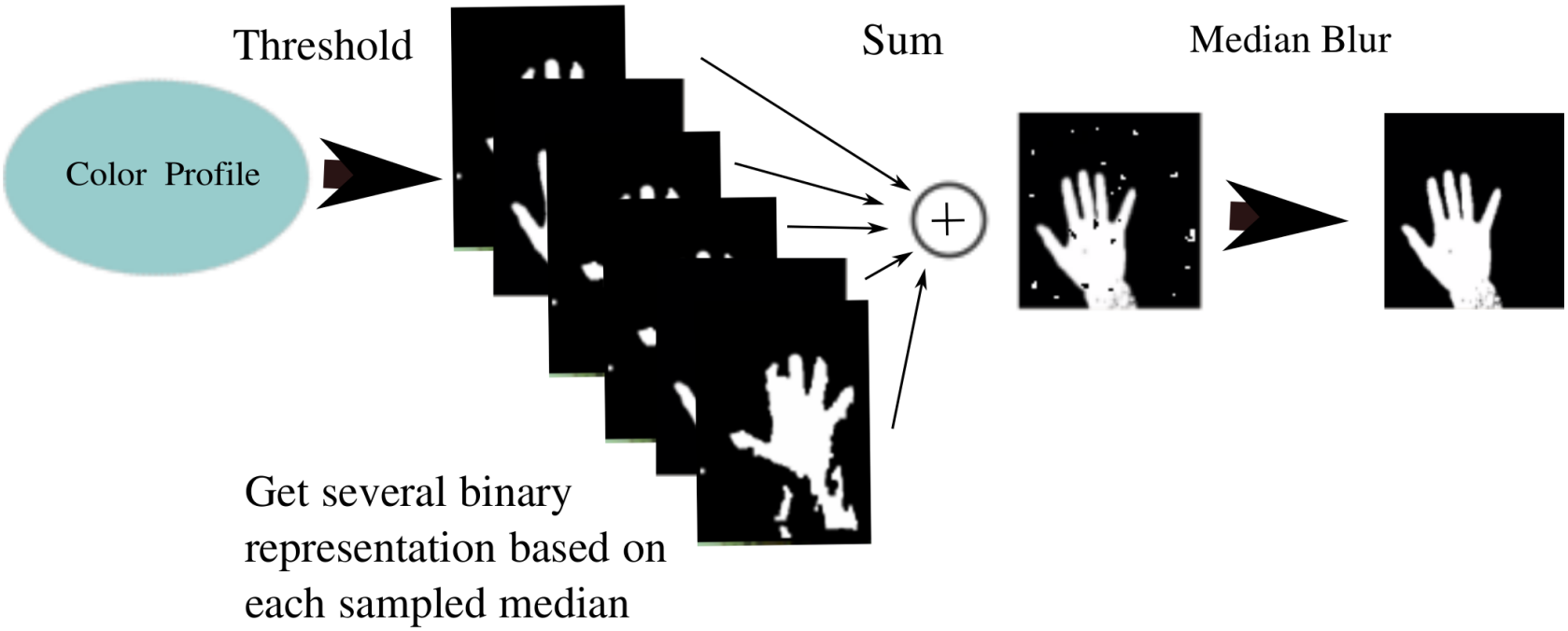


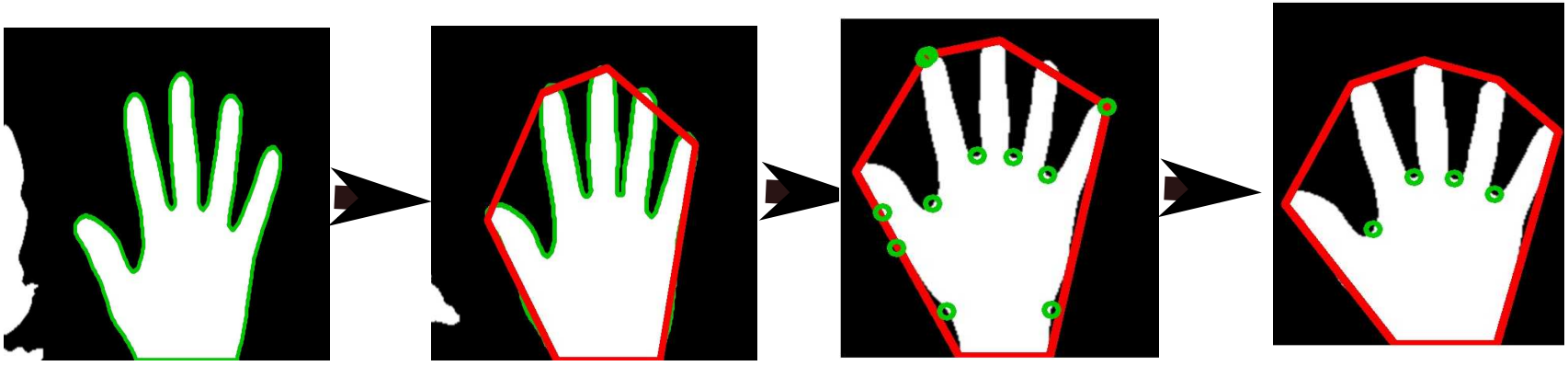
Figure: Extract hand based on color recognition. Compute one binary image based on each sampled median and sum the binary images together. Finally filter the result with the nonlinear median blur filter

Analyzing contour - geometric approach

Get Convex Points in contour

Get points furthest away from each convex vertex (convexity defects)

Filter out convexity defects not relevant



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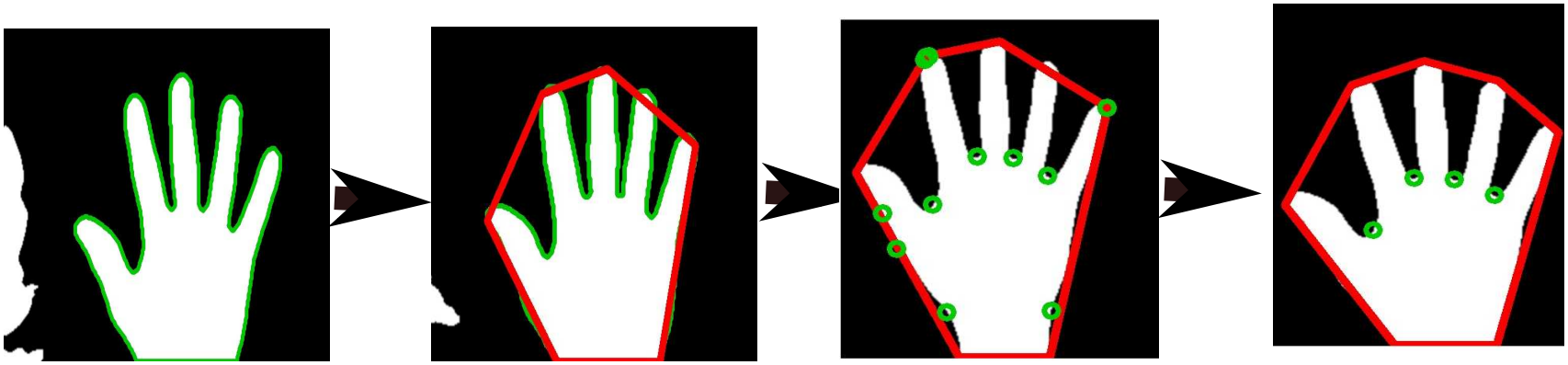
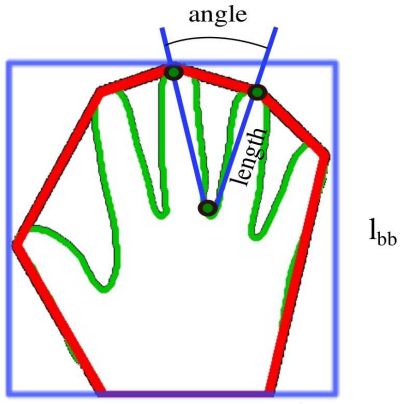


The properties that determines whether a convexity defect is to be dismissed is the angle between the lines going from the defect to the convex polygon vertices



Dismiss convexity defect if

$$length < 0.4 l_{bb}$$

$$angle > 80^{o}$$

Result of Hand Analysis

The analyzis results in data that can be of further use in gesture recognition:

- Fingertip positions
- Number of fingers
- Number of hands
- Area of hands

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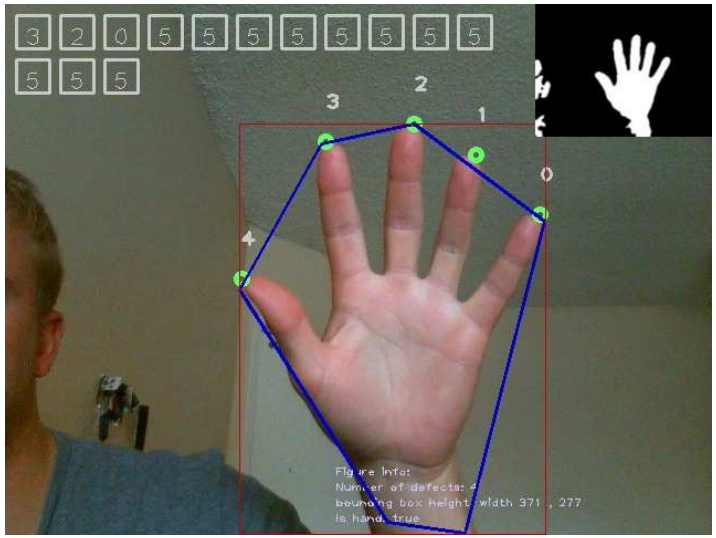

Figure

Further work and limitations

Things that needs improvement

- Still need to tune the threshold for extracting skin colour
- For finger tracking one would need to identify each finger individually

Limitations

- Overlapping objects
- No memory
- Noise and lighting sensitive
- Camera sensitive
- Manual calibration

Suggestion for further work

- Use memory/Kalman filter (merge programs)
- Use adaptive methods for tuning the parameters for the threshold