

Using Gesture Recognition to Navigate Google Chrome

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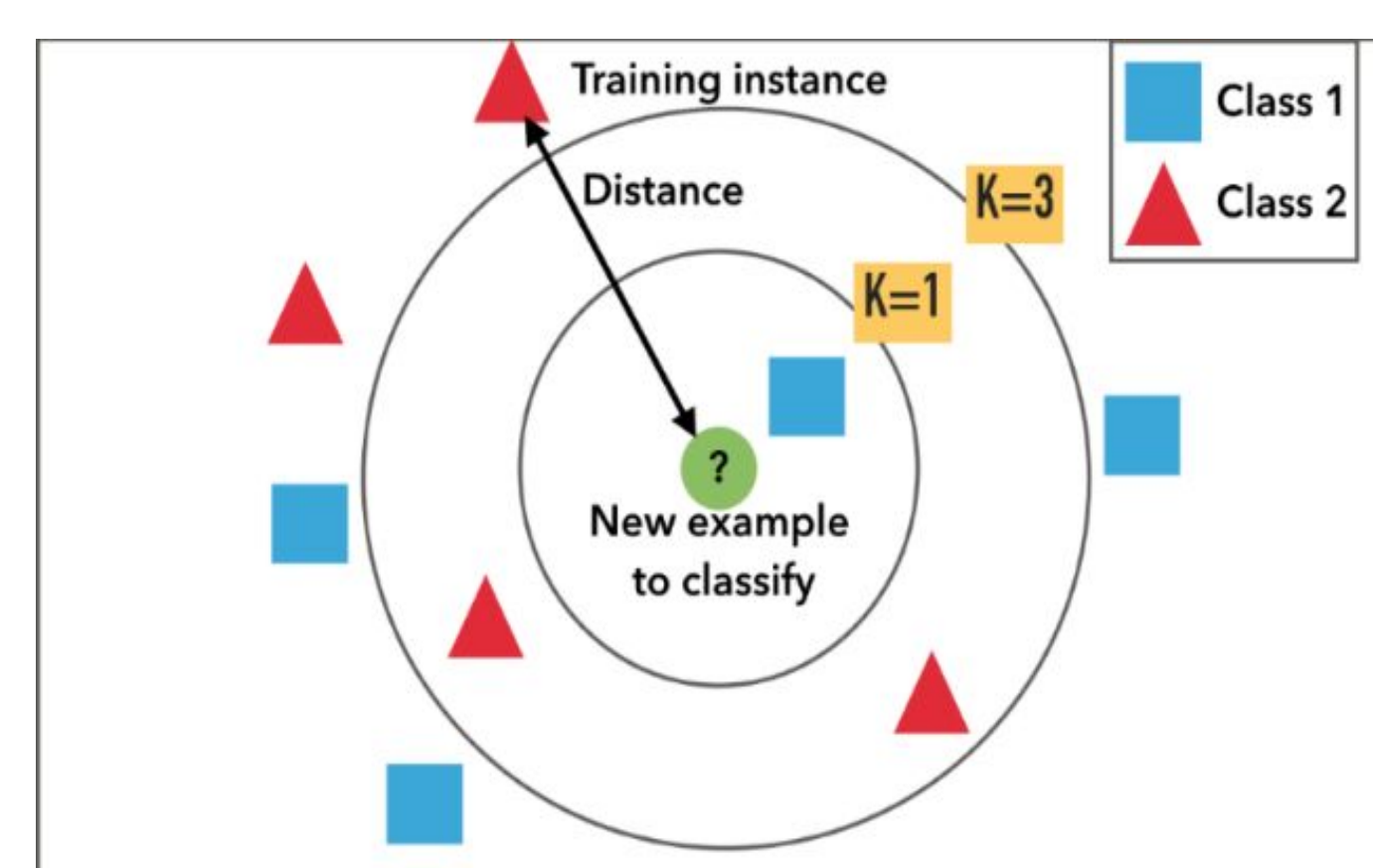


Motivation and Background

- Humans frequently use hand gestures and body language to aid in communication [1]
- Developing a static gesture recognition system is a complex challenge in computer vision
- Main question: using just a laptop, how can I develop a gesture recognition system that works in real time?
- Minimal work in using gesture recognition with the browser
 - Chrome Gesture Control (has issues using webcam) [2]
 - Hand-Web-Browser [3]
- Other hardware options are more robust, but at an expense

Tools

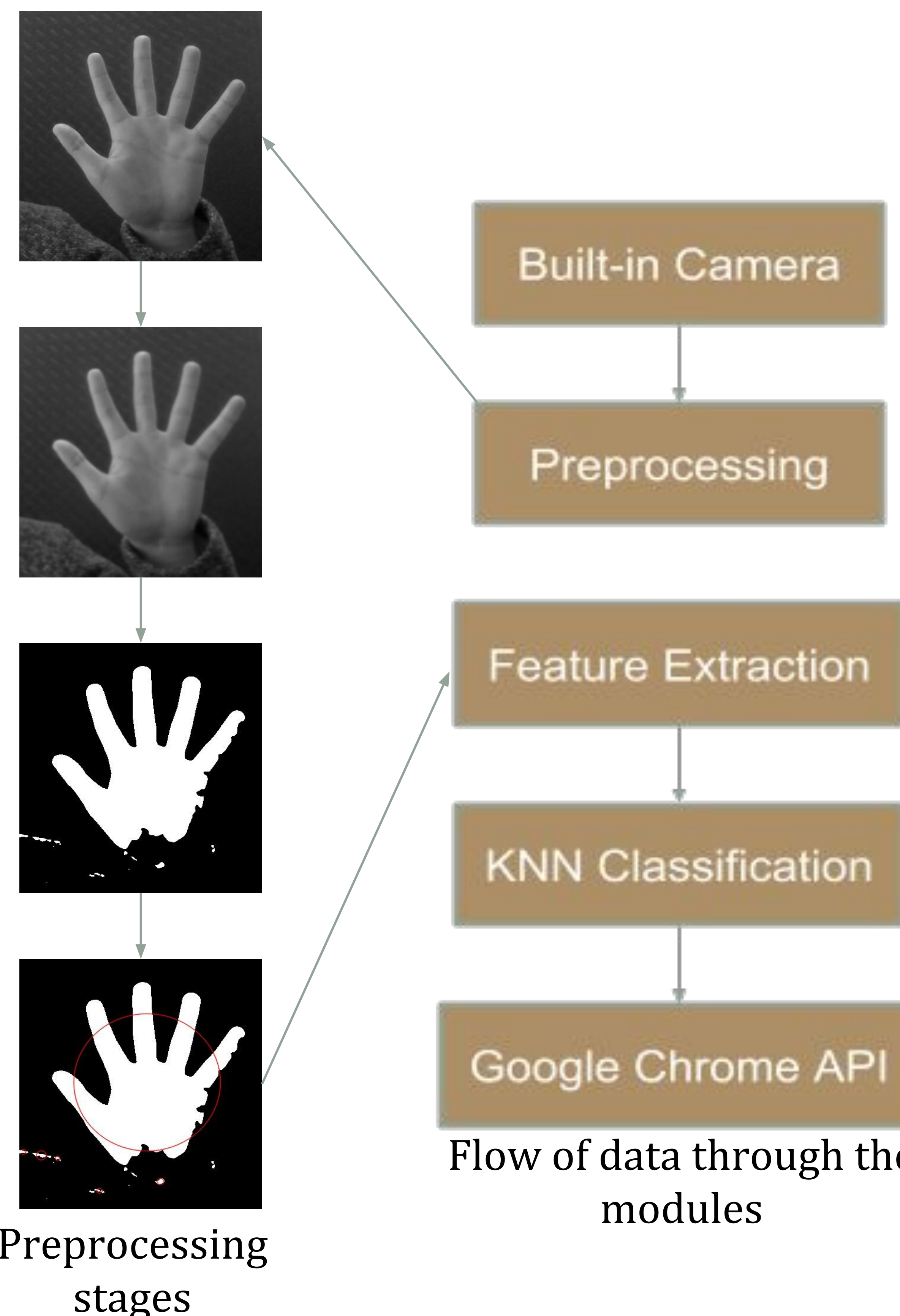
- I utilized an open-source library called OpenCV because it could handle
 - real-time video
 - object detection
 - image processing
- Using Scikit-learn's KNN classifier to predict gestures
- Google Chrome API to make extension



K-Nearest-Neighbors Classification

Methodology

- Live video is passed to the preprocessing stage
- Video is converted into grayscale, blurred, overlaid with a binary mask, and keypoints are found
- After each frame is preprocessed, keypoints are drawn on the image
- The largest white area is the hand
- Circularity, centroid, and convex hull are features being extracted from the keypoints
- These features are passed to the classifier, and the gesture is predicted based on the training set



Flow of data through the modules

Preliminary Findings

- KNN is computationally expensive and requires a significant amount of memory during the prediction stage
- Latency is expected during preprocessing and prediction stages

Next Steps and Future Work

- Finish tweaking classifier
- Google Chrome extension
- Increase functionality
 - Allow for mouse control
 - Open/Close browser
- Pair with facial recognition
- Use different classification method

References

1. A. Kendon. Gesture: Visible Action as Utterance. Cambridge: Cambridge University Press. 2014.
2. D. Ross. Chrome Gesture Control. 2014.
<https://github.com/daveross/chrome-gesture-control>
3. S. Malani. Hand-Web-Browser. 2018.
<https://github.com/ShivamMalani/Hand-Web-Browser>

Acknowledgements

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