



Handy Dandy Tracking – A simple hand gesture recognition system

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Hand gestures are a promising, but unexplored way of interacting with digital devices. At present gesture recognition systems are based on machine learning, probabilistic methods or specialized hardware, and not on understanding the configurations and transformations of the hand itself.

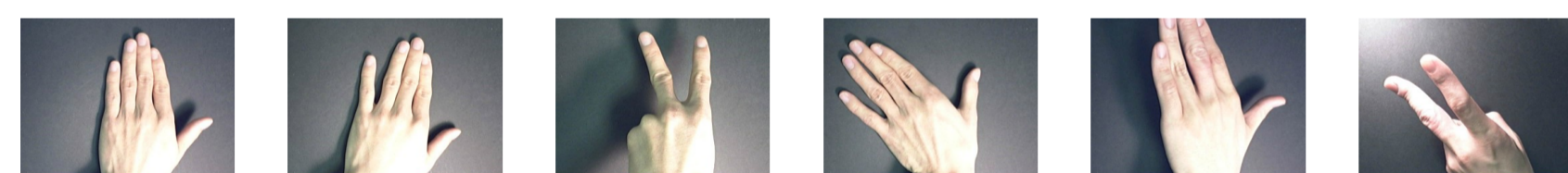
Using a webcam, our approach filters out most of the incoming information, keeping only the geometrical relations between the biological features that define the hand state: closed, partially open and open. Indeed, our system tracks the ends of tendons in the hand, which determine the range of motion of the fingertips and their relative positions.

PREVIOUS WORK

- Complexes approaches



With hardware: depth cameras, sensors/markers



With machine learning

- Simple approach

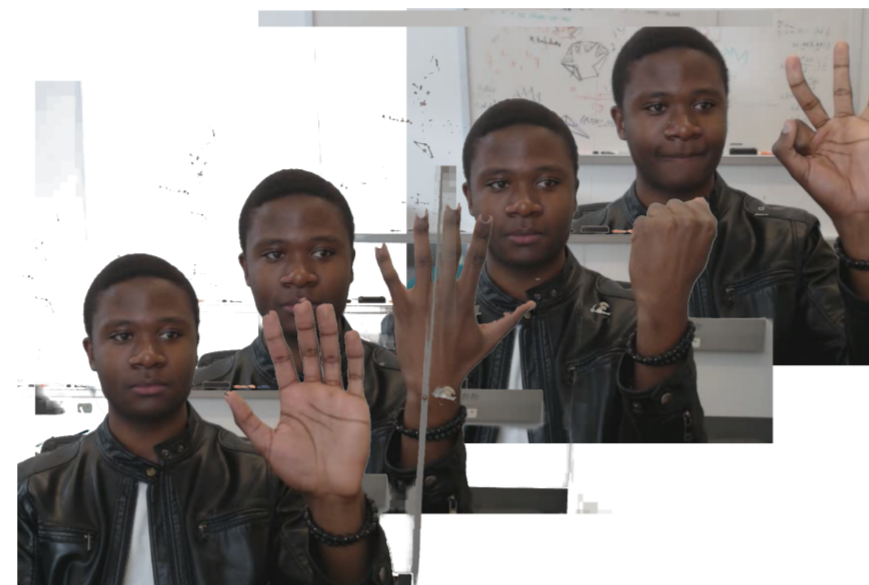


With computer vision

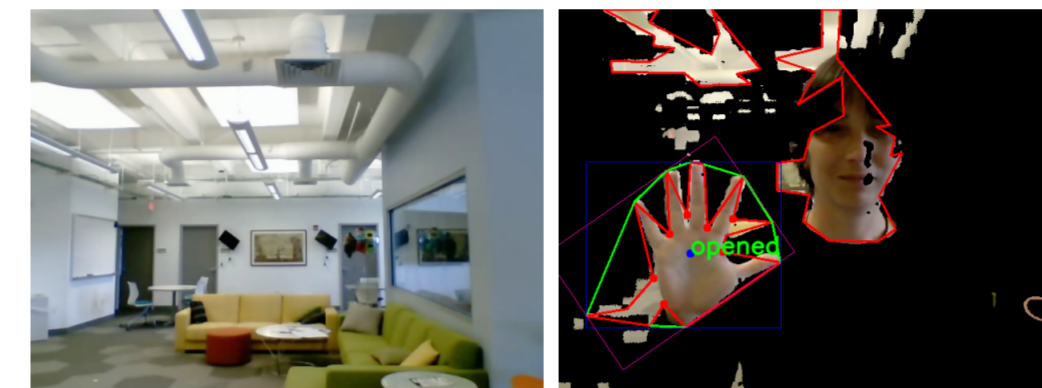
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CHALLENGES

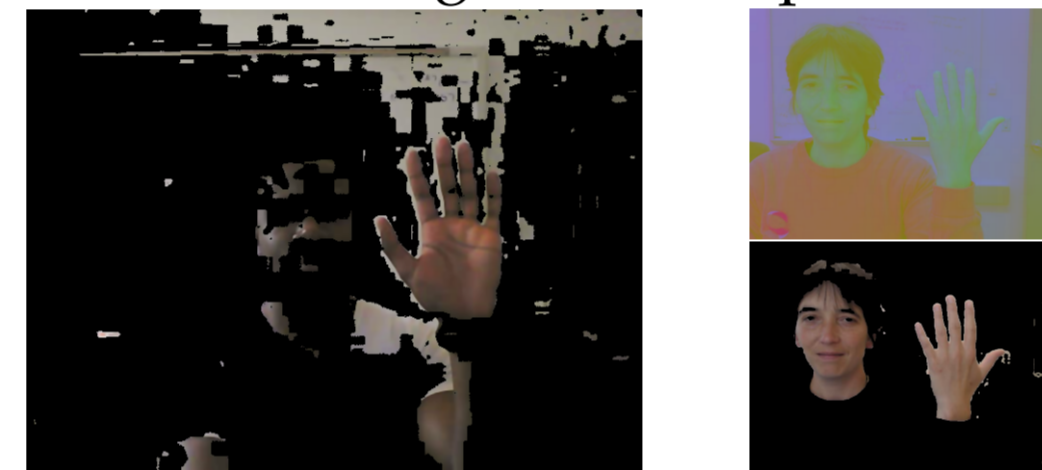
Video stream



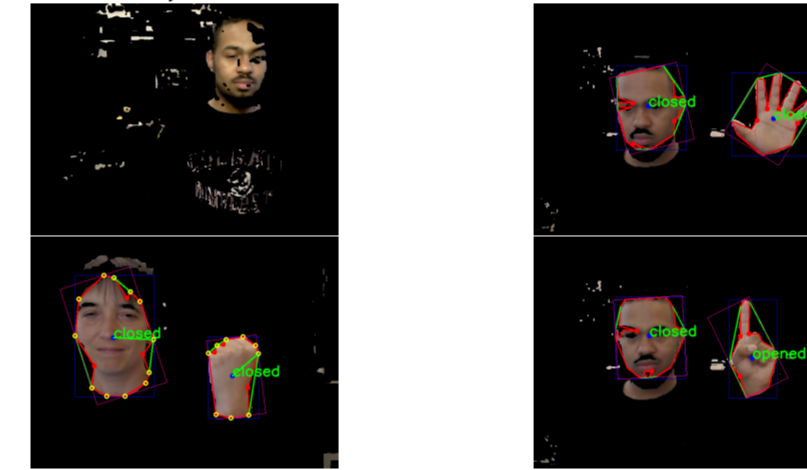
Environment: background & lighting complexity



Skin color range & color spaces



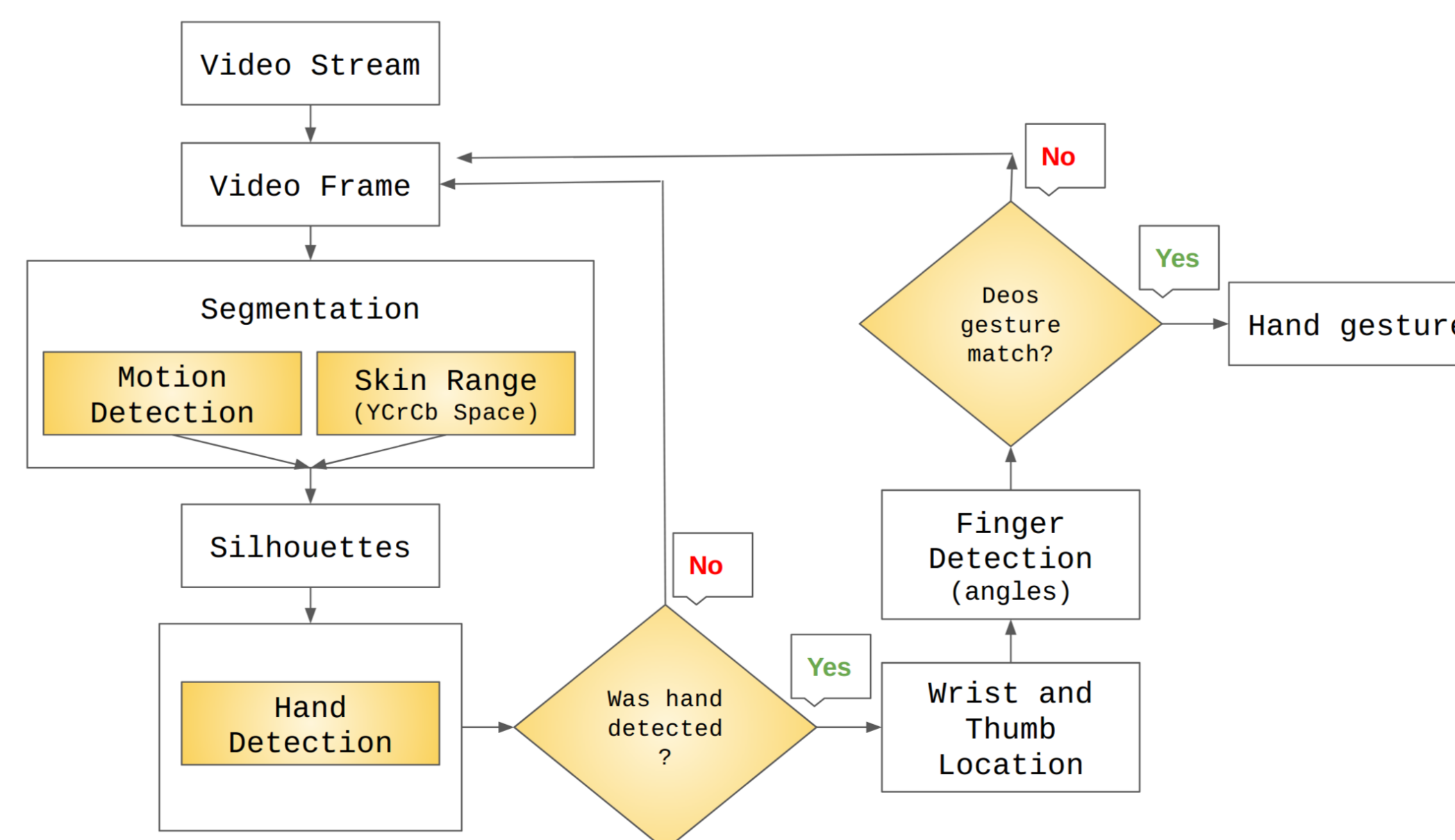
Zero, one or two skin areas



- Different hands: orientations, poses & types

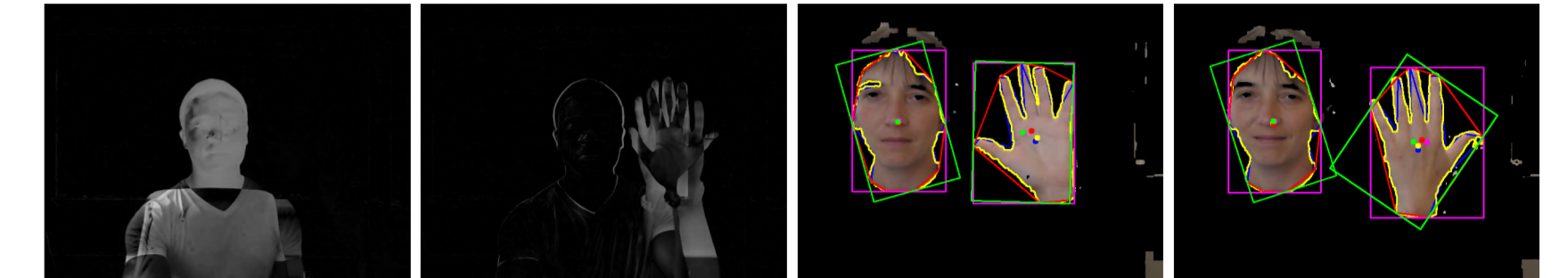


IMPLEMENTATION

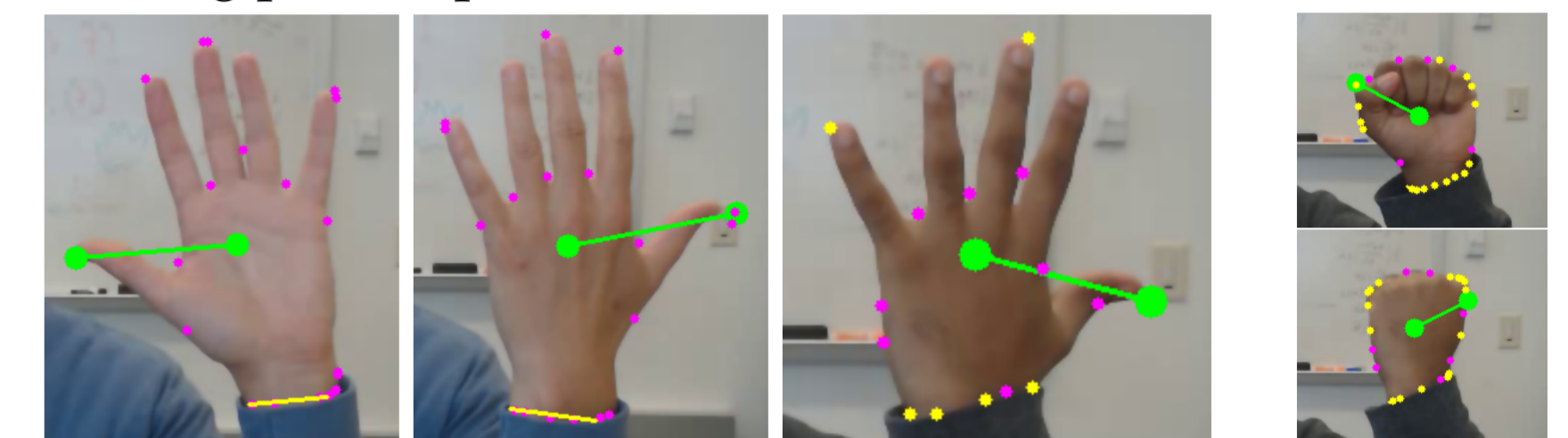


RESULTS

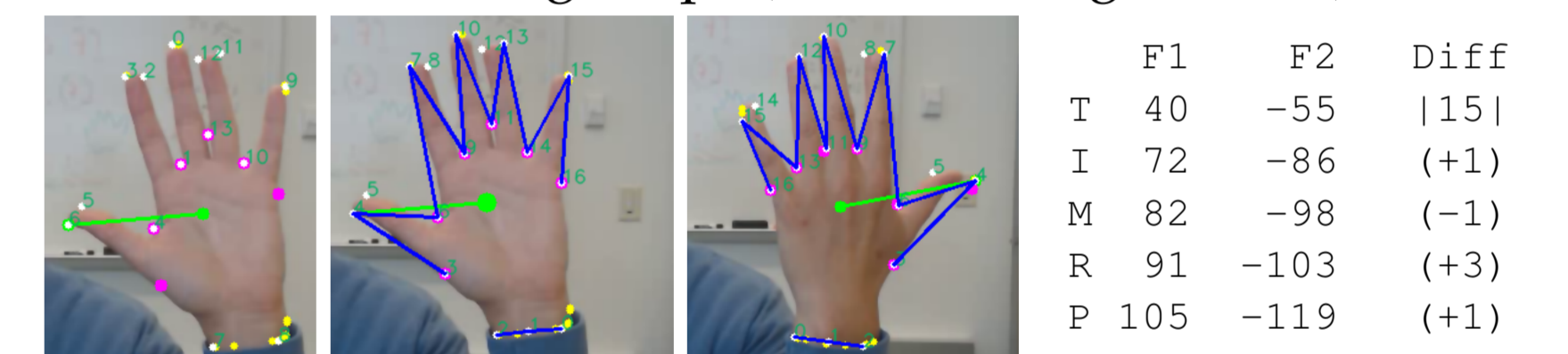
- Pixel differences and then contours



- Among points (pink defects) find wrist & thumb



- Orientation and finger tips (+ tendon angles table)



TAKE-AWAY FINDINGS

- Chirality (reflection symmetry) of the two helps us.
- Angles create a scale invariant template.
- The origin must be carefully selected, respecting the structure of the model: the center of the wrist, and not of the palm, is the morphological center of the hand.

“The purpose of this work is to present the hand not only to the eye [computer webcam] , but to [our] understanding” (adapted from the Introduction of *The Book of a Hunderd Hands* by George B. Bridgman)

HAND REFERENCES

