Body measurements using Computer Vision

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Outline

Problem Statement

- Determine the body measurements of a person as accurately as possible from a set of images
- To do so we need atleast one length in the image with known metric

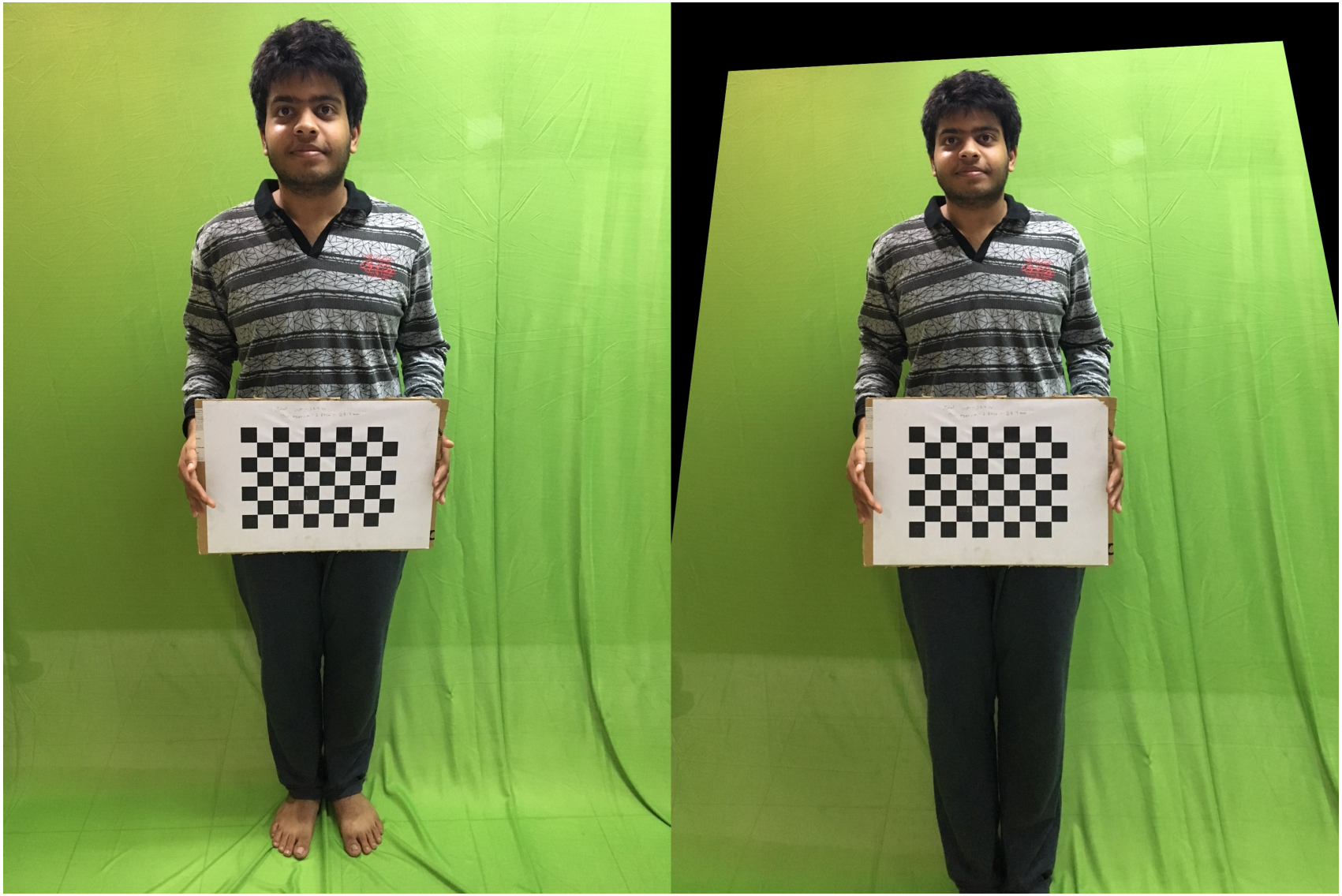
Uses

- Boost customized online-cloth trade and commerce.
- Help build virtual-trial rooms, because it solves the easier problem of cloth fitting on person.
- Serve as a virtual tailor.

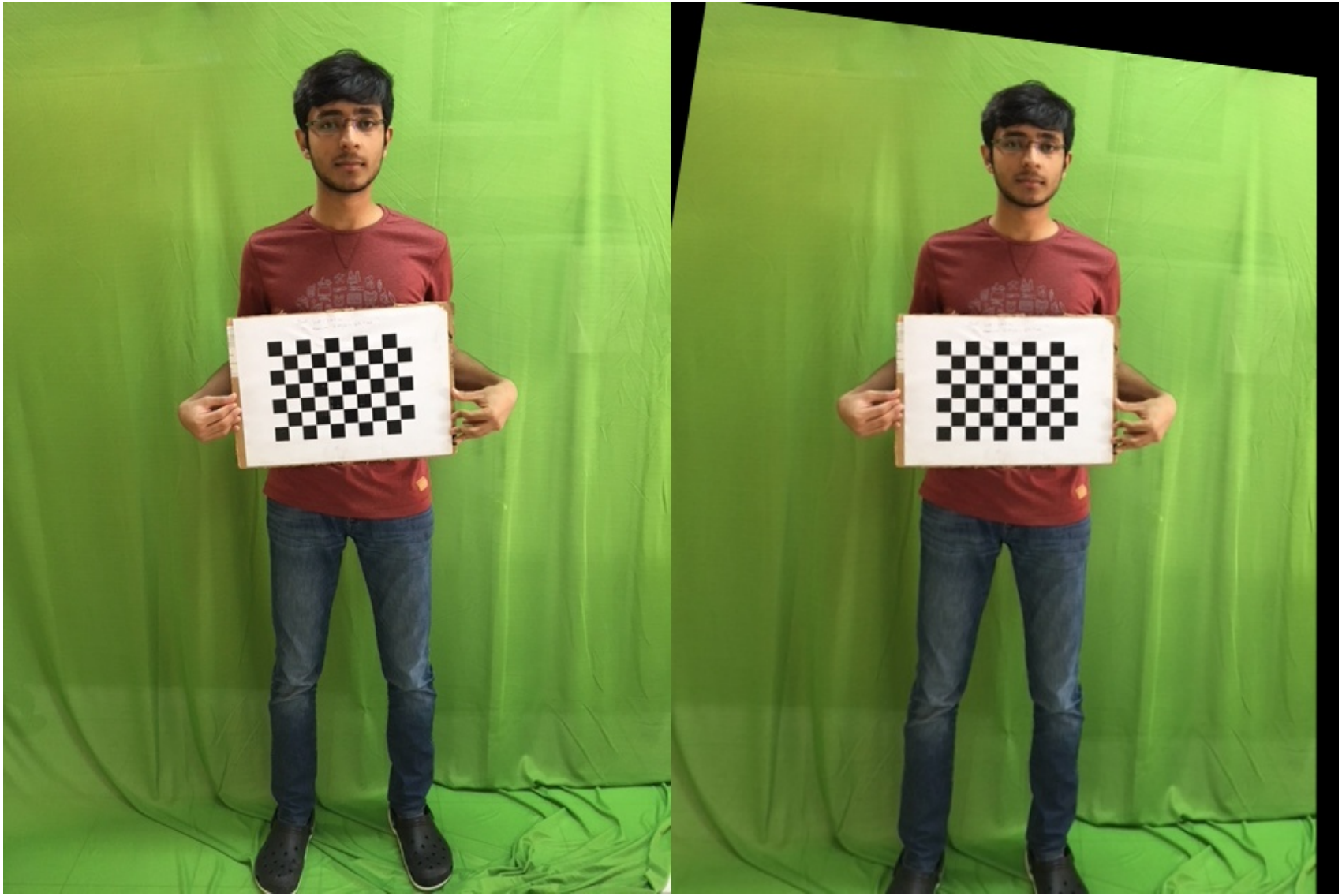
Pipeline

flow.png

Corrections



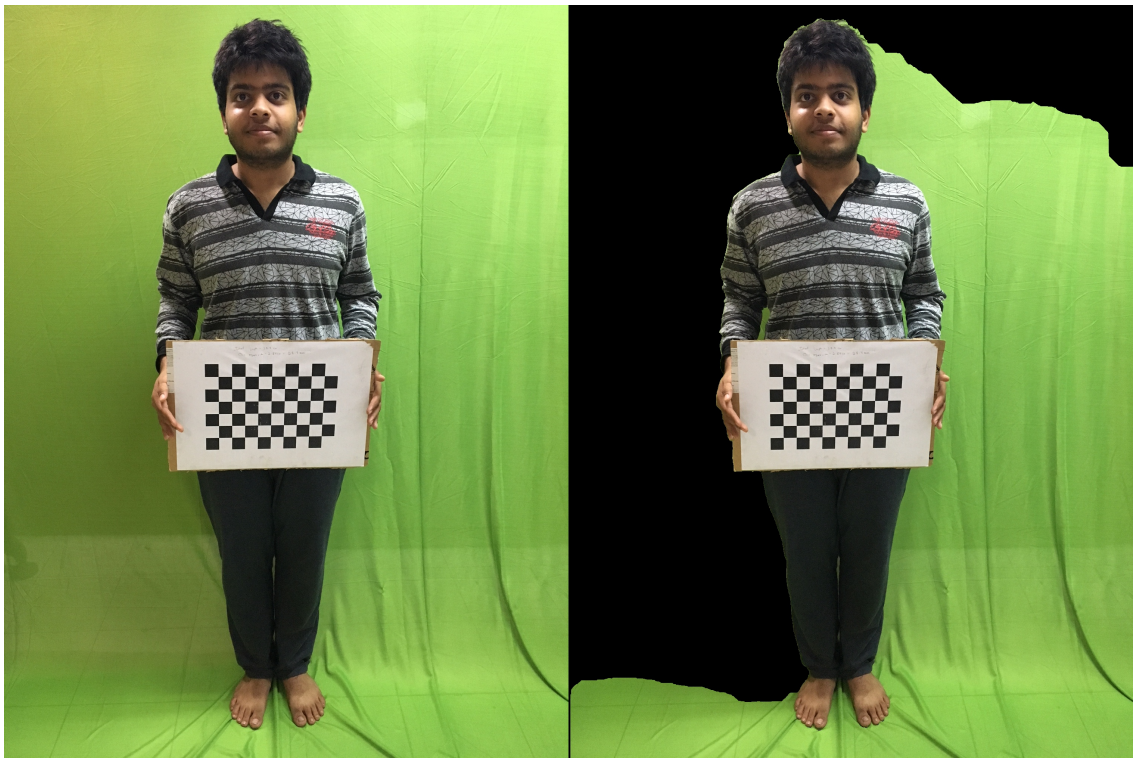
Corrections



Unsuccessful Segmentation Approach

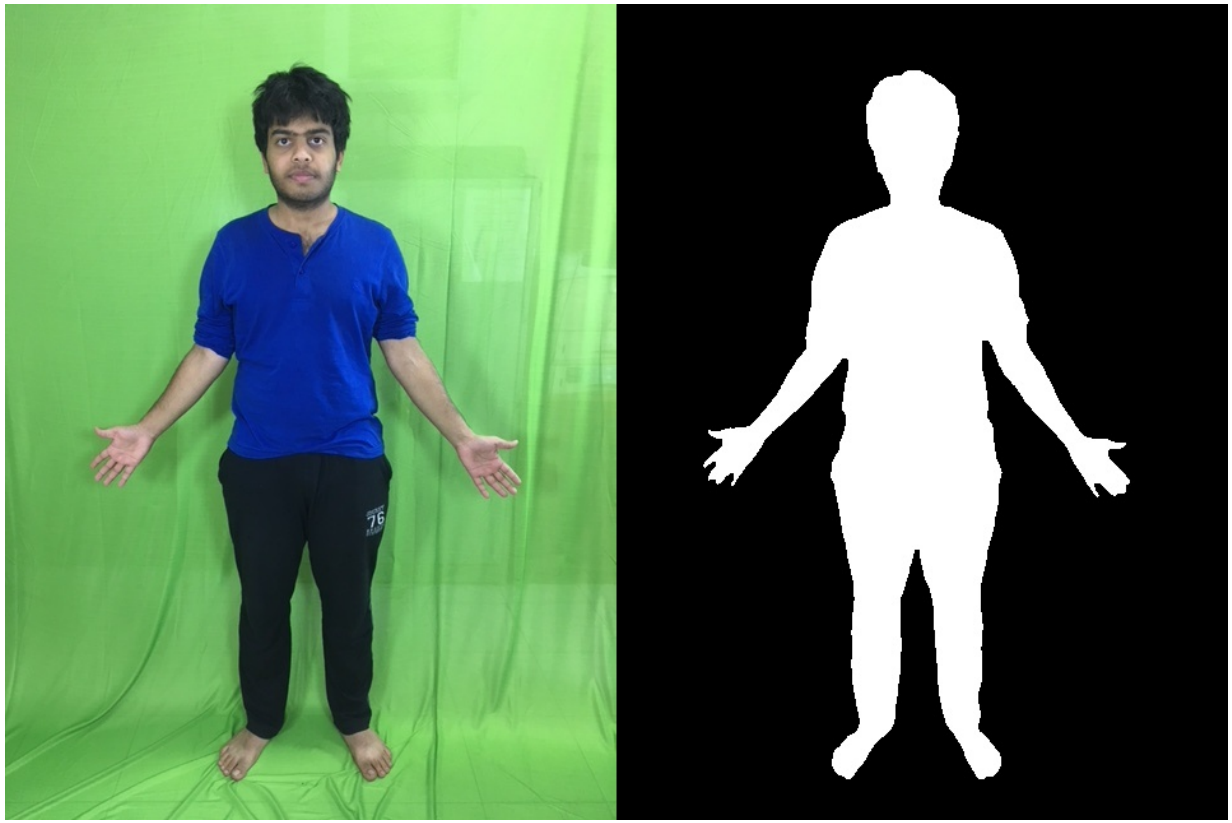
Grab Cut

- It receives a bounding box and image as input and segments it iteratively.
- It uses color data modelling by iterative energy minimization.
- Iterations are extremely slow.



Green Screen Segmentation

- Chroma King technique was used. It segments image based on provided color.
- Credits to our Virtual Studio project group for their source code for the same.



Heuristics to automate point selection

Starting from the segmented image of the human silhouette

For shoulder points

- We first find the tip of the head as the highest point in the silhouette
- We then move along the horizontal directions from the tip and stop at the point where there is a drastic change in the slope in a window, giving us the shoulder tips

We further use a similar heuristic for the wrist points.

Approximating the waist from two images

- We approximate the waist of the human body as an ellipse
- We calculate the semi axis of the ellipse from two images where the person is facing the camera in one image and orthogonal in another

Heuristics to automate point selection

detected_r.jpg

Results

yeh.png

Comparison of shoulder measurement with Kinect results

Our algorithm showed 40cm shoulder width compared to the 33.6cm given by Kinect when the actual measurement was 38cm

kinect.png

Assumptions

- Since we are trying to approximate the metric rectified images as orthogonal projections we get better results if the human is standing a bit farther from the camera.
- We get significantly erroneous results if we try to measure the height using this system since the angles made by the lowermost point with the point of camera centre is large enough to cause significant distortion in the rectified images
- The person and the chessboard that the person is holding are approximately parallel and the separation between the two planes is also negligible.

Future Scope

- Generalizing segmentation - Any background.
- Robust key-point detection using pose-estimation.
- Removing dependency from checkerboard and introducing more implicit method for metric calibration.