ROBOTICSLAB
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Towards Robotic Clothes Folding:
A Garment-Agnostic Unfolding Algorithm

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Máster Universitario en Robótica y Automatización

Overview

1. Introduction
2. State of the Art
3. Architecture
4. Garment Segmentation
5. Garment Depth Map Analysis
6. Garment Pick and Place Points
7. Experiments and Results
8. Future Work

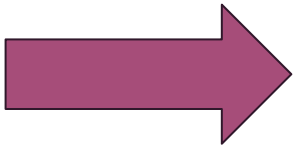
Introduction

Problem: Folding Garments

Human-based

Industrial solution

Introduction



State of the Art

Two approaches:

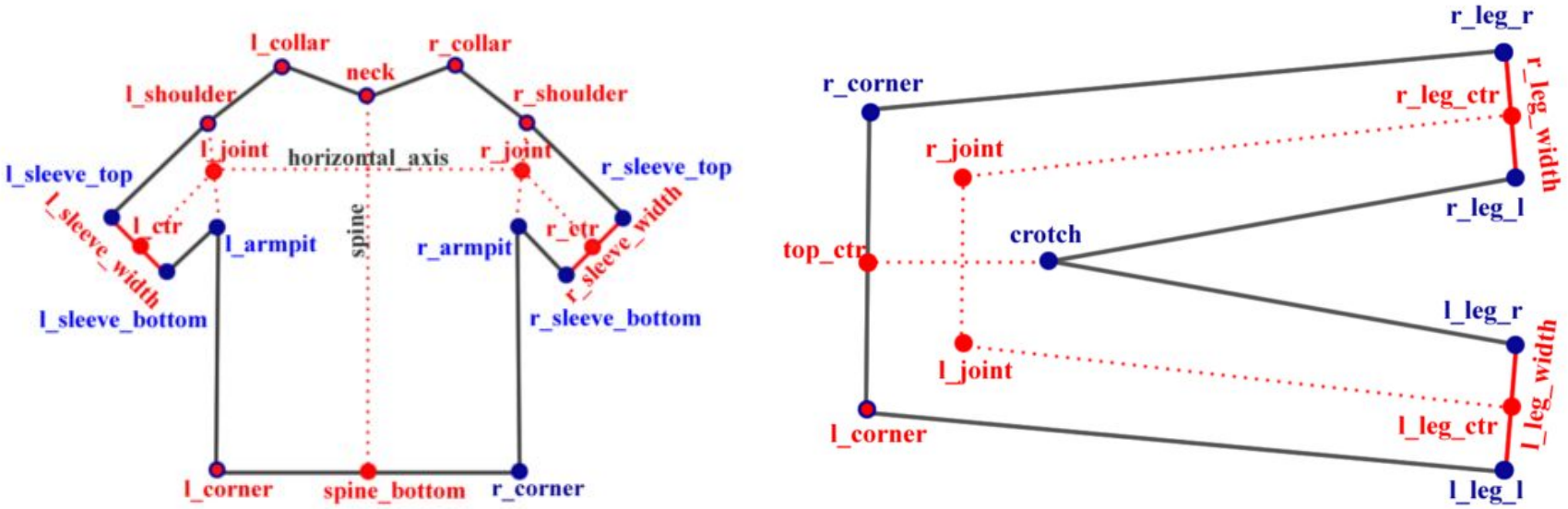
- Modeling-based Approaches
- Manipulation-Based Approaches

European Project:

- CloPeMa

State of the Art

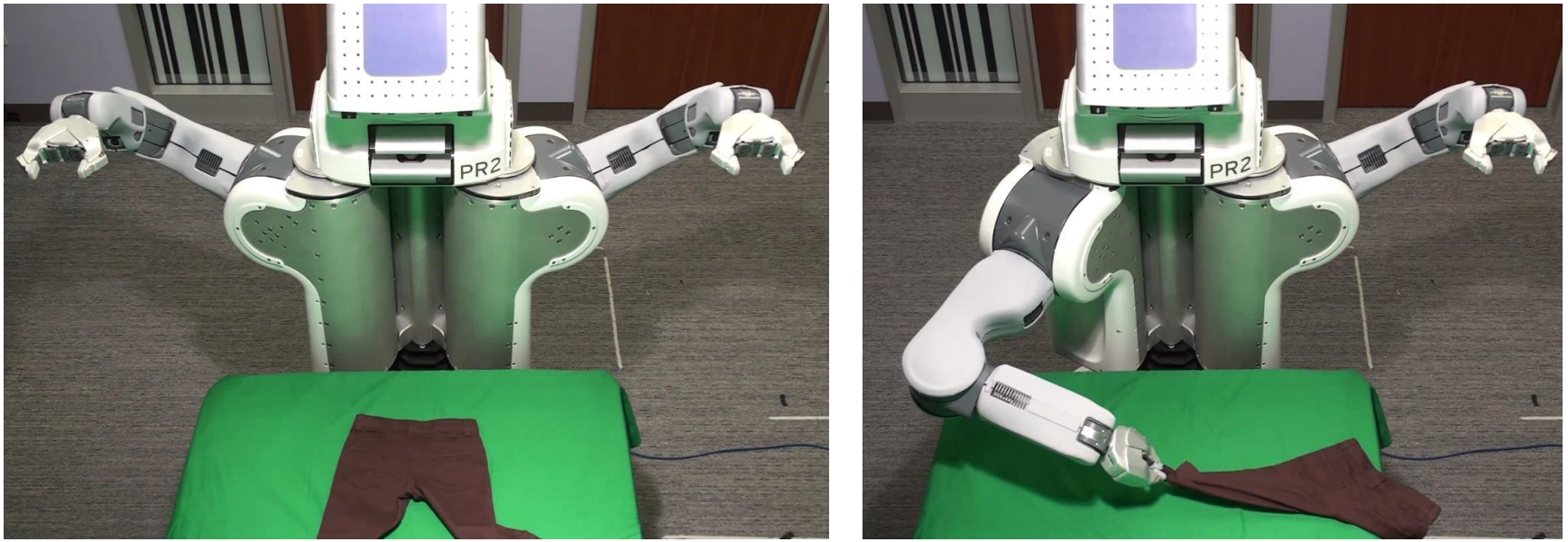
Modeling-Based Approaches



(Miller, Fritz, Darrell, & Abbeel, 2011)

State of the Art

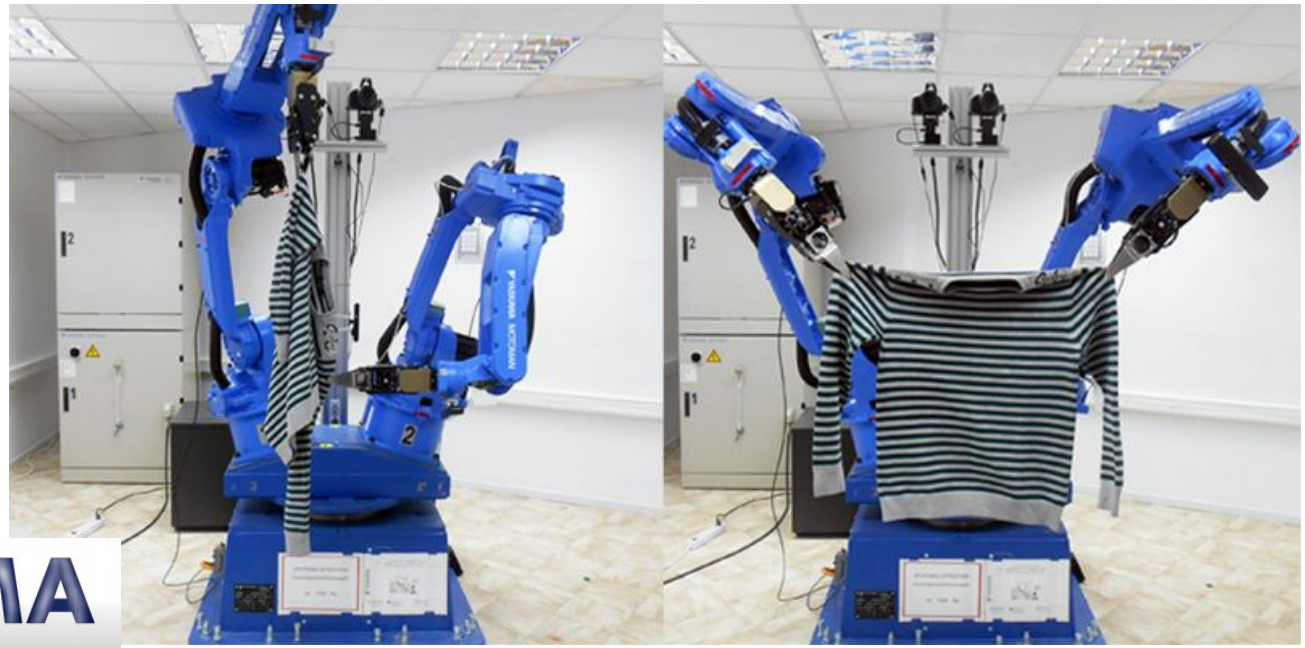
Manipulation-Based Approaches



(Cusumano-Towner, Singh, Miller, O'Brien, & Abbeel, 2011)

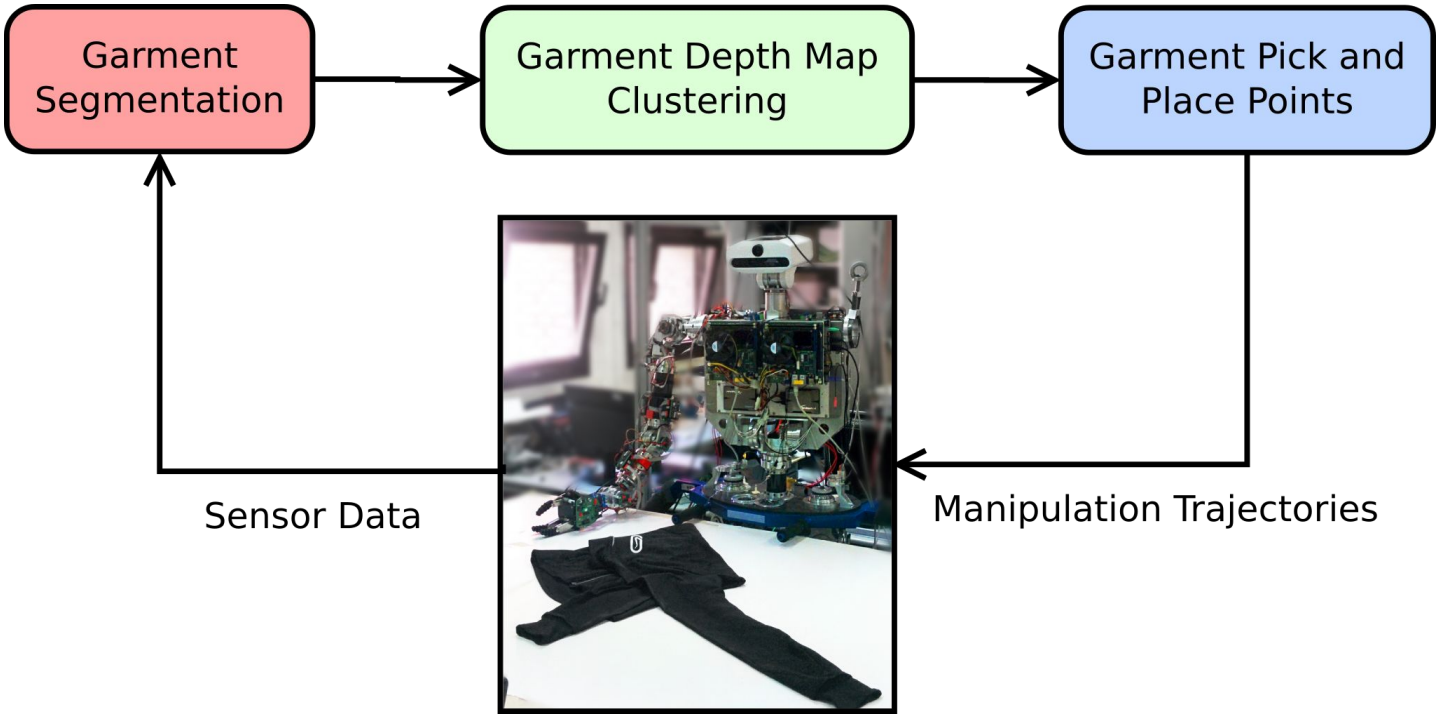
State of the Art

CloPeMa (Clothes Perception and Manipulation)

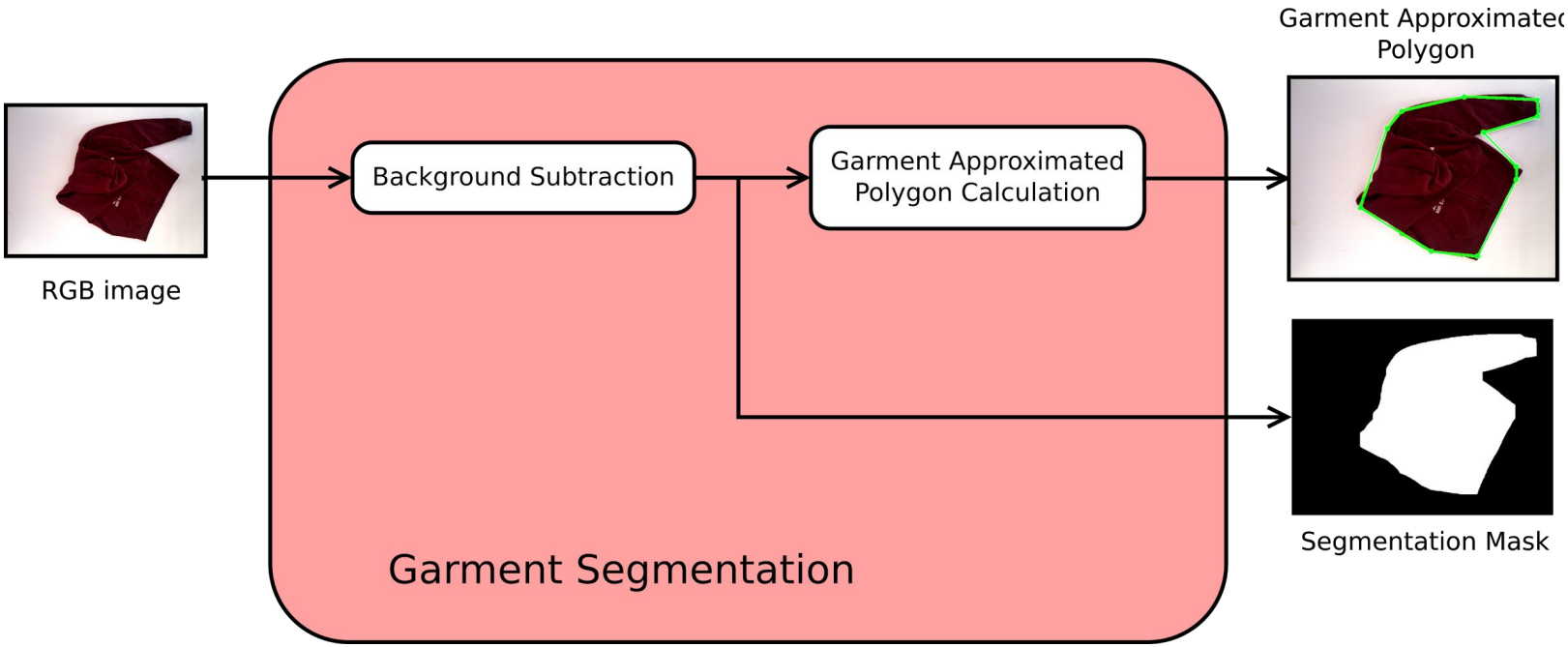


(Doumanoglou, Kargakos, Kim, & Malassiotis, 2014)

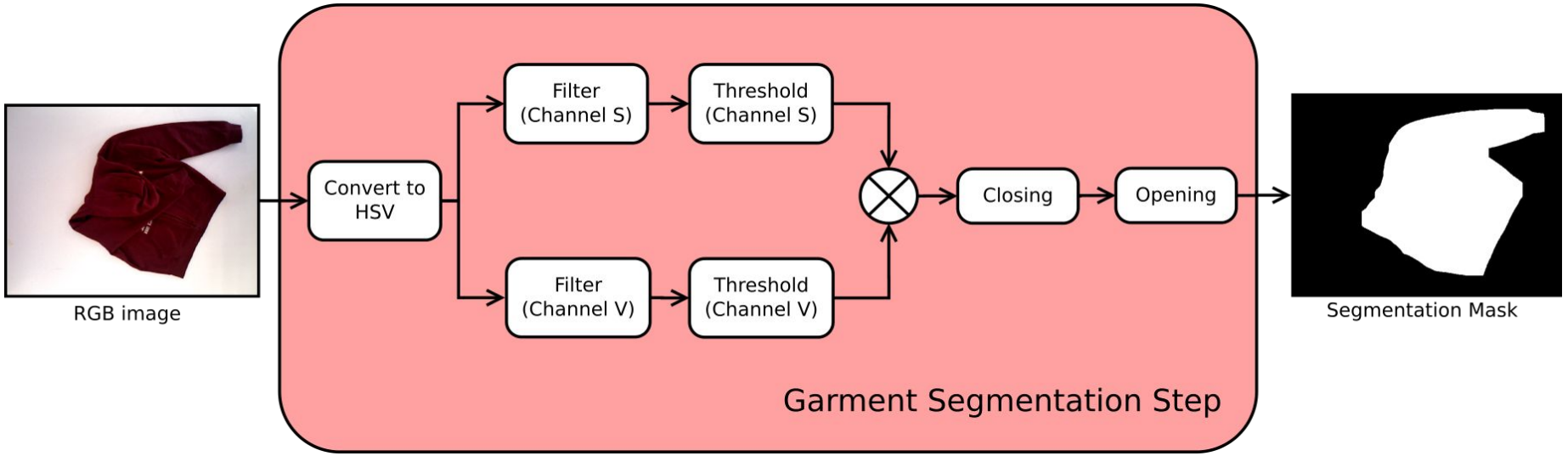
Architecture



Garment Segmentation



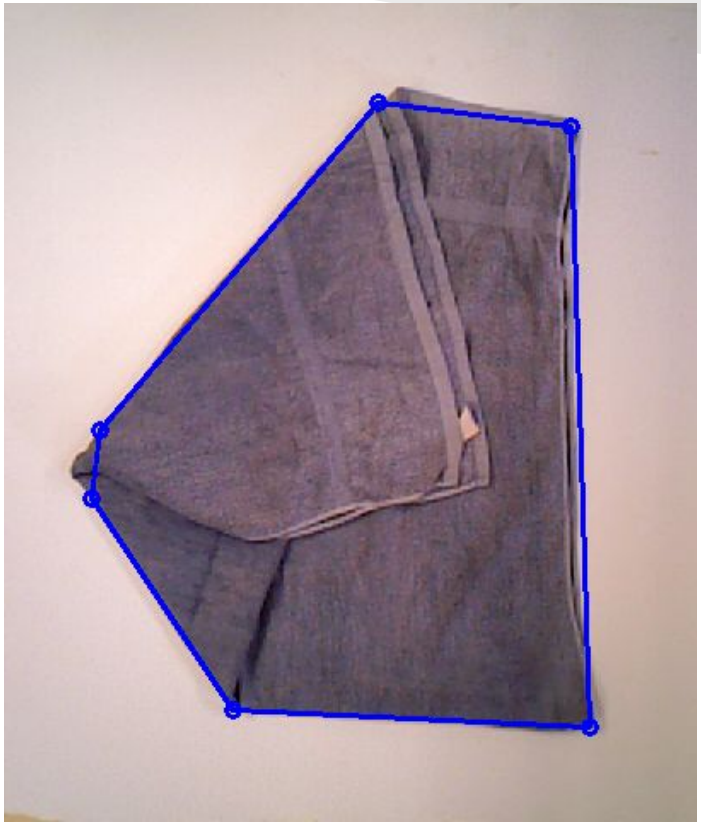
Garment Segmentation



Garment Segmentation

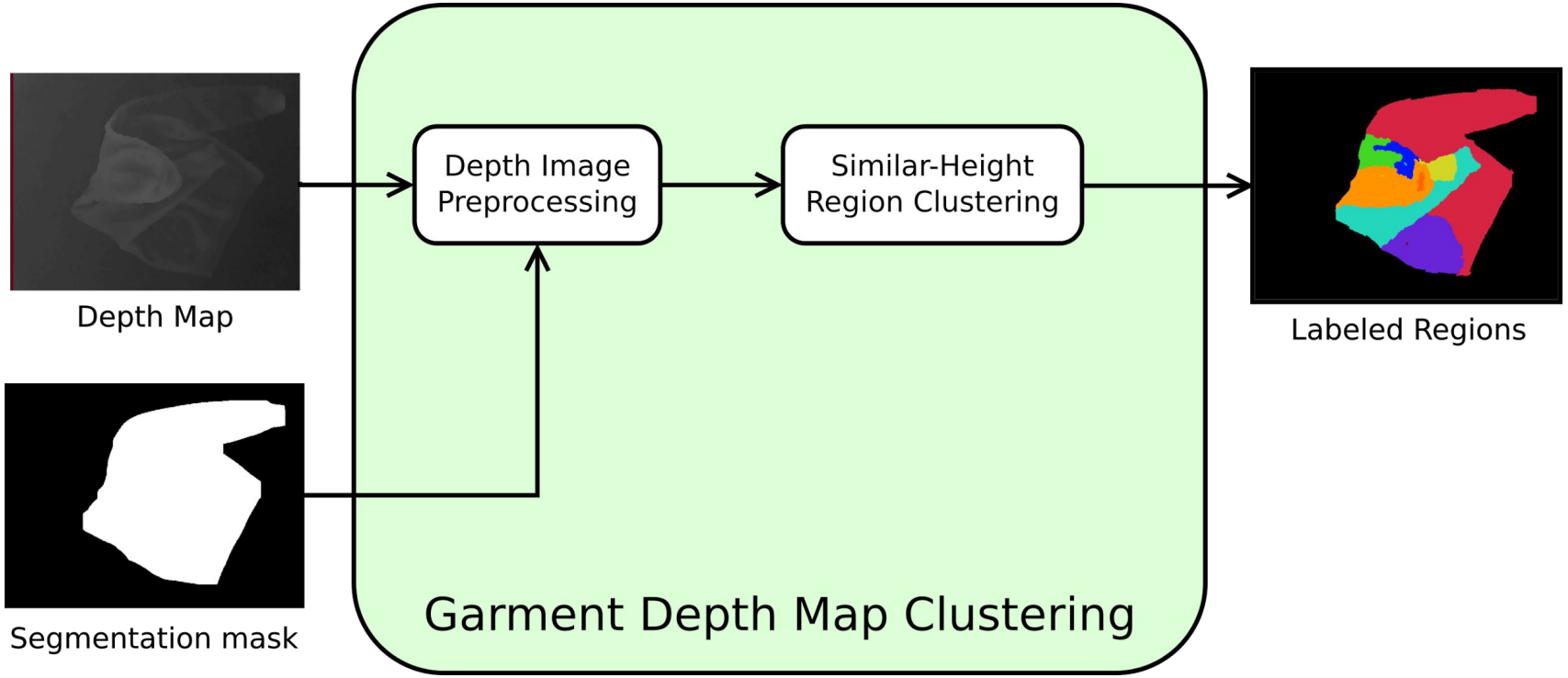
Contour

Outline



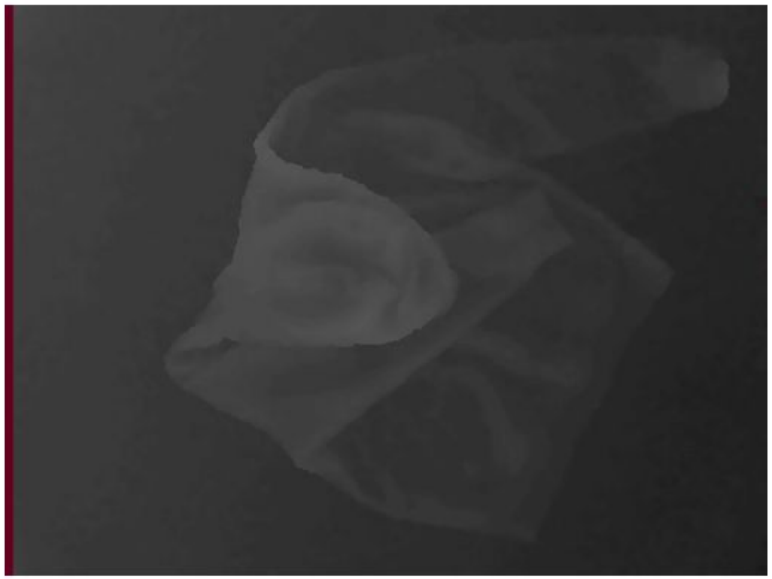
Approximated Polygon

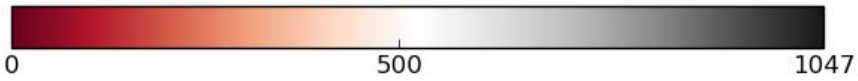
Garment Depth Map Clustering



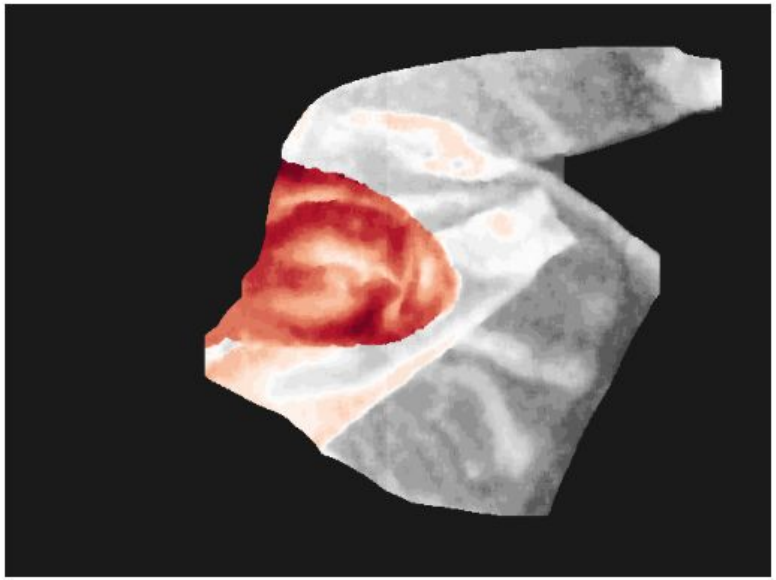
Garment Depth Map Clustering

Before preprocessing

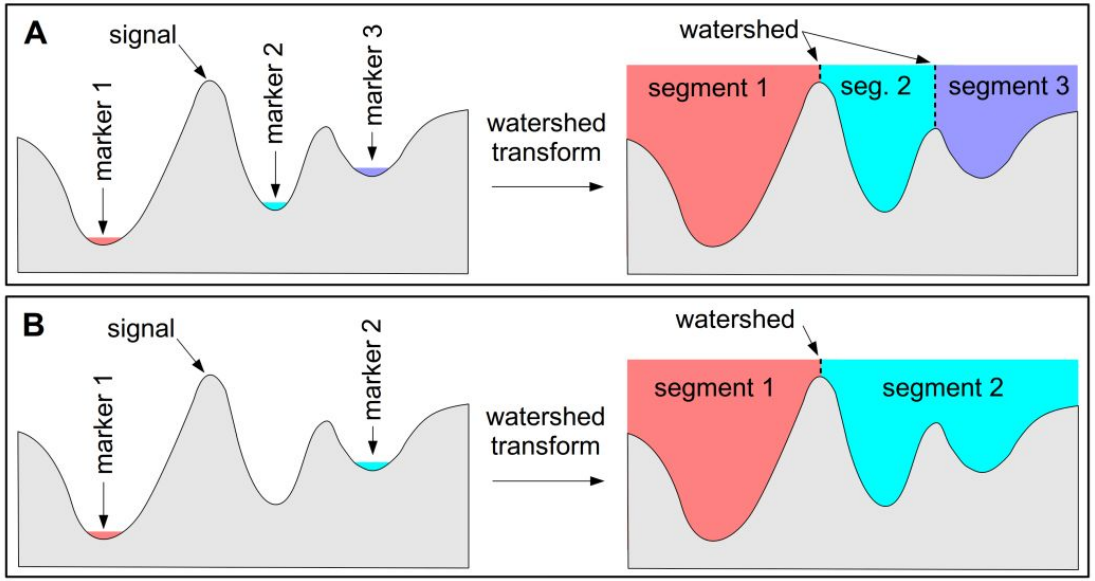




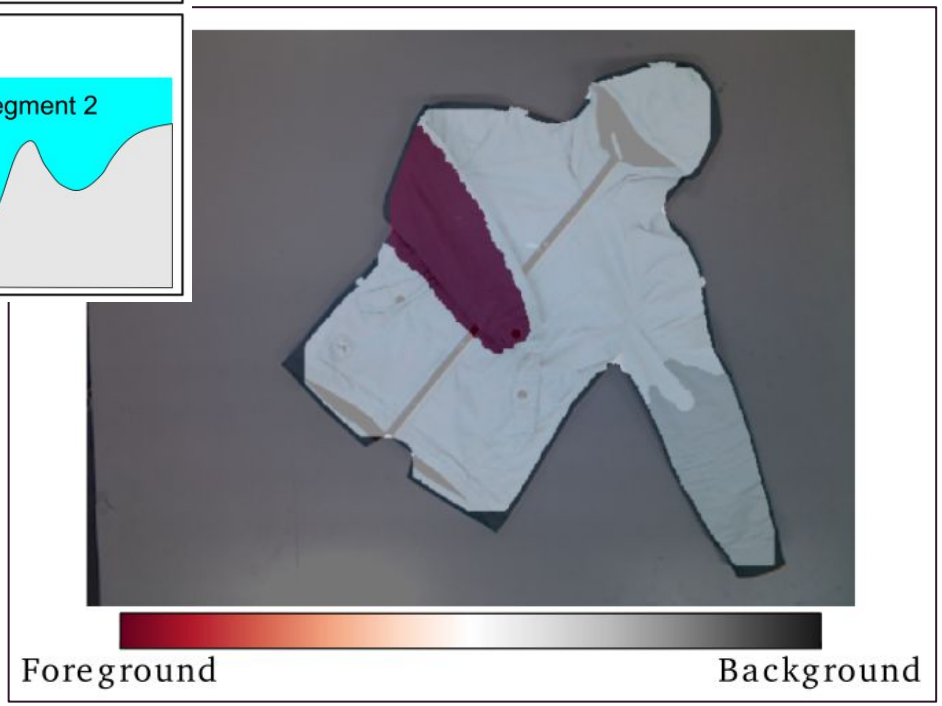
After preprocessing



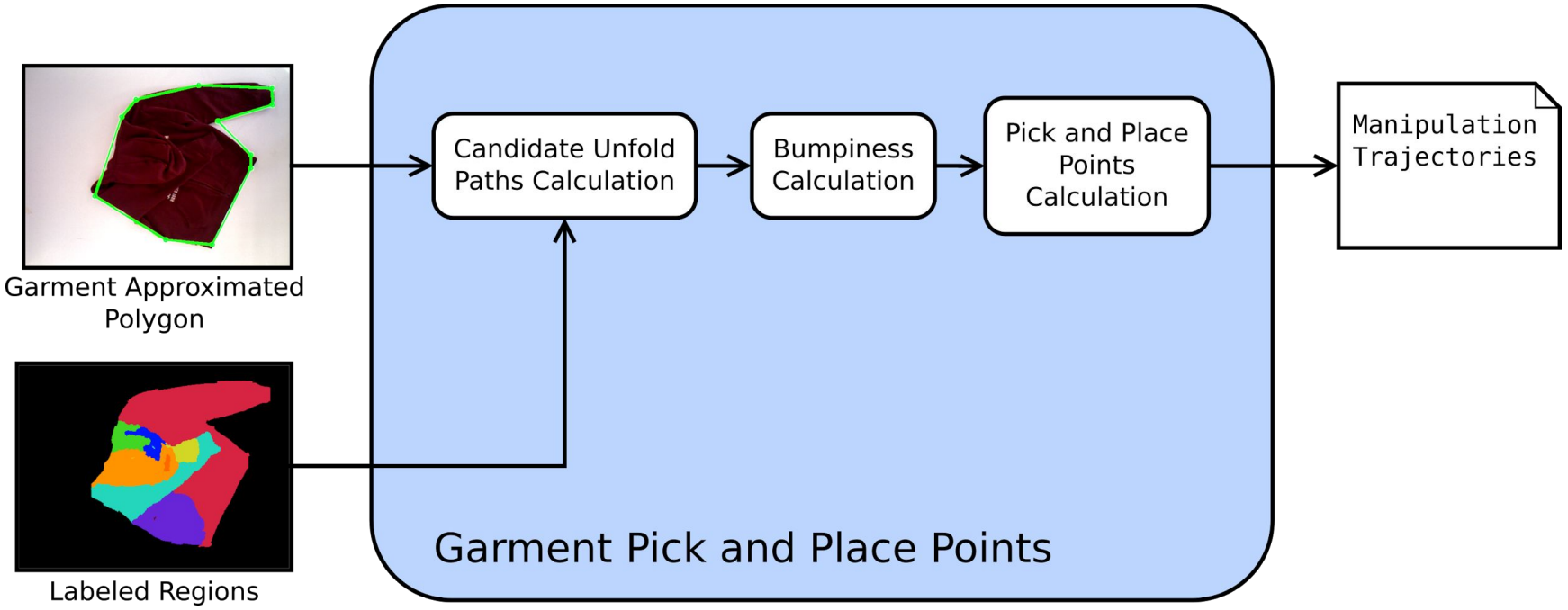
Garment Depth Map Clustering



Apply Watershed

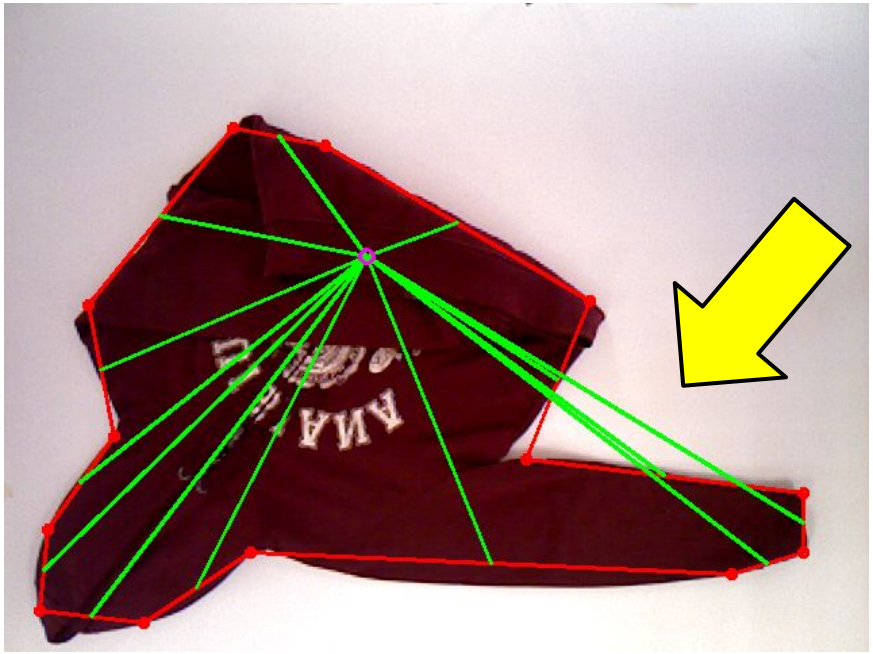


Garment Pick and Place Points

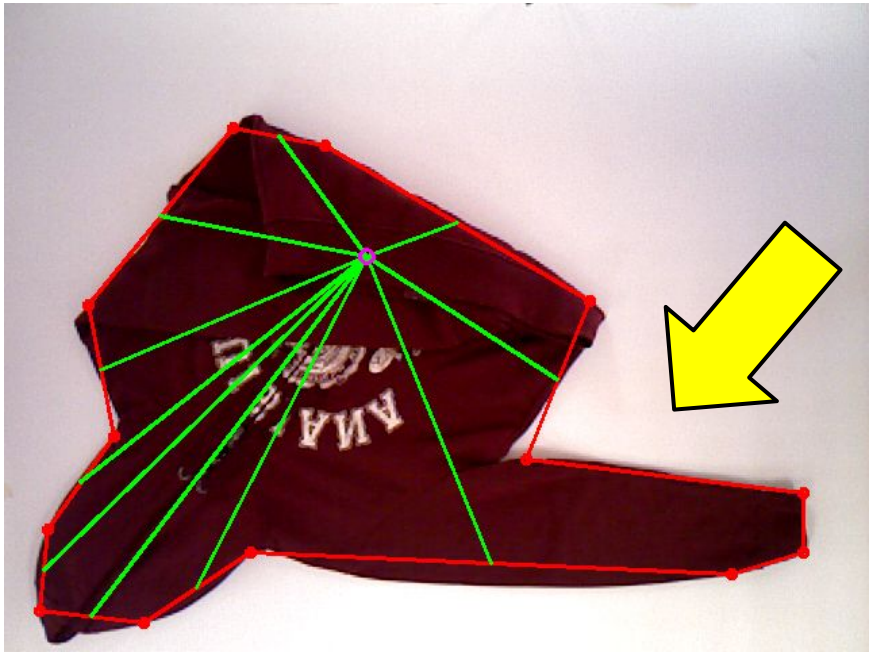


Garment Pick and Place Points

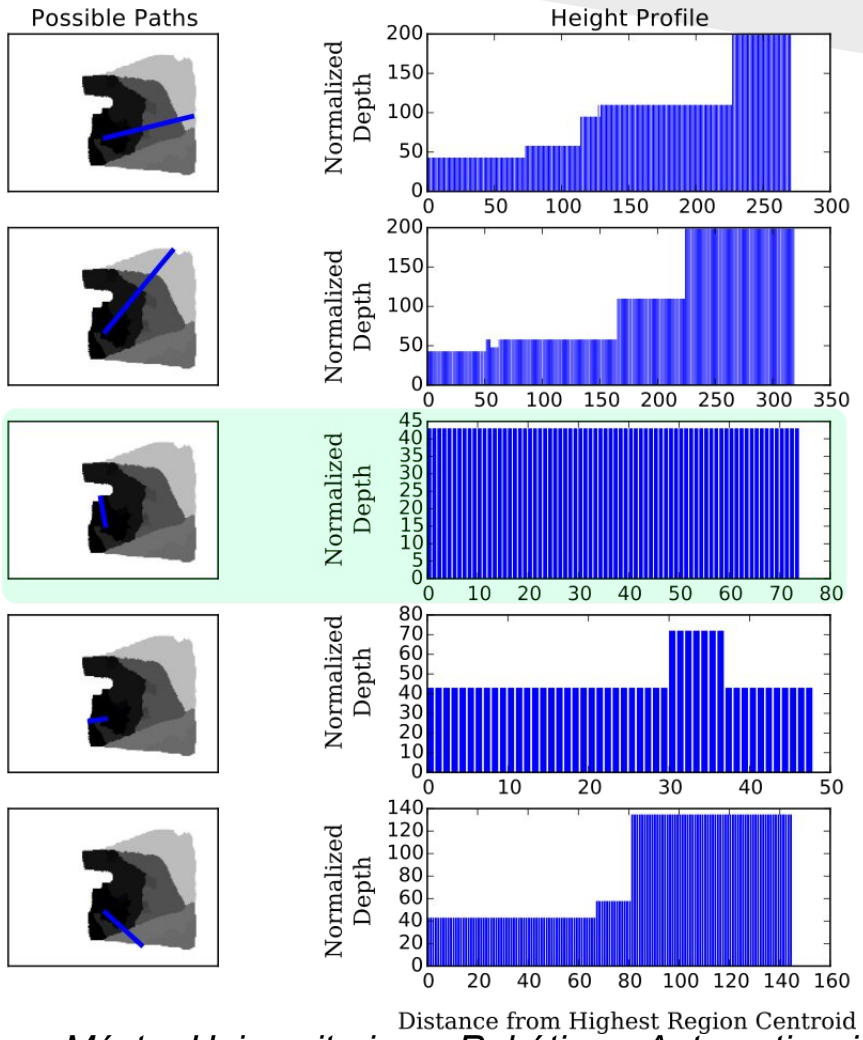
Candidate paths



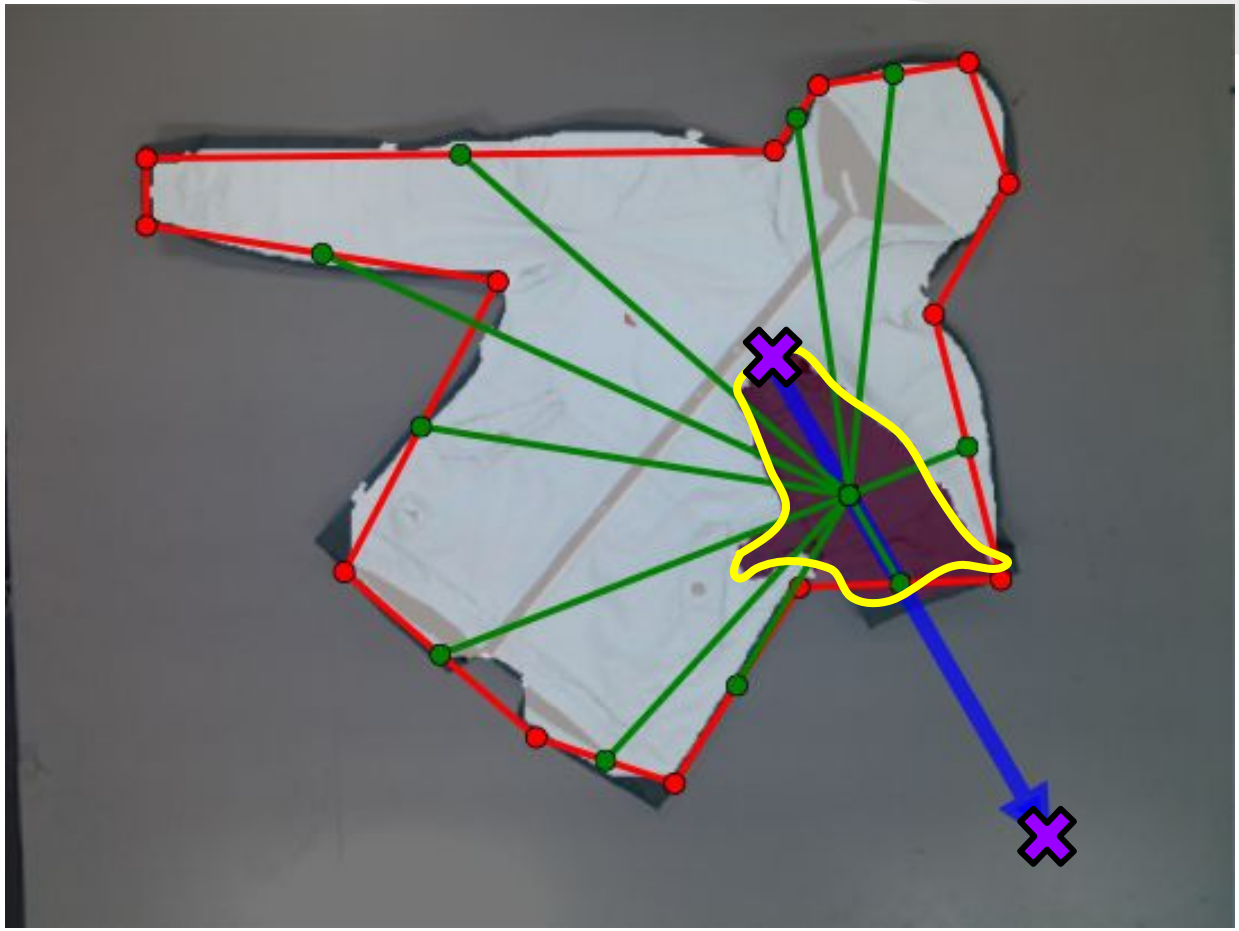
Valid paths



Garment Pick and Place Points



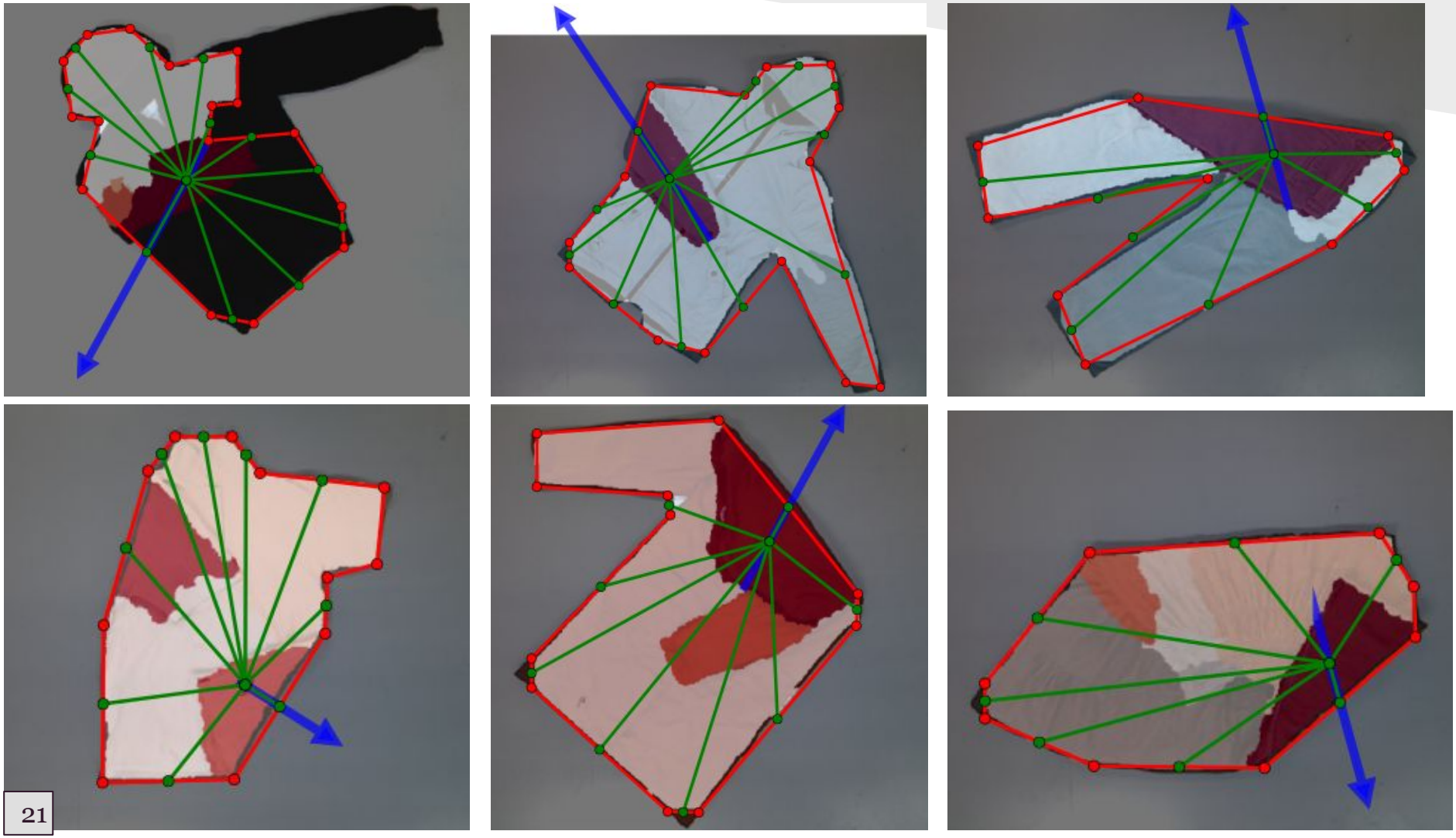
Garment Pick and Place Points



Experiments and Results

Dataset generation

Experiments and Results



Experiments and Results

Future work

- **Segmentation**: improve background extraction.
- **Depth Map Clustering**: move to a 3D approach.
- **Pick and Place Points**: evaluate other strategies through experiments.

Contributions

- David Estévez; Juan G. Victores; Santiago Morante; Carlos Balaguer. **Towards Robotic Garment Folding: A Vision Approach for Fold Detection.** International Conference on Autonomous Robot Systems and Competitions (ICARSC). 2016. *(review pending)*

- David Estévez; Juan G. Victores; Carlos Balaguer. **Unfolding to Fold: A Garment-Agnostic Process to Unfold Clothes** International Conference on Intelligent Robots and Systems (IROS). 2016. *(review pending)*

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Thank you!

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