UnFlare - Automated Lens Flare Removal

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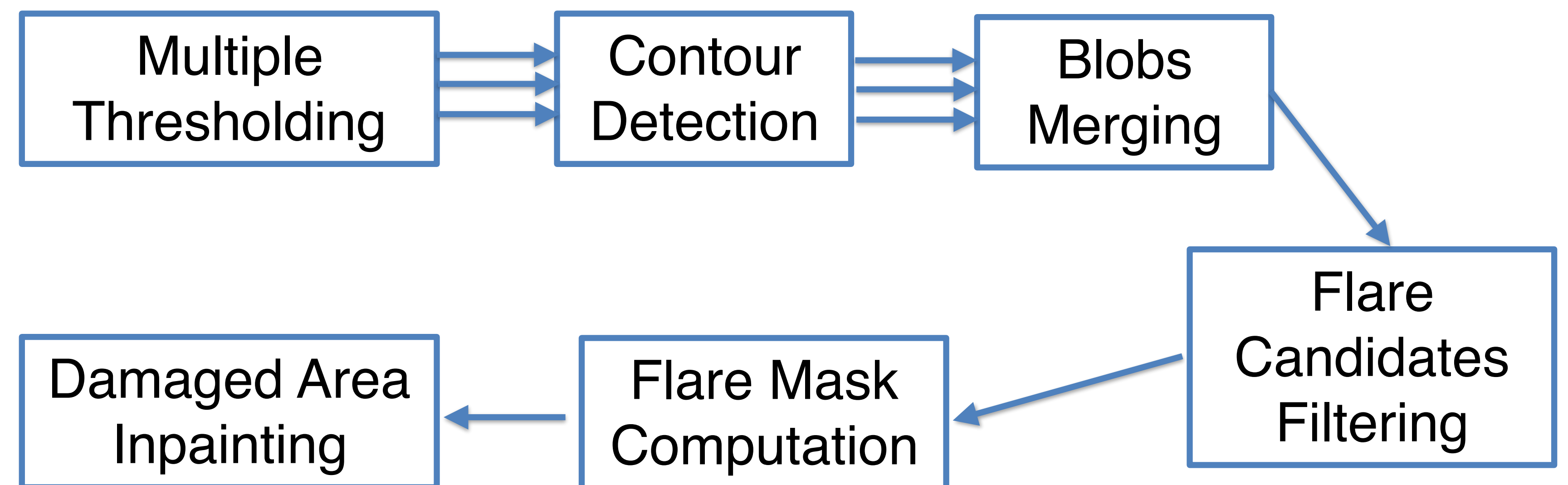Department of Electrical Engineering, Stanford University

Motivation

Lens flares can often make an otherwise perfect picture unusable.
This is especially true with smartphone cameras that show annoying lens artifacts when there is a bright source of light (in sunset shots for instance) because of their poor anti-reflective coating.
Here, we automatically detect those lens artifacts and restore the damaged area in order to recover a beautiful picture.

Flare Detection and Removal

Multiple Thresholding → Contour Detection → Blobs Merging → Flare Candidates Filtering → Flare Mask Computation → Damaged Area Inpainting

Related Work

Most of the existing flare detection methods rely on using multiple shots with spatial and exposure differences or need manual hints to find the lens flares. Here we use a tailored blob detection algorithm:
- *Robust Aerial Object Tracking in Images with Lens Flare*
- *Removing lens flare from digital photographs, Dusan Psotny*
- *OpenCV Framework, Feature Detection and Description*

The inpainting methods used to fill the area are an active research subject. Here we use a diffusion based model:
- *A Novel Inpainting Model for Partial Differential Equation Based on Curvature Function, Jiansheng Liu, Mingming Li, Fangfang He*
- *Mathematical Models for Local Nontexture Inpaintings, Tony F. Chan and Jianhong Shen*
- *Non-Texture Inpainting by Curvature-Driven Diffusions, Tony F. Chan, Jianhong Shen*

Experimental Results