Generating photorealistic footprints

Author: Bc. Matej Viskupič   Supervisor: Ing. Tomáš Goldmann

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Motivation

Sensitive data from crime scenes

Limitations of the non deep learning approaches

The need for large amount of training data

Footprint imprints

Available from existing datasets

Created by experts in forensic science

Consisting of black and white images

Used in databases as ground truths

Figure 1

Figure 2

Ground Texture

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High quality (4K)

Normal maps, roughness layer, displacement layers

Wide variety of available textures
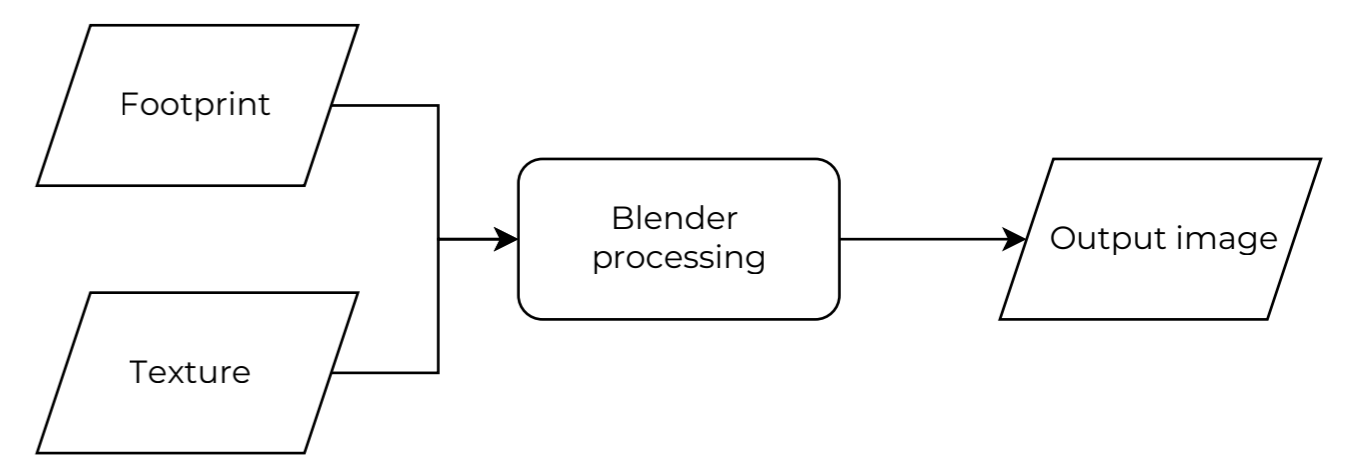

Figure 3

High level program overview

Footprint → Blender processing → Output image

Texture →

Figure 4

Rendering graph

Footprint image → Footprint deformation → Apply footprint on texture → Blenders' BSDF

Displacement texture
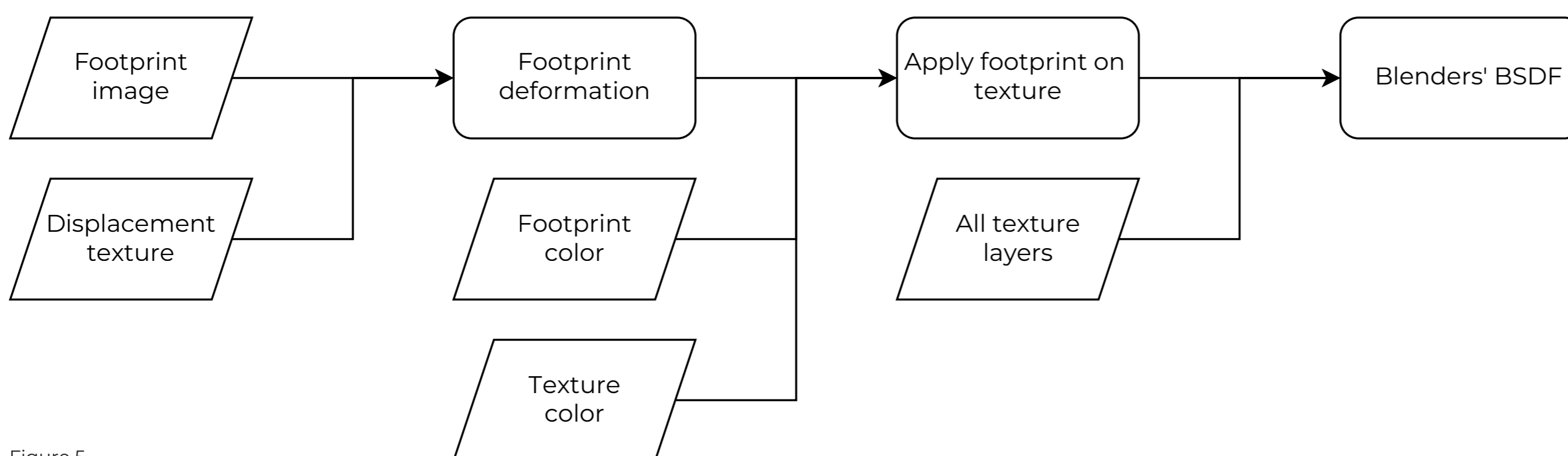
Footprint color

All texture layers

Texture color

Figure 5

Generated images with ground truth

Photorealistic shoe outsole impression images

Keeping the deformation of the ground (cracks, stones, bumps...)

High resolution ground truth generated alongside of first image

Usable in many computer vision tasks as detection, alignment, segmentation and feature extraction
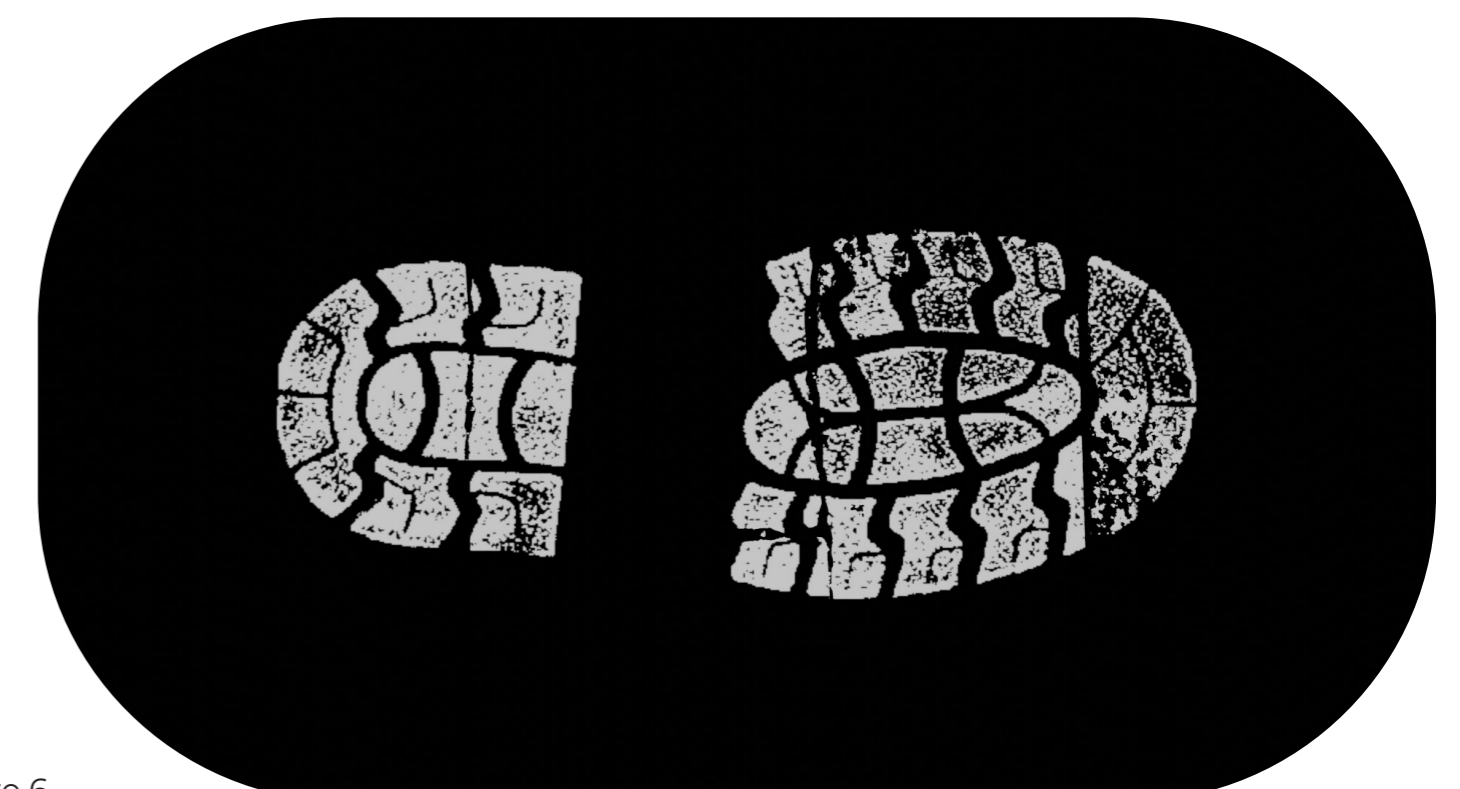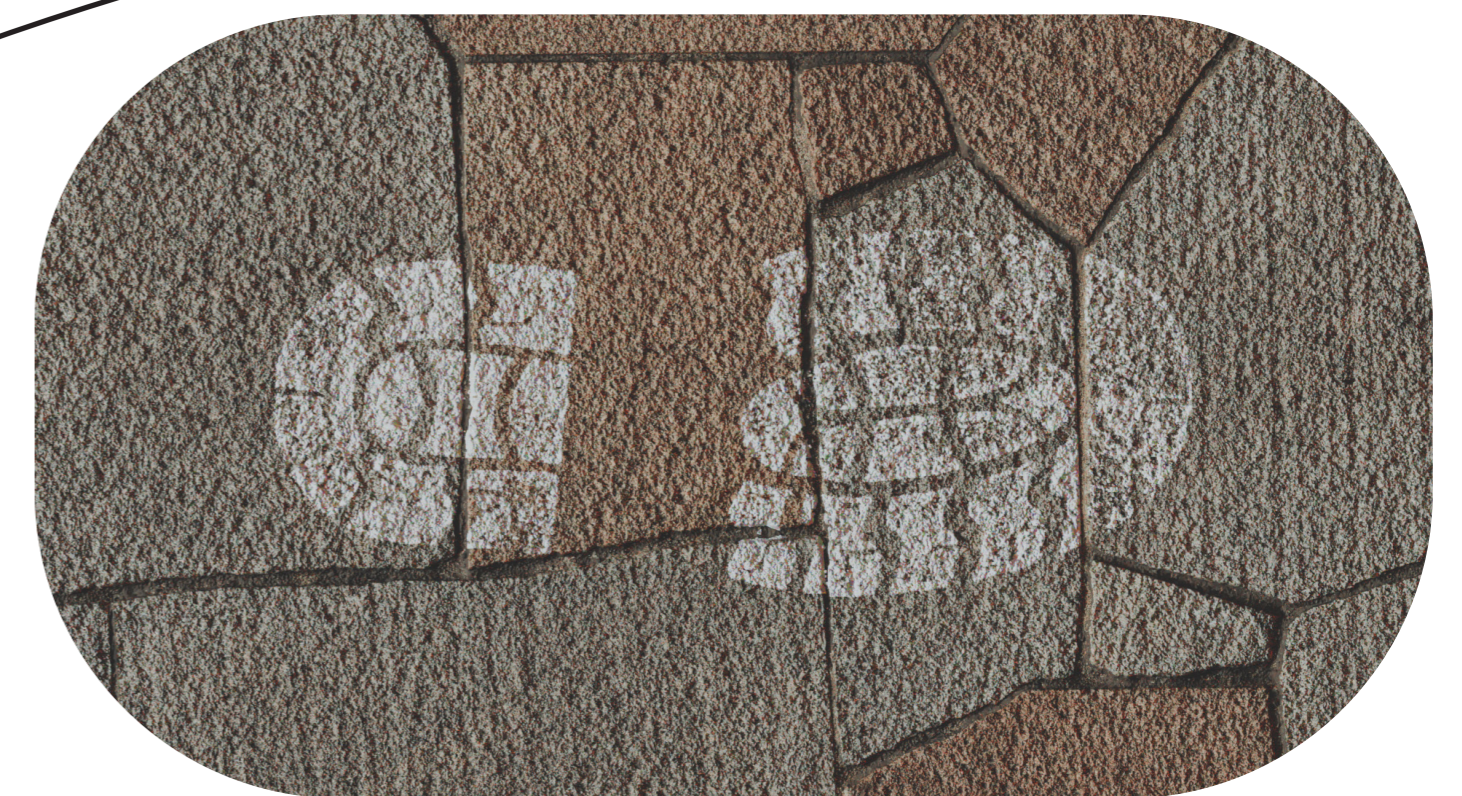
GPU accelerated rendering

Figure 6