

Implementation of a Stereo Vision System for a Mixed Reality Robot Teleoperation Simulator

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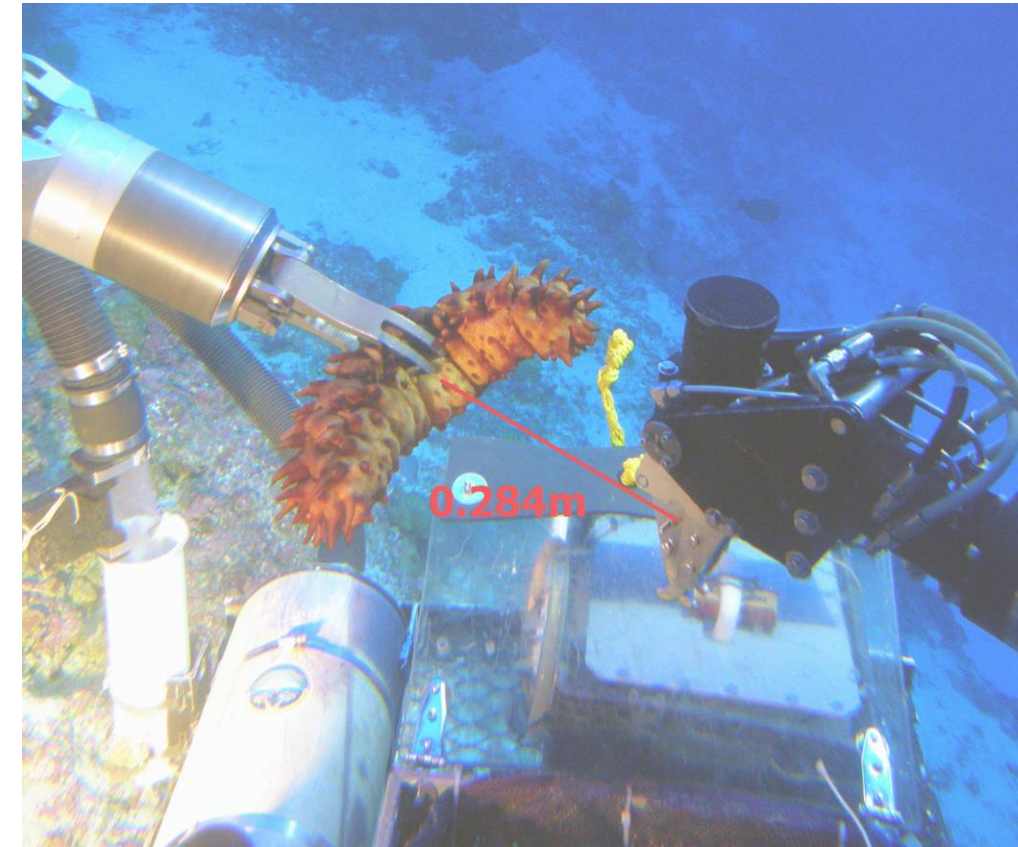
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Abstract

We present the preliminary work on a stereo vision system designed for a mixed reality-based simulator dedicated to robotic telemanipulation. The simulator encompasses a 3D visual display, stereo cameras, a desktop haptic interface, and a virtual model of a remote robotic manipulator. The integration of the stereo vision system enables accurate distance measurement in the remote environment and precise visual alignment between the cameras' captured scene and the graphical representation of the virtual robot model.

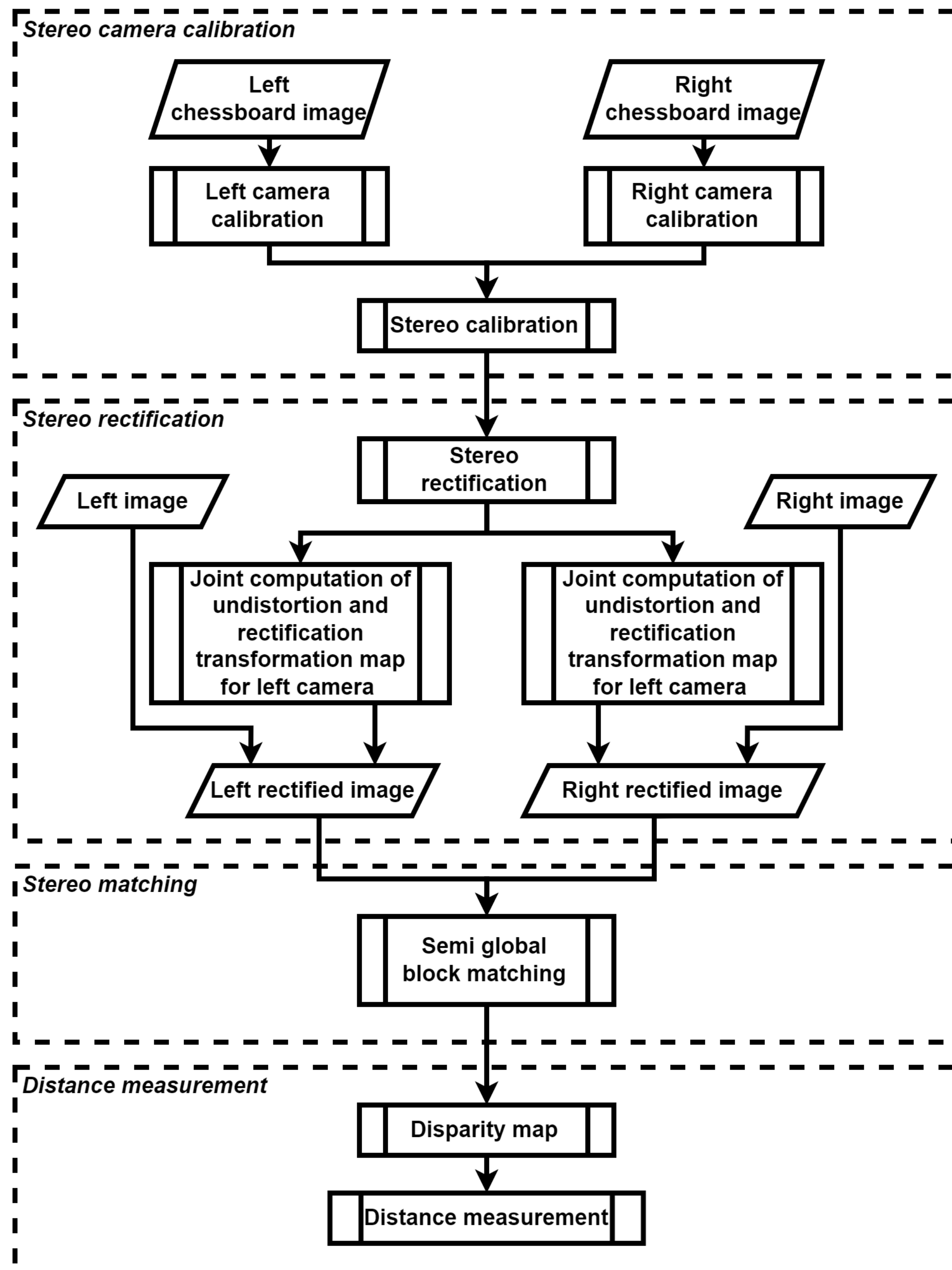
Goal



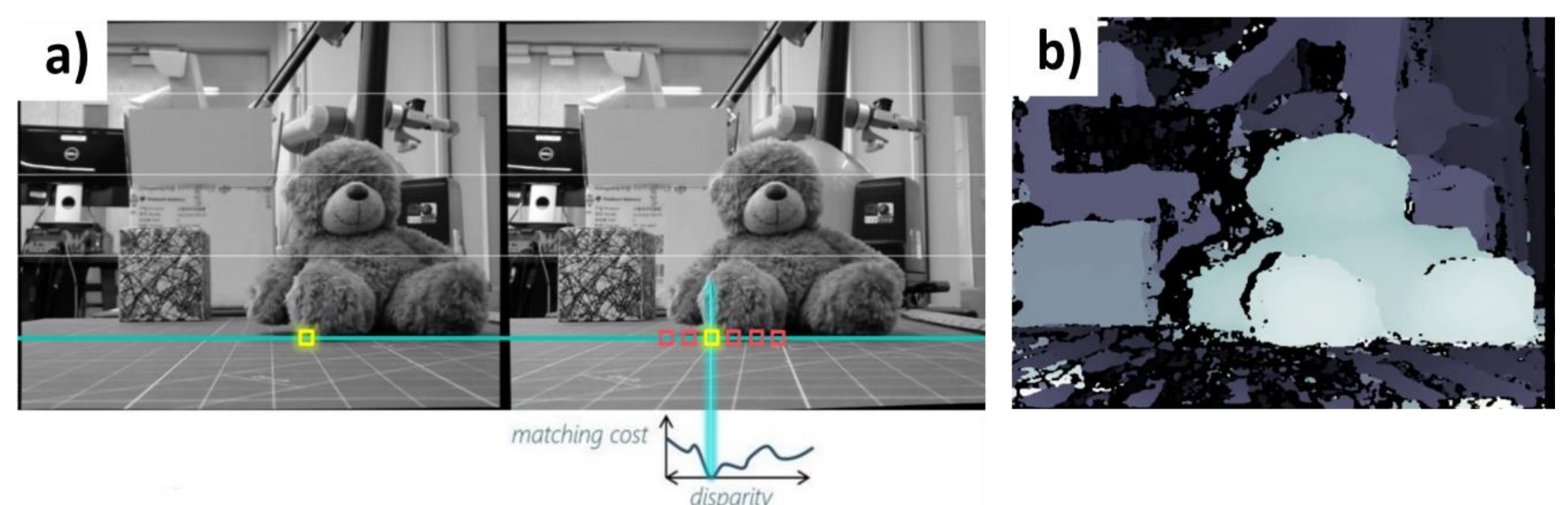
- Visualise and sonify sensor data
- Provide mixed reality audio-visual cues/aids
- Support teleoperation
- Increase task performance
- Reduce cognitive load

System overview

Two mono camera inputs are used to create the stereo vision system in OpenCV, which sends the processed images and distance estimate data via UDP sockets into Unity. The Unity environment renders a simulated robotic end effector, which can be controlled via the haptic controller, in AR using the Vuforia plugin in the images from the webcams. These augmented camera images are then displayed on the stereo display, including the distance estimate, which can be viewed in 3D.

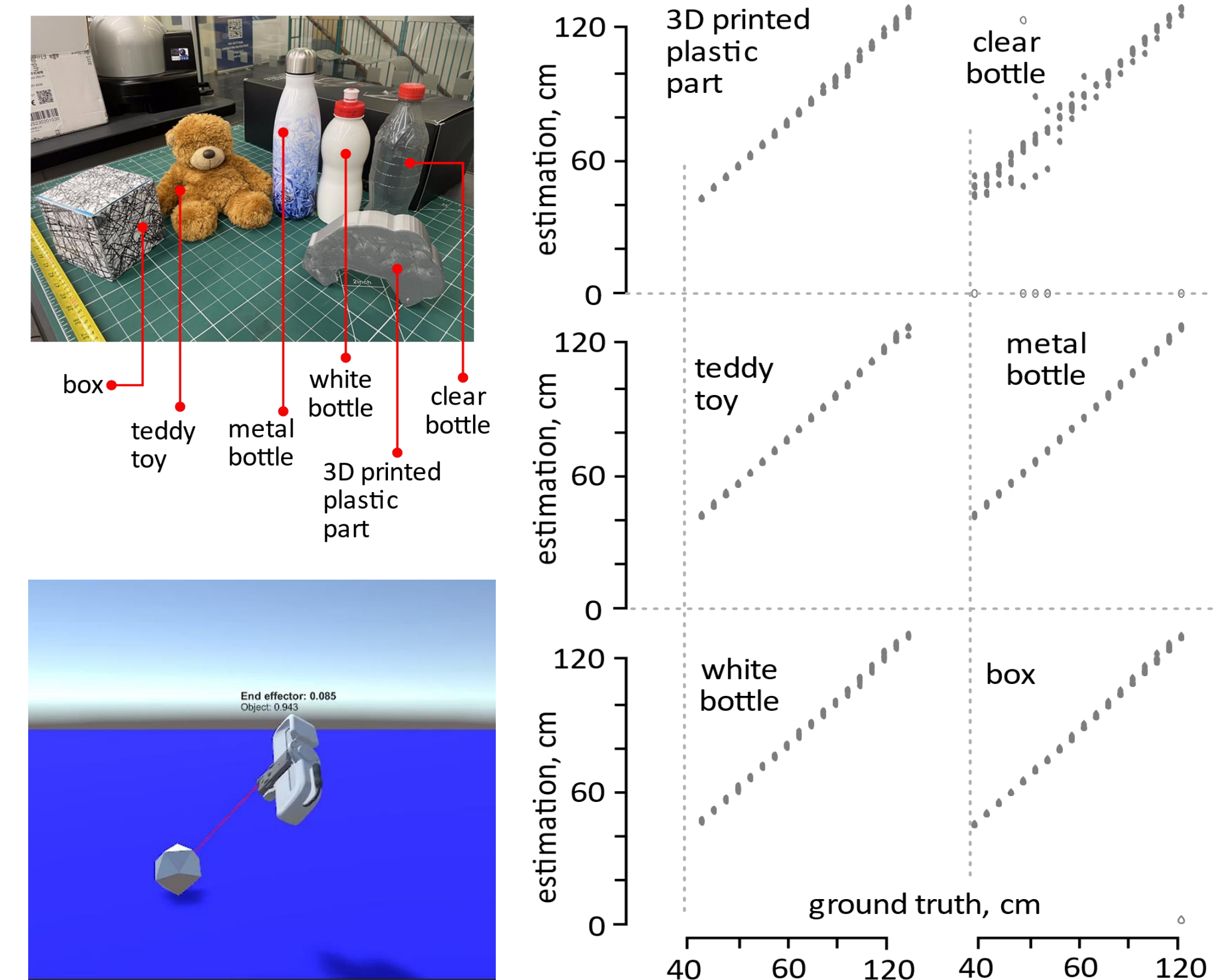


Stereo image processing



Block matching algorithm is implemented for depth estimation.

Results



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