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A Markerless Augmented Reality Environment For On-Patient Medical Data Visualization

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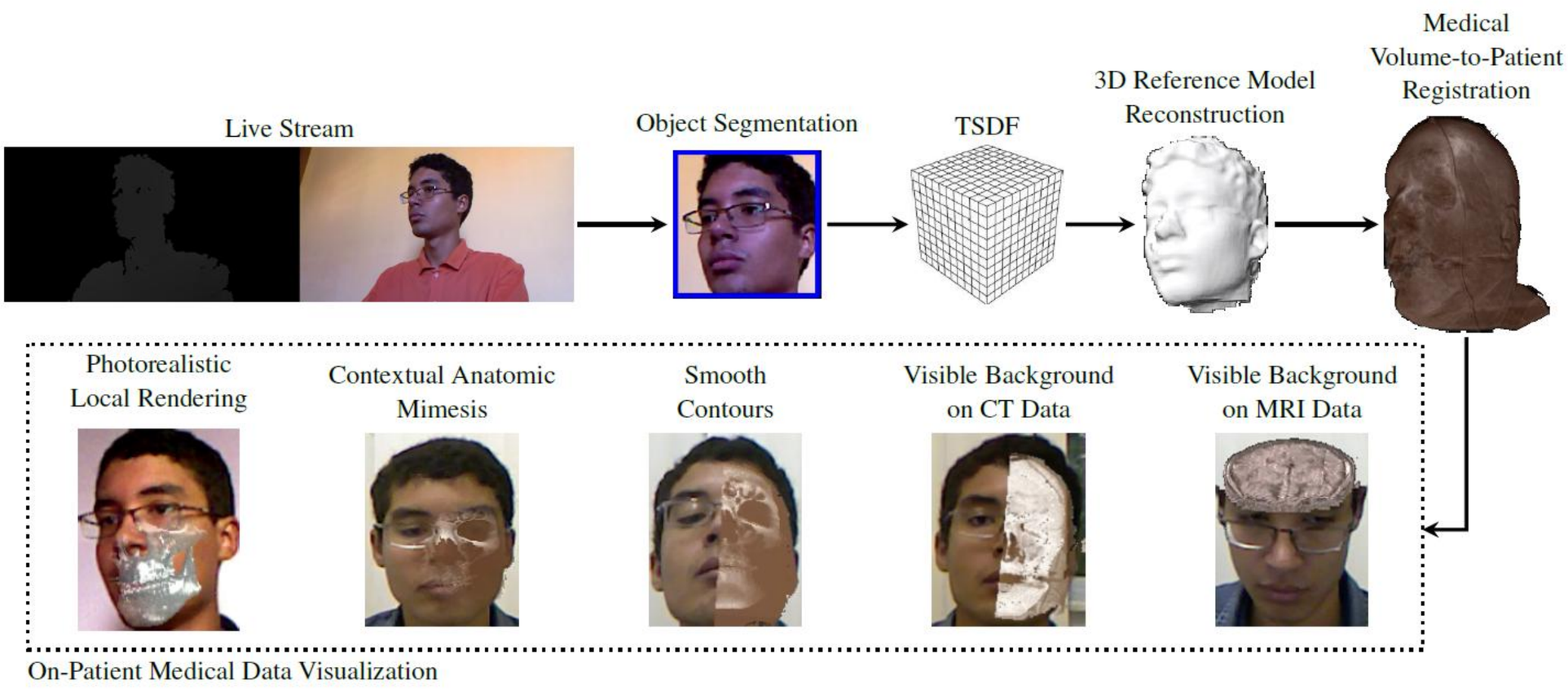


I. Introduction

With the Augmented Reality, the physician is able to visualize, at the same time, the patient and a part of his anatomy. In this work, we show an integrated solution for markerless on-patient medical data visualization which supports: real-time performance, accurate tracking, volume rendering, high visual quality and photorealism.

II. Markerless Tracking

To track the patient's region of interest (ROI) without markers, we detect and segment it from an RGB-D sensor live stream. Then, the KinectFusion is used to reconstruct and track a 3D reference model of the patient's ROI in real-time [1].

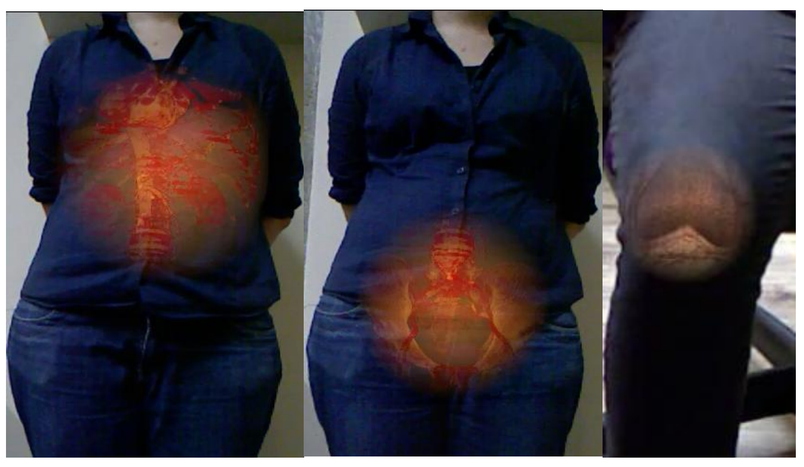
III. On-Patient Medical Data Visualization

After rendering and positioning the medical volume into the augmented scene, our application supports the following visualization modes:

- **Contextual Anatomic Mimesis**: Uses focus point and radius to define the visualization [2];
- **Smooth Contours**: Adds a smooth transition between the virtual and real images;
- **Visible Background on CT data**: Deemphasizes the soft tissues to enhance the visualization of the bone structures;
- **Visible Background on MRI data**: Enables the user to cut away volume and patient's ROI to visualize organs in the patient.
- **Photorealistic Local Rendering**: Enables the rendering of the medical volume according to real-world environmental lighting;

IV. Results

- **Performance:** All of the methods run in real-time (above 25 frames per second);
- **Accuracy:** 10mm for reconstruction and 2mm for tracking;
- **Visual Quality:** Our approach supports several free-of-artifact visualization modes;
- **Generality:** Our approach supports several ROIs, such as: faces, torso, knee, among others.



Acknowledgments

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References

[1] S. Izadi et al. "KinectFusion: real-time 3d reconstruction and interaction using a moving depth camera". UIST. 2011;
[2] C. Bichlmeier et al. "Contextual Anatomic Mimesis: hybrid in-situ visualization method for improving multi-sensory depth perception in medical augmented reality". ISMAR, 2007.