

# Data Processing in Mixed Reality

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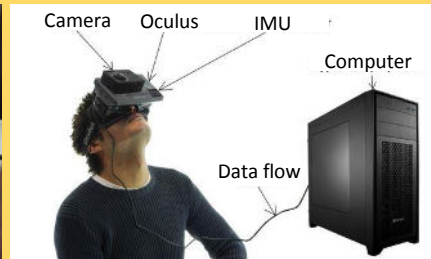
This work represents unlimited no reference point positional tracking for mixed reality applications based on visual SLAM methods. Proposed system is capable of real time processing using Oculus Rift DK2, SJCAM SJ4000 and algorithms being PTAM and LSD-SLAM. Preprocessing filtering is proposed as well using Sobel derivatives and Gaussian filter as main filters.

## 1. Motivation

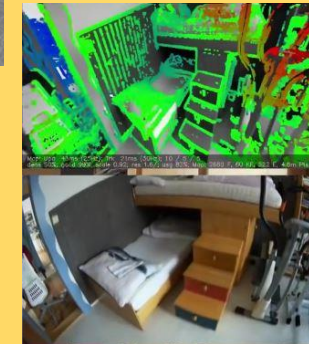
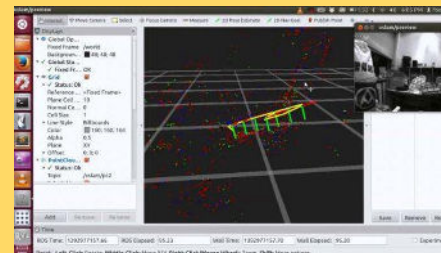
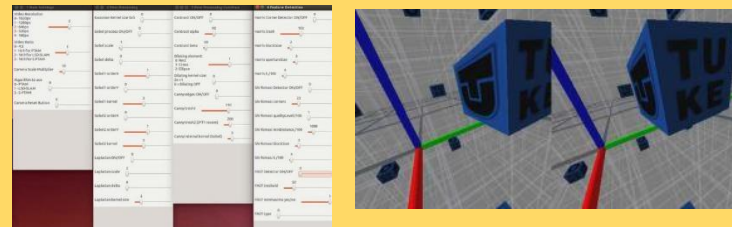
- Lack of positional tracking for Mixed Reality (also for head mounted displays and virtual reality).
- If there is positional tracking, its limited, based on reference point (positional camera), usually 2-3 meters.
- User is tethered.
- Need of unlimited no reference point positional tracking arises.

## 2. Final system

- Devices used are Oculus Rift DK2, SJCAM SJ4000 both connected to a computer with Linux.



- Video feed is processed into 3D position by running SLAM algorithms using Robot Operating System.
- SLAM algorithms used are LSD-SLAM and PTAM.
- Video feed is prefiltered in prefiltering system utilizing many filters – Gaussian blur, Sobel derivatives, Laplacian, contrast, Dilating, Canny edges.
- 3D position vector computed by SLAM is fused with orientation from Oculus to provide final 3D pose.



## 3. Results

- Many settings and combinations of algorithms tested.
- Final system is fast and reliable in small indoor spaces.
- Working in exterior as well, less reliably.
- Most helpful video prefiltration algorithms are Gaussian filter and Sobel derivatives.
- Presentation of idea of computing 3D pose using video feed in unlimited way.
- Video available at <https://www.youtube.com/watch?v=lyMMbEEbLq4>