

FVV Live is a **real-time, low-latency, end-to-end free viewpoint video system** including capture, transmission, synthesis on an edge server, and visualisation and control on a mobile terminal.



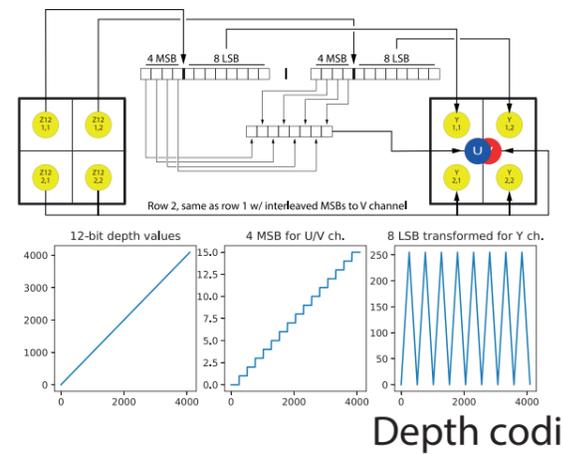
Capture setup

Capture

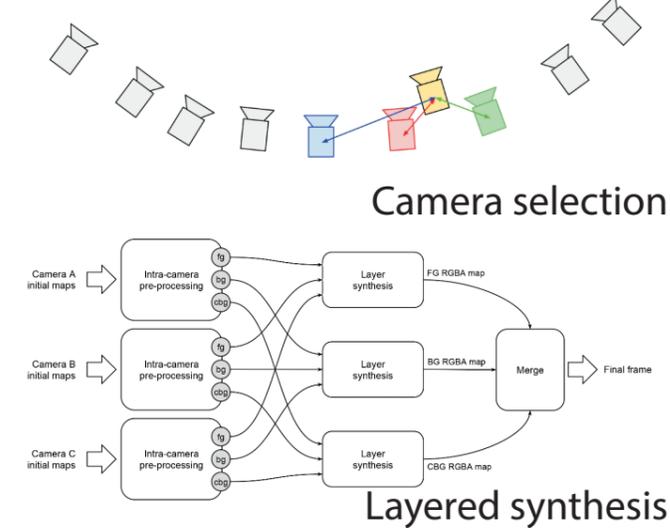
- Consumer-grade stereo cameras over standard USB connections, no gen-lock required.
- Software synchronization procedure over a shared clock source distributed using PTP (IEEE 1588-2002).
- Real-time depth estimation and segmentation to enable layered synthesis and bandwidth savings.

Transmission

- Real-time encoding all (necessary) camera streams, both colour and depth, RTP transmission.
- Depth information means structure, but video lossy codecs are designed for natural images and the HVS: lossless coding.
- Extended precision to deliver depth data for the synthesis: adaptation of 4:2:0 video structures to get 12 bits per pixel.



Depth coding



Camera selection
 Layered synthesis

Synthesis and visualisation

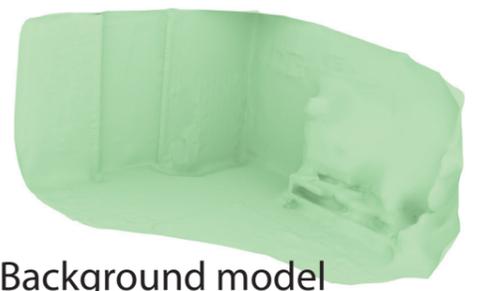
- Real-time synthesis, too much data from all cameras, therefore only the cameras nearest to the virtual viewpoint are used.
- Very complex task, and also unreliable depth data. Soft transitions mix contributions from closest reference cameras.
- Dense off-line background model with Retinex+AKAZE+SfM+MVS.
- Layered synthesis to integrate reliable off-line background model with on-line foreground to combat noisy on-line depth estimation in the background.
- Cell phone controls the position of the virtual camera.



Synthesized image



Colour



Background model



Depth



Cell phone control

Demo videos can be found at: <https://www.gti.ssr.upm.es/fvvlive>