REALTIME VIRTUAL REALITY STREAMING

RYAN ROWE Advisors: Dr. Li, Dr. Iyengar, Dr. Marhamati

01 Abstract

Realtime video VR video streaming is hypothetically possible, but practically very difficult. Streaming multiple separate video streams and accurately splicing them, with accurate eye and head tracking is taxing on both the video software and transmission hardware. The overhead of multiple 1080p+ high bit rate video encoding is too taxing on most cheap consumer level hardware to be useful as a utility. Using less cameras as a stop gap measure is an acceptable alternative but runs into practical engineering issues when deployed.

02 Methodology

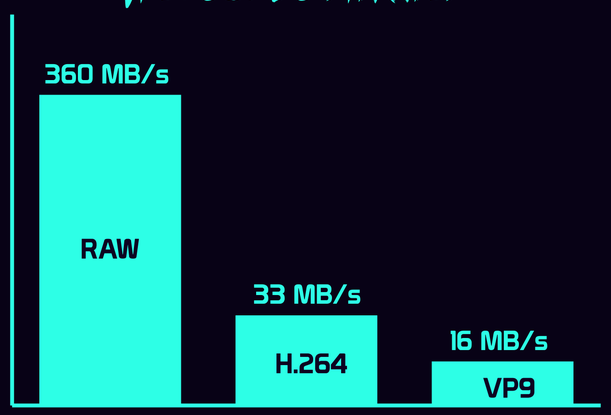
- 9 total tests performed
- Each test done with one compression method and one network method
- Tests were done using a raspberry pi 3 and a USB Wirelss AC USB dongle
- Data bitrate was calculated by assuming a single video stream of 1080p 60fps
- Test was performed with optimzed mirror setup with two 1080p 60fps streams,z and unoptimized eight 1080p 60fps data streams

03 Results

- RAW video was the highest quality, but had performance issues on anything but the 5GHz connection with the two camera setup
- H2.64 encoding had better beformance across the board, but that had significant performance impact on the streaming hardware and lead to frame drops
- VP9 fared the best but often lagged behind on latency due to the amount of compression needing to be done by the streaming hardware

	Availible Bandwidth	Bandwidth Δ for 8	Bandwidth Δ for 2
RAW + 5GHz	900 MB /s	-1980 MB /s	180 MB /s
RAW + 2.4GHz	150 MB /s	-2730 MB /s	-570 MB /s
RAW + Bluetooth	16 MB /s	-2864 MB /s	-704 MB /s
H.264 + 5GHz	900 MB /s	636 MB /s	834 MB /s
H.264 + 2.4GHz	150 MB /s	-114 MB /s	84 MB /s
H.264 + Bluetooth	16 MB /s	-248 MB /s	-50 MB /s
VP9 + 5GHz	900 MB /s	772 MB /s	868 MB /s
VP9 + 2.4GHz	150 MB /s	22 MB /s	118 MB /s
VP9 + Bluetooth	16 MB /s	-112 MB /s	-16 MB /s

Video CODEC Bitrates



Ad-Hoc Network Bandwidth