Games and Frames: A Strange Tale of QoE Studies

UNIVERSITÄT DUISBURG ESSEN

Open-Minded

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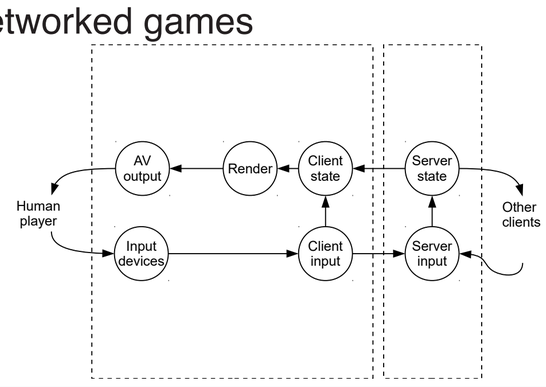
Motivation

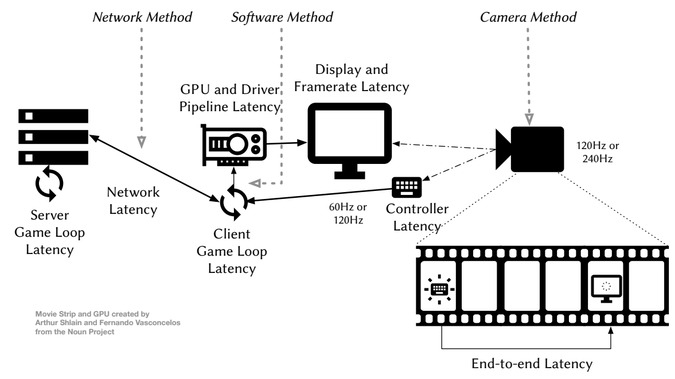
- Increasing research interest for video game QoS/QoE
- Past approaches treated video game QoE assessments similar to video streaming
- Networked video games have difficult-to-understand interlocked mechanics (frame and tickrates, lag, ...)
- Singular focus on network delay
- Need for a better theoretical understanding of these mechanics

Frame- and Tickrates

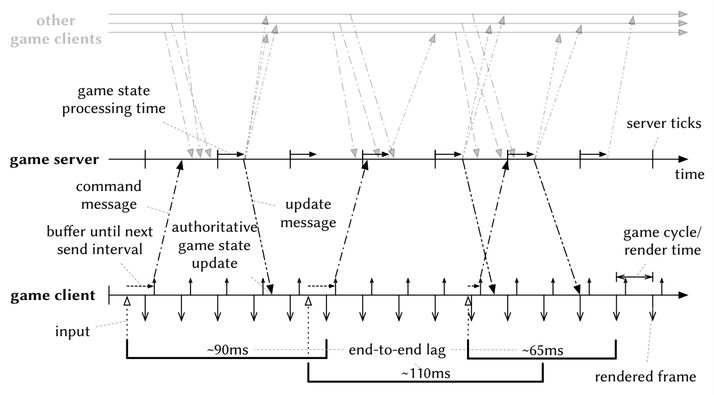
- Framerate and tickrate governings factor in input latency
- Independently clocked processes in networked games



Sources of Lag



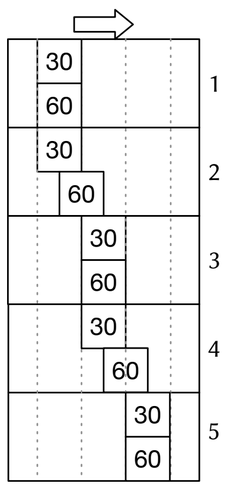
- Every game is influenced differently by lag and its sources
- Lag has different effects on gameplay
- Lag distribution through inter-arrival time distributions and clocked processes
- Different vantage points to observe lag



Issues of Past Studies

Examples of issues in past gaming QoE studies:

- Framerates insufficient for motion perception (3, 7, 15Hz), also increasing latency; but still observing acceptable quality
- Wrong choice of metrics (e.g. timescale-wise)
- Lack of training sessions and too short observation period
- No understanding of core gameplay mechanics
- Inability to generalize results from specific games

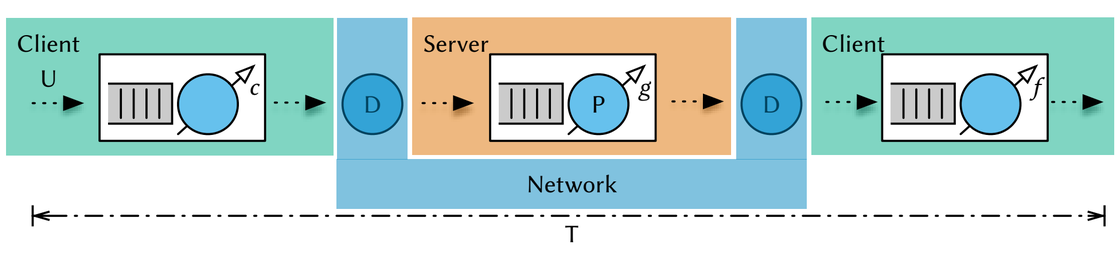


Motion percption in video (and games) follows the concept of "apparent motion", kicking in at ~16Hz

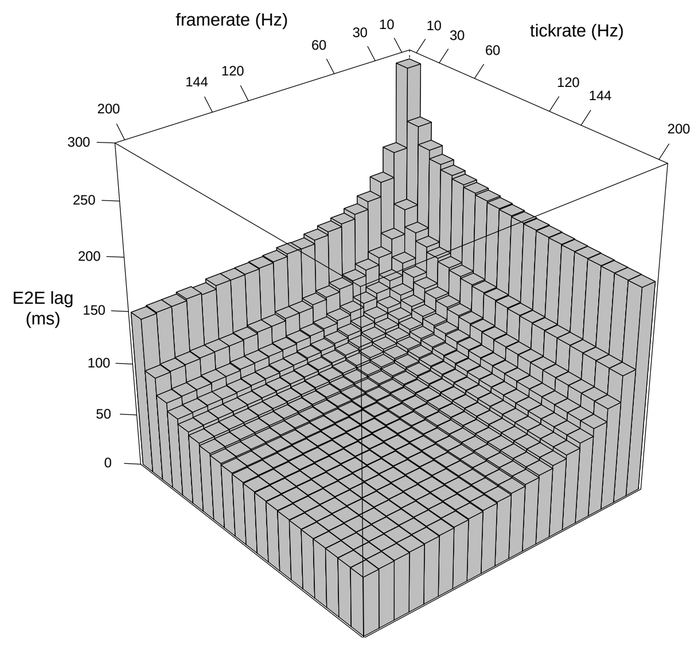
- Common framerates: 30. 60, 120
- Reasoning: Monitor refresh rates and VSYNC/tearing
- Minimum for VR: 90
- Equally important: frametimes and pacing

Modeling and Simulating Lag

- End-to-End lag sources modelled as a queuing system
- Goal: investigate influences of sources previously not directly attributed to lag: framerate, tickrate, client/server message rates
- Interaction of multiple, independently clocked processes
- Generic model allows mapping the above game types by adding or removing delay components.
- Extension for cloud gaming: further fixed clock entities for video en-/decoding, modified input and transmission process
- Determine correct parametrization of model entities
- Implement model in a R simulation
- Run studies for different game types



Results



Evaluation of the networked game case for 10-200Hz frame/tickrates, ~40ms base network RTT

- Large influence of frame/tickrate on E2E lag
- Network influence is negligible if frame/tickrate low
- Lowering the framerate has a bigger impact than lowering the tickrate
- Guidelines for future user study parametrizations!

Further information, the full paper, all data as well as source code can be found at `https://github.com/mas-ude/onlinegame-lag-sim`, contact `florian.metzger@uni-due.de`, or just scan the QR-code.

References and Acknowledgements: