# Acceptable System Latency for Gaze-Dependent Level of Detail Rendering

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Human visual system is unable to perceive all details in the entire field of view. High frequency features are noticeable only at a small angle of 1-2 degrees around the viewing direction. Therefore, it is a reasonable idea to render the coarser object representations for the parafoveal and peripheral visions. A core problem of this gaze-dependent level-of-detail rendering is minimisation of the system latency. In this work we measure how fast should be the whole process of rendering and visualisation to prevent that level-of-detail change will be visible for human observers. We measured in the pilot experiment that even for distant periphery, the change from coarser to fine object representation should take less than 28 ms.
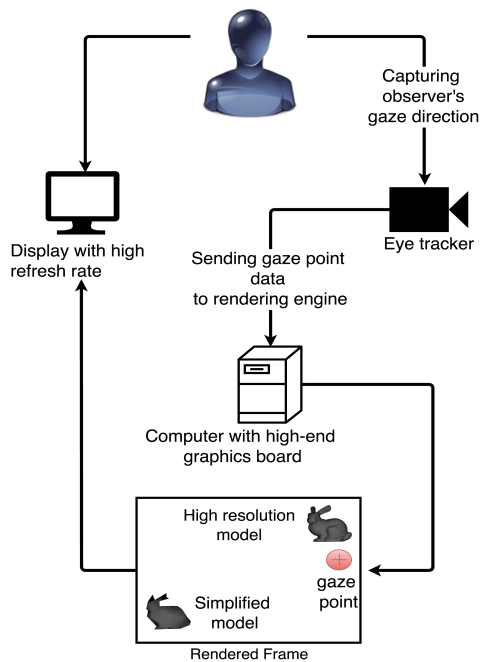

Gaze-dependent rendering system
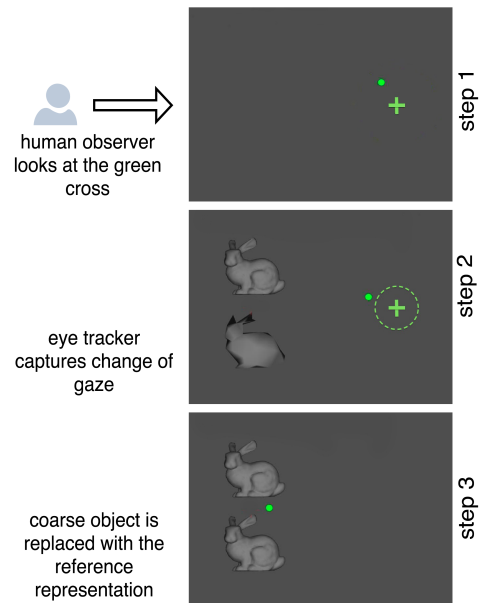
EXPERIMENT

The green spot depicts the observer's gaze location captured by eye tracker. In the first step, observer looks at the green cross plotted on the grey background. After a second two objects are shown on the left side of the screen: a fine representation of the object geometry and its reduced version with lower number of polygons. The simplified version of the object is replaced with the reference one as soon as the gaze moved away from the initial position. In the third step observer decides, which object is drawn is the coarser version.
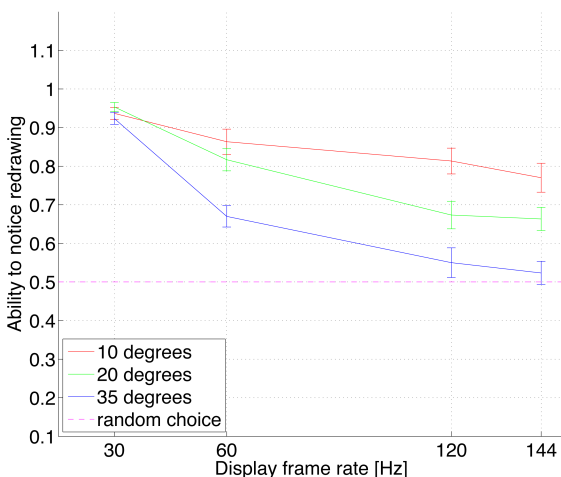
RESULTS

The plot shows the normalised ratio of correct answers as a function of the display frame rate. The ratio of 0.5 is equivalent to the random choice, i.e. indicates inability to distinguish between reference and simplified models. In our study only for the display refresh rate of 144 Hz and the angular distance of 35 deg the results are close to this line. In all other cases the system latency was to long to ensure imperceptible change of the level-of-detail.

DO-IT-YORSELF EYE TRACKER (300 Hz)