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TRANSFER OF 2D-EYETRACKING DATA TO VIRTUAL 3D-DESIGN TOOLS

Ideas on utilisation

Eye movements of humans are based on the alignment of both eyes on objects to be fixed (visual targets). Depending on the distance of such visual goals, the eyes perform two different movements. For one, the eyes accommodate (Adjustment of the refractive power of the lens by curvature). On the other hand, the eyes align themselves in their visual axis on the visual target (so-called "Vergenzbewegung" such as the inward squinting near objects, approximate parallel position with distant objects (Fig.1). Eyetracking data allow the detection of human eye movement (Vergenzen) and present it image-based and synchronous to processes dar. This usually happens on the basis of two-dimensional coordinate pairs, which are marked as points of view, eg by means of color dots, and a video sequence (forehead camera) superimposed (Fig. 2) Common methods of presenting analysis results are often limited to 2-dimensional Visualizations with so-called "heat maps" or "visual paths" (Fig. 3).

The result presented here is a method to integrate eye movement data into 3D design tools and to use them in these.

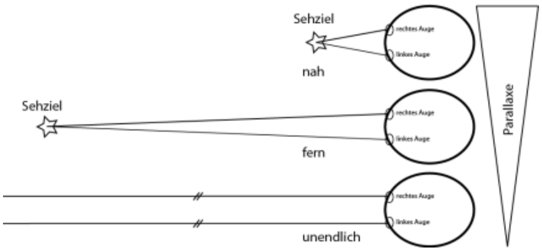

Fig 1: Human eye movement: relationship between distance, vergence and parallax.

Fig 2: Overlay video with two color markings for right and left eye.

Fig 3: left: heat map visualization; right: viewpoint presentation.

Potential adopters of technology

Reuse / further development / utilization is aimed at both manufacturers and users of eyetracking systems or digital human models:

- Eyetracking systems manufacturer: Extension of your analysis software
- Manufacturer of human model software: Development and licensing of import functions for various eye tracking systems
- Eyetracking system users: Used to test new machines in the early stages of the product creation process with virtual prototypes
- Developer: Design of visual MMI with options for virtual verification of semitransparent ads
- Developer: Novel visualization concepts with depth-adaptive design criteria

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Advantages of technology

- Verification of visibility with virtual prototypes quantitatively
- No compulsion to prioritize so-called "areas of interests, (AOIs)"
- Automated analysis of gaze data with customization options for individual developer needs via programming scripts in 3D development environments
- Use of eyetracking data as active input parameters for the dynamic adaptation of visual information interfaces to human visual processes (e.g., user- and process-oriented assistance systems with variable degree of adaptability)
- Visualization concepts with a novel adaptivity criterion (for example, information representations adapted to viewing distances to reduce accommodation work)

Market and context of technology

- Frequent Status Quo: Qualitative visual checks on real prototypes/ test sample → high costs for subsequent changes.
- Current state of development: Integrate binocular eye-tracking data into a 3D drafting tool. Discrete-time analysis of visual ray vectors generated in this way with regard to penetrations, collisions or interactions with other 3D objects.

Fig 4: Experimental setup comparing the distance calculation based on eye tracking data with the actual distance.

- Maturity level: Registered patent with functional test under laboratory conditions.
- Further development needs: Summary of the process required for individual steps/ Programming for standardization under a graphical user interface (GUI).
- Comparison of viewing data-based to real viewing distance currently in progress (Fig. 4).
- Acceptance problems in the utilization strategy of the procedure as input parameters for depth-adaptive interface design both at the level of the user (need to get used to - to investigate through experiment) as well as at the regulatory regulatory level with high probability to expect. (→ Investigations in simulators recommended, use initially off-road or on company premises with mobile machines (street legal) conceivable.

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