Improving Accuracy in Head Tracking for Desktop VR Applications

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I. Context

- Virtual Reality (VR) technology has advanced significantly, enabling immersive experiences in a variety of fields such as gaming, simulations, and training.

- One of the essential components for immersion is the precise tracking of the user's head, known as "Head Tracking."

- The current challenge lies in enhancing Head Tracking for VR experiences on desktops. Having better accuracy and latency are critical factors that directly impact the user experience.

- This problem is crucial to the field of Virtual Reality as precise Head Tracking not only increases immersion but also reduces user discomfort such as dizziness and nausea that can occur with inaccurate tracking.

II. Motivation

- As a video game lover, I've always been intrigued by how games work. Discovering Virtual Reality (VR) intensified this curiosity. I wanted to understand how it creates such immersive experiences and how we could make them even better.

- Enhancing Head Tracking is crucial for maximum immersion in VR from a scientific perspective. A more realistic and comfortable VR experience has broad applications, from entertainment to medical and industrial training.

- Improving Head Tracking could revolutionize desktop VR, offering more engaging experiences with increased accuracy and reduced latency. This advancement could lead to wider adoption of VR across various fields.

III. Objective

- **Research Question:**
    - How can we improve the accuracy of head pose estimation for head tracking applications?
- **Research Goals:**
    - Optimizes head pose estimation to improve the experience in Desktop VR applications

IV. Relevance

- **Current State of the Field:**
  - The current landscape of Head Tracking in VR displays for desktops reveals a focus on improving accuracy and reducing latency.
  - Existing methods often rely on a combination of gyroscopes, accelerometers, and magnetometers to track head movements.
  - However, challenges persist in achieving seamless and precise tracking, especially during rapid motions.
- **The Research's Contribution:**
  - This research aims to contribute by exploring novel algorithms that enhance the accuracy and responsiveness of Head Tracking.

V. Brief Related Works

- M. Kunz et al., "Reducing Fixation Error Due to Natural Head Movement in a Webcam-Based Eye-Tracking Method," 2023 IEEE Sensors Applications Symposium (SAS), Ottawa, ON, Canada, 2023, pp. 1-6, doi: 10.1109/SAS58821.2023.10253976.

- A. Sherstyuk and A. Treskunov, "Head tracking for 3D games: Technology evaluation using CryENGINE2 and faceAPI," 2013 IEEE Virtual Reality (VR), Lake Buena Vista, FL, USA, 2013, pp. 67-68, doi: 10.1109/VR.2013.6549366.

VI. Preliminary Results

VII. Conclusion and Future Directions

- **Summary:**
  - The primary objective of this research is to enhance Head Tracking for desktop VR displays, focusing on improving accuracy, reducing latency, and ultimately enhancing the user's sense of immersion within virtual environments.
  - Through the exploration of advanced sensor fusion techniques and machine learning models, the study seeks to contribute to the evolution of VR technology.
- **Upcoming Phases of the Research:**
  - Moving forward, the research will delve deeper into the implementation and testing of the developed algorithms.
  - User feedback will also play a crucial role in refining the algorithms for optimal user comfort and immersion.

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