Title: Enhancing Pupil Detection on Raspberry Pi through Machine Learning-Based Localization

Introduction:

The aim of this research is to augment the existing pupil detection system on a Raspberry Pi by implementing machine learning techniques for more precise localization of pupils. Accurate pupil localization is essential for various applications, including gaze tracking, biometrics, and human-computer interaction. This thesis outlines the development process and experiments to enhance pupil detection in real time.

Example

Objectives:

- Develop a wearable eye-tracking system on a Raspberry Pi using Python and OpenCV.
- Extend the existing pupil detection system to enable accurate gaze tracking.
- Evaluate the system's performance against two established state-of-the-art eye-tracking systems.
- Assess the potential applications and advantages of the developed system.

Methodology:

1) System Development: Implement the wearable eye-tracking system on the Raspberry Pi, integrating our existing pupil detection technology.
2) Gaze Tracking: Extend the system to accurately track and record the user's gaze in real time.
3) Data Collection: Gather data from various participants to train and validate the system.
4) Model Selection: Choose a suitable machine learning model for pupil localization, considering accuracy and computational efficiency.
5) Evaluation Setup: Conduct comparative evaluations with two state-of-the-art eye-tracking systems.
6) Performance Metrics: Assess the accuracy, precision, and real-time capabilities of the developed system.

Methodology from Blended report

Experiments:

Accuracy Comparison: Compare the accuracy of our wearable eye-tracking system with the two state-of-the-art systems in controlled settings such as lighting conditions, participant positioning, and background distractions.

Real-World Performance: Evaluate the system's performance in real-world scenarios to gauge its practicality and robustness by evaluating two existing state-of-the-art eye-tracking systems as a benchmark.

Significance:

This research holds substantial significance by introducing an affordable and accessible wearable eye-tracking solution. The development of such a system on a Raspberry Pi has the potential to revolutionize eye-tracking applications, including human-computer interaction, healthcare diagnostics, and user experience research.

Expected Outcomes:

We anticipate the creation of a portable and cost-effective eye-tracking system with competitive performance. This project aims to establish the feasibility and potential advantages of our system in comparison to existing state-of-the-art solutions.