Technische Universität München

Neurowissenschaftliche Systemtheorie

Practical Project

Comparison of event-based vs. frame-based cameras for human body pose tracking

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Problem description:

In constrained interior settings within automotive environments, driver and passengers typically operate in a well constrained space. Future intelligent assistive cars shall know the drivers and passengers current position and observe interactions (e.g. gestures). Computer Vision technology is currently developed to identify head and arm position of driver and passengers, but suffers from various problems such as sensitivity to changes in illumination, motion blur in recordings, or substantial computing resources needed to interpret human poses in real time. In this project a novel type of camera sensors (event-based dynamic vision systems (DVS)) shall be initially explored and compared against traditional (high frame rate) computer cameras.

Task:

Develop a portable setup to synchronously record video sequences and data from DVS, record several exemplary situations within laboratory environments (e.g. tracking of a person's moving head or an arm), followed by recordings in an automotive environment (stationary or driving car). Analysis of captured data in terms of amount per second, initial quality assessment, insensitivity to illumination changes, etc.
Focus on one subproject, either head pose tracking or limb (arm) pose tracking; ideally apply existing computer vision algorithms (event-based or frame-based) or extend existing or develop novel algorithm for pose tracking in real time. Evaluate required resources, achieved accuracy, and required lag (delay) from motion percept to result.
Consolidate results and compare the different sensor methods in a short report.

Timeline:

Milestone 1 · develop and assemble sensor recording setup (traditional cameras and DVS)
Milestone 2 · initial test recordings, evaluation of recording setup, improvement
Milestone 3 · recordings and analysis of simulated driving conditions, decision on head vs. limb
· recordings in final environments (on the road, in car simulation, etc.)
· initial data analysis, identification of metrics for comparison
Milestone 4 · development / advancement of algorithms for automatic pose estimation
· assessment of advantages / drawbacks of event-based vision vs. frame-based vision
Milestone 5 · final report, additional recordings if needed, visualization of results

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