Karlsruher Institut für Technologie

Applied Informatics and Formal Description Methods
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# Master Thesis

## Video Stream Feed-Forward 4D Gaussian Splatting for Dynamic Driving Environments

**Background:**

While 3D Gaussian Splatting (3DGS) excels in static novel view synthesis, extending it to highly dynamic driving environments traditionally requires exhaustive, unscalable per-scene optimization. To overcome this, recent state-of-the-art methods in autonomous driving (e.g., ReconDrive [1] and DGGT [2]) leverage feed-forward 4DGS to directly regress Gaussian parameters from multi-view inputs in a single pass. However, these methods typically process fixed video segments offline. Shifting towards real-world autonomous driving applications demands online, video stream-based reconstruction. Building upon these breakthroughs, this Master's thesis focuses on developing an efficiency-optimized streaming 4DGS framework that processes sequential video inputs through causal temporal modeling and efficient memory management. By significantly reducing the computational and memory overhead of dynamic scene reconstruction, this work aims to provide a versatile 4D representation that enhances both high-fidelity autonomous driving simulation and robust downstream perception tasks.

**Your Tasks:**

- Conduct a literature review of feed-forward 4D reconstruction methods
- Develop a feed-forward network for streaming 4DGS, focusing on causal temporal modeling and efficient memory management.
- Benchmark against baselines to assess rendering quality, memory efficiency, and temporal coherence.
- Write your thesis; top-tier conference submission of outstanding results is highly encouraged.

**Your Profile:**

- Strong background in computer vision, deep learning, robotics, or related fields.
- Motivation to work on open-ended research problems and conduct independent experiments.
- Solid programming skills in Python and experience with PyTorch.
- Good analytical skills and ability to communicate research ideas clearly in English.

**Start date:** Immediately **Duration:** As per the applicable examination regulations.

If you are interested or have any questions regarding this thesis position, feel free to contact:
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[1] Yu, Haibao, et al. "Recondrive: Fast feed-forward 4d gaussian splatting for autonomous driving scene reconstruction." arXiv preprint arXiv:2603.07552 (2026).
[2] Chen, Xiaoxue, et al. "DGGT: Feedforward 4D Reconstruction of Dynamic Driving Scenes using Unposed Images." arXiv preprint arXiv:2512.03004 (2025).