

Task #01:

Due: July 20, 2023

Computer Graphics- 51 4 (Spring 2023)

Interesting Topic in Computer Graphics

Please describe two topics of interest in Computer Graphics, in your area of research. Each paragraph should have three components:

- Title reflecting the topic, not just area of research. You can take a look at how paper titles are constructed to get an idea about how to write the titles for your paragraphs.
- Clear and short explanation of the topic, understandable to a broader CS audience.
- A short description of the reason you find the topic interesting. The reason could be related to the impact you want to create, inspiration from the past, what you enjoy doing or thinking about, or other reasons you find the topic interesting.

The total length of your response should be less than one page, reasonably formatted like a **conference or journal paper**. We expect your writing to be polished like a paper submission. It typically takes one or two hours to edit one page of text.

Topic Lists:

- 1. Real-Time Ray Tracing:** Real-time ray tracing aims to achieve high-quality and realistic rendering in real-time applications such as video games and virtual reality. Research focuses on developing efficient algorithms and hardware acceleration techniques to enable real-time ray tracing on consumer-grade hardware. There are still ongoing research problems to address. Here are some recent challenges in real-time ray tracing:

Real-Time Ray Tracing on Mobile and Embedded Devices	Real-Time Ray Tracing for Virtual and Augmented Reality	Dynamic Scenes and Animation	Hybrid Rendering Techniques
Anti-Aliasing and Denoising	Performance Optimization	Real-Time Ray Tracing on Mobile and Embedded Devices	Global Illumination and Light Transport

- 2. Generative Adversarial Networks (GANs) for Graphics:** GANs have gained significant attention in computer graphics for tasks such as image synthesis, style transfer, and texture generation. Researchers are exploring ways to leverage GANs to generate high-quality and realistic graphics content. Here are some recent research problems and areas of interest for Generative Adversarial Networks (GANs) in the field of graphics:

Improved Training Stability	High-Fidelity Image Generation	Controllable and Semantically Meaningful Generation	Diversity and Mode Coverage
Text-to-Image Synthesis	Video and Temporal Sequence Generation	Interactive and User-Guided Generation	Understanding and Mitigating Bias
Domain Adaptation and Style Transfer	Unsupervised and Self-Supervised Learning		

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- 3. Virtual and Augmented Reality (VR/AR):** VR and AR technologies continue to evolve, and research in computer graphics plays a crucial role in enhancing the visual quality and user experience. Areas of research include realistic rendering, interaction techniques, and perceptual issues related to VR and AR systems. Here are some recent research problems in computer graphics for Virtual and Augmented Reality (VR/AR):

3D Reconstruction and Object Recognition	Realistic Rendering in VR/AR	Real-time Physics and Simulations	AR for Spatial Understanding and Contextual Awareness
Domain Adaptation and Style Transfer	Content Creation and Authoring Tools:	Seamless Integration of Real and Virtual Environments	Immersive Interaction and User Experience

- 4. Computational Photography:** Computational photography combines computer graphics and computer vision techniques to enhance and manipulate digital photographs. Research focuses on developing algorithms for image-based lighting, depth estimation, image in-painting, and other advanced image editing techniques.

- 5. Deep Learning for Computer Graphics:** Deep learning techniques have been applied to various computer graphics tasks, such as image and shape synthesis, image and video in-painting, and image de-noising. Researchers are exploring ways to leverage deep learning architectures to improve the quality and efficiency of computer graphics algorithms.

Deep Learning for 3D Reconstruction:	Deep Learning for Geometry Processing:	Deep Learning for Animation and Motion Synthesis	Deep Learning for Physically Based Rendering
Deep Learning for Data-Driven Graphics:	Deep Learning for Computational Photography	Deep Learning for Augmented Reality (AR) and Virtual Reality (VR)	

- 6. Segmentation and 3D Reconstruction:** Computer graphics algorithms are employed to segment medical images and extract specific structures of interest. This process involves delineating organs, tumors, blood vessels, or other anatomical regions. Segmentation is typically followed by 3D reconstruction, where computer graphics techniques create 3D models from segmented image data for further analysis and visualization
- 7. Computer Graphics in Addressing Environmental Challenges**
- 8. Data-driven Disease Analysis and Prediction**