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MC3D: Motion contrast 3D scanning

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Structured light 3D scanning systems are fundamentally constrained by limited sensor bandwidth and light source power, hindering their performance in real-world applications where depth information is essential, such as industrial automation, autonomous transportation, robotic surgery and entertainment. We present a novel structured light technique called Motion Contrast 3D scanning (MC3D) that maximizes bandwidth and light source power to avoid performance trade-offs. The technique utilizes motion contrast cameras that sense temporal gradients asynchronously, i.e., independently for each pixel, a property that minimizes redundant sampling. This allows laser scanning resolution with single-shot speed, even in the presence of strong ambient illumination, significant inter-reflections, and highly reflective surfaces. The proposed approach will allow 3D vision systems to be deployed in challenging and hitherto inaccessible real-world scenarios requiring high performance using limited power and bandwidth.

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Adventures in scientific visualization

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With the advancement of simulation and data storage technologies and the ever-decreasing costs of hardware, our ability to derive and store data is unprecedented. However, a large gap remains between our ability to generate and store large collections of complex, time-dependent simulation data and our ability to derive useful knowledge from it. Visualization exploits our most powerful sense, vision, in order to derive knowledge and gain insight into large, multi-variate flow simulation data sets that describe complicated and often time-dependent events. This talk presents a selection of state-of-the art flow visualization techniques and applications in the area of computational fluid dynamics (CFD) and foam simulation, showcasing some of visualizations strengths, weaknesses, and, goals. We describe inter-disciplinary projects based on flow and foam motion, where visualization is used to address fundamental questions-the answers of which we hope to discover in various large, complex, and time-dependent phenomena.

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