

Open Master thesis

Light Rendering in Unity with Multipath Effect for Sensor Simulation

Sensor simulation plays a paramount role in the investigation of distance sensing technologies employed in a variety of fields, such as robotics, autonomous driving, surveillance and drone navigation. Often, simulation environment don't consider realistic environmental conditions and parasitic effects that limit real-world sensing performances. The use of advanced simulation softwares like Unity 3D allows to efficiently and realistically model light characteristics such as reflection and diffusion, together with the simulation of multipath propagation between objects.

In this project, you will be working with our framework in Unity, where we already set up an environment that uses the High-Definition Render Pipeline (HDRP) to model the light intensity as captured by an RGB camera object. The depth and intensity images collected by this camera are used to generate point clouds and simulate realistic measurements of a Time-of-Flight camera and a Radar sensor.

You will need to investigate and improve the light reflection models employed in the framework by acting in Unity itself and with its shader scripts. The goals are to have a realistic light environment that includes multipath propagation and converts this information in suitable format for the ToF and radar sensor simulation.

The thesis will be conducted at the University of Klagenfurt, where you will also have scheduled access to a high-performance simulation PC with Unity. We also offer publication possibilities.

Your tasks:

- 1) Get familiar with the existing Unity simulation (office scenario/parking garage)
- 2) Use the HDRP features in Unity to investigate complex light reflection with the needed materials
- 3) Model ray tracing and multipath effect in the proposed scenarios
- 4) Report and document your findings and results

Your requirements:

- Good knowledge in Unity
- C# or equivalent programming language
- Basics of computer vision / image processing

Nice to have's:

- Knowledge of the HDRP pipeline
- Knowledge of other sensing technologies, e.g., ToF or Radar
- Matlab coding

Time period and contact information:

Duration: about 6 months, Start: as soon as possible

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