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Automated Irradiance Measurements for
Validation of
Far-UVC Lighting Installations
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Abstract

Accurate spatial measurement of Far-UVC irradiance is necessary for designing installations that provide effective germicidal exposure while remaining within recommended exposure limits. The current validation method commonly uses a manual grid in which irradiance is measured at 0.5 m intervals throughout a room. Although effective, this process is labor-intensive, time-consuming, and provides relatively coarse spatial resolution. This project developed a robotic system for collecting high-resolution, spatially registered 222 nm Far-UVC measurements and comparing them with simulations generated by Illuminate, an open-source germicidal ultraviolet simulation tool.

A Gigahertz Optik X20 light sensor was mounted on a TurtleBot 4 using a custom stand with optional height variability. The robot uses Simultaneous Localization and Mapping to determine its position, generates a coverage path, and records irradiance at user-defined spatial intervals. The measurements are saved with their spatial coordinates and reconstructed as a two-dimensional heatmap using thin-plate spline interpolation. A graphical user interface was designed for this project and integrates mapping, path generation, data collection, heatmap generation, and error analysis. The completed system provides a faster and higher-resolution alternative to the conventional manual grid method and establishes an end-to-end framework for validating Far-UVC lighting simulations and installations.