

Creation of a Realistic Railway Simulator Developed on a 3D Graphic Game Engine Using a Numerical Computing Programming Environment

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Abstract : Advances in algorithms related to autonomous systems have made it possible to research on improving the accuracy of a train's location. This has the capability of increasing the throughput of a railway network without the need for the creation of additional infrastructure. To develop such a system, the railway industry requires data to test sensor fusion theories or implement simultaneous localization and mapping (SLAM) algorithms. Though such simulation data and ground truth datasets are available for testing automation algorithms of vehicles, however, due to regulations and economic considerations, there is a dearth of such datasets in the railway industry. Thus, there is a need for the creation of a simulation environment that can generate realistic synthetic datasets. This paper proposes (1) to leverage the capabilities of open-source 3D graphic rendering software to create a visualization of the environment. (2) to utilize open-source 3D geospatial data for accurate visualization and (3) to integrate the graphic rendering software with a programming language and numerical computing platform. To develop such an integrated platform, this paper utilizes the computing platform's advanced sensor models like LIDAR, camera, IMU or GPS and merges it with the 3D rendering of the game engine to generate high-quality synthetic data. Further, these datasets can be used to train Railway models and improve the accuracy of a train's location.

Keywords : 3D game engine, 3D geospatial data, dataset generation, railway simulator, sensor fusion, SLAM

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