Abstract

Ever since the mass production of automobiles our cities have become less pedestrian friendly to cater for vehicle transport. Paths and footways are reduced or removed to build more roads to fulfil the ever-increasing demand for car infrastructure. This has a negative impact on the walkability of a city, especially for older people. This can lead to negative consequences such as isolation and a reduction in physical activity. This study explores the use of Digital Twin Cities and their suitability for predicting walkability concerns.

This study focuses on kerb heights around Dublin and how they can prove to be a challenge for some older people. Previous studies on Walkability have investigated either macro level Walkability such as walking distance to public amenities or micro features such as the impact of tactile pavements on the gait of older people. This study uses a Digital Twin City model of Dublin to investigate kerb height, a micro level feature, on a macro scale test.

To investigate the walkability concerns, a simulation environment was created using the Unity game engine and the Digital Twin of Dublin. In the simulations, agents are created to walk around the Digital Twin environment. If agents encounter steps up or down with a height greater than that of the agent's step height it results in a fall. This agent step height is tuned based on the demographic agility being simulated, Older Agents having progressively less agility. The falls are recorded and displayed as a heatmap which visualises the areas of most concern. Multiple simulations were run for Able bodied agents as a baseline and then progressively Older Agents to investigate the different areas of concern for the different demographics. Finally, the heatmap data to inform modifications of the Digital Twin to improve walkability and evaluated these improvements.

This study found that Walkability concerns can be effectively evaluated using the Digital Twin City. It was also revealed that the current 3D model lacks sufficient resolution to capture all Walkability concerns, specifically with regards to step height and level change resolutions at crossings. In fact, the heat maps accurately predicted the points where sloped footways of dished kerbs are located. The inclusion of dished kerb details on future Digital Twin models will facilitate the performance of a more detailed future study.