Assessing Walkability from High-resolution Street View Images: A Deep Learning Approach

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1. Introduction

Walkability in urban environment plays an important role in the urban sustainable transportation and social well-being [1], which will significantly decrease the risk of chronic conditions such as obesity, diabetes, heart disease, and depression [2]. However, unconnected and unmaintained sidewalk infrastructure is the major obstacle towards the walkable environment; moreover, poor infrastructure increase physical injuries and accidents [3], especially for wheelchair users [4]. Therefore, it is important to assess the status and quality of urban sidewalk and walkability. However, traditional methods, including in-situ investigation and self-reported questionnaire, are costly and inefficient.

Nevertheless, the progress of information and communication technologies and the rise of Big Data provide another possibility of assessing walkability. Street view images services, which capture continuous and panoramic views with high-resolution cameras, are one of the most popular data sources for the extraction of urban information. Correspondingly, numerous studies tried to develop automated methods to detect sidewalk or assess sidewalk qualities with Street view images [5]–[11]. Still, few studies provided attainable solutions for the assessment of sidewalks quality and most studies do not have a comprehensive evaluation of each model.

To address these gaps in this area, we would like to adopt a deep learning approach to solve the sidewalk detection and quality problem.

1. Problem statement

There are three research questions for this paper:

RQ1: What is the sampling strategy? How to design the parameters (camera angle, resolution, locations) for the street view images?

RQ2: How to process and transform the captured images to formatted pictures that can be ingested by the deep neural network?

RQ3: How to transform the picture information into geographic information?

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