Improving 2D Construction Plans with Cycle-consistent Generative Adversarial Networks

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ABSTRACT

Digital methods such as Building Information Modeling (BIM) offer significant potential in the operation phase of a building but, therefore, require digital as-built models of the existing structures as a prerequisite. The existing building records have to be transferred into a digital model. For this retro-digitization purpose, Computer Vision (CV) and Machine learning (ML) are essential technologies. Thereby, 2D construction plans are an indispensable data basis for these methods to extract the geometry of the existing structures. The extraction requires a highly reliable detection of lines and texts.

However, the performance of the CV and ML methods is highly dependent on the quality of the data. Anomalies like discolorations, stains, and fold lines can negatively affect the detection. This is especially the case for old, hand-drawn paper plans, which are often the only data source available for old buildings. To integrate old plans better in the detection process by CV and ML, a quality recovery of the plans is necessary. To achieve this, we propose the use of the cycle-consistent Generative Adversarial Network (CycleGAN) that enables style transformation with unpaired data. Hereby transformation means the removal of the stated anomalies. Our results of CycleGAN improved 2D plans show that both text and edge detection methods perform better.