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Ph.D. Thesis Defense

Entitled

INTEGRATING COMPUTER VISION IN CONSTRUCTION PROGRESS MONITORING: A COMPREHENSIVE ANALYSIS AND FUTURE PERSPECTIVES

by

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Date & Venue

Thursday, 09:00 am – 11:00 am

28 March 2024

Architectural Engineering (AE) Meeting Room, F1-1124

https://uaeu-ac-ae.zoom.us/j/86488791735

Abstract

This thesis presents an in-depth exploration of the integration of Computer Vision (CV) in Construction Progress Monitoring (CPM), a field that has traditionally relied on manual and document-centric approaches. The primary objective of this research is to investigate the potential of CV technology to transform CPM into a more efficient, accurate, and automated process. This is achieved through a series of comprehensive studies encompassing a systematic review, critical appraisal, barrier analysis, feature classification, and assessment of construction professionals' perceptions.

The first segment of the thesis systematically reviews the current state of automated CV-based CPM, identifying the technological advancements and limitations in data acquisition, information retrieval, progress estimation, and output visualization. Following this, a critical appraisal of traditional CPM methods is conducted, highlighting the inefficiencies, and proposing a shift towards automated solutions.

A pivotal part of the research identifies and analyzes barriers to adopting CV in CPM. This multi-method analysis employs a thorough literature review, expert opinions, and robust statistical methods to categorize and prioritize these barriers within the Technology-Organization-Environment (TOE) framework, offering insights into the complexities of implementing this technology in construction practices.

Furthermore, the thesis classifies essential features of CV-CPM using the Kano model, based on the preferences of construction practitioners. This classification provides a user-centric perspective on the desirable features and their potential impact on user satisfaction and technology adoption.

Finally, an extended Technology Acceptance Model (TAM) is utilized to understand construction professionals' perceptions of CV-based CPM. This analysis, supported by a survey and Partial Least Squares Structural Equation Modeling (PLS-SEM), provides empirical insights into the factors influencing the acceptance and potential use of this innovative technology in the construction industry.

This thesis contributes to the body of knowledge by providing a holistic understanding of the challenges, opportunities, and user perspectives in integrating CV into CPM. It offers valuable recommendations for researchers, technology developers, and construction industry practitioners, paving the way for more innovative, efficient, and effective construction progress monitoring practices.