

A study on internal observation of vertical protective nets of temporary structures using image processing techniques

Min-Guk Kang ^a , **Jeong-Hun Won** ^{a,b} , **Nam-Gwon Jang** ^a  and **Min-Jun Kim** ^b 

^a Department of Safety Engineering, Chungbuk National University, Cheongju, Republic of Korea

^b Department of Disaster Prevention Engineering, Chungbuk National University, Cheongju, Republic of Korea

Email: jhwon@chungbuk.ac.kr

Abstract: This study proposes an internal observation technology of temporary structures surrounded with vertical protection nets in construction sites using image processing techniques. Temporary structures are erected on construction sites to prevent accidents caused by falling objects or workers. Vertical protection nets are installed on the outer surface of the structures to enhance workers' safety. Generally, inspection of the correct installation of temporary structures and workers' behaviour is performed by direct visual observation by safety managers. Recently, interest in safety management using video devices such as cameras, drones, and CCTV is increasing. However, the installation of vertical protection nets makes it difficult to observe the internal status of temporary structures from the outside. Therefore, the proposed technology was applied to enhance the identifiability of the internal status of temporary structures and workers' safe behaviour within the enclosed space of vertical protection nets.

The major inspection items to be observed using the proposed technology were selected. There were a total eight selected items: the status of safety signboard attachment, personal protective equipment of workers, installation status of safety handrails on worker passageways, installation status of work platform connecting passages, presence of bending or deformation on the outer surface, installation status of anchor bolts for fixing, fixing status of vertical protection nets, and installation status of ladders for movement between cages.

The results showed that the identifiability of internal objects within vertical protection nets increased to the level where visual safety inspection was possible for all eight major inspection items. In addition, 3D modelling results were obtained using the proposed technology, enabling internal observation of temporary structures. Therefore, it is expected that the proposed technology will be helpful in preventing accidents when applied to temporary structures with vertical protection nets installed on construction sites.

ACKNOWLEDGEMENTS

This work was supported by a Human Resources Development of the Korea Institute of Energy Technology Evaluation and Planning grant funded by the Korean government (No. 2022400000070).

REFERENCES

- Jeelani, I., & Gheisari, M. (2021). Safety challenges of UAV integration in construction: Conceptual analysis and future research roadmap. *Safety Science*, 144, 105473.
- David G. Lowe. (2004). Distinctive image features from Scale-Invariant Keypoints. *International Journal of Computer Vision*, 60(2), 91–110.

Keywords: *Image processing, 3D modelling, temporary structure, vertical protective net*