Rapport de veille n° 58

BIM

30/04/2024

Objectif : *L'utilisation du BIM en phase de conception et de ses potentiels applications pour la prévention des risques*

La validation des informations fournies (exactitude, fiabilité, pertinence par rapport aux principes de prévention, etc.) est du ressort des auteurs des articles signalés dans la veille. Les informations ne sont pas le reflet de la position de l'INRS.

Les liens mentionnés dans le bulletin donnent accès aux documents sous réserve d'un abonnement à la ressource.

Table des matières

1. Références anglophones

1.1 Articles scientifiques

The use of building information modelling (BIM) in the management of construction safety: The development towards automation hazard identification and assessment [PDF]

M Yasir, Z Khurshid, UA Raja, H Khurshid, AM Khan… - International Journal of Science and Research Archive, 2024, 11(02), 830–852

DOI : https://doi.org/10.30574/ijsra.2024.11.2.0518

The construction industry faces safety management challenges that impact its reputation and workforce well-being. Despite existing safety regulations, safety violations persist, necessitating innovative solutions. This thesis explores the potential of Building Information Modeling (BIM) as a tool to improve safety practices throughout the project lifecycle. A literature review identifies key safety factors and BIM features, revealing their interconnections and potential for synergistic improvements. A questionnaire survey and semi-structured interviews with 55 construction professionals from diverse regions revealed that over 45% of respondents reported positive outcomes from BIM implementation in their projects. A comprehensive framework is developed to integrate BIM-based safety improvement strategies into various project phases, providing practical guidelines and recommendations for construction professionals to enhance safety practices effectively and efficiently. The research emphasizes the significance of BIM adoption in the construction industry, promoting better safety outcomes and elevating safety management practices. The proposed framework offers valuable insights for stakeholders, encouraging the widespread adoption of BIM technology and its seamless integration with safety practices for improved project safety and overall construction efficiency.

Safety Management In Construction: New Applications And Innovations Involved In The Construction Field [PDF]

S Bhesma, MPA Prabakaran - International Journal Of Progressive Research In Engineering Management And Science (IJPREMS), Vol. 04, Issue 02, February 2024, pp. 547-552

DOI : https://www.doi.org/10.58257/IJPREMS32752

This paper synthesizes a wealth of literature to elucidate the pivotal role of Building Information Modeling (BIM) technology in advancing safety management within the construction industry. Employing a range of methodologies, including systematic reviews, bibliometric analyses, and empirical studies, the research investigates the impact of BIM on hazard identification, safety training, and overall safety planning. The study extends its focus to other technological interventions, such as IoT and machine learning, in conjunction with BIM, to create a holistic safety management system. Insights from diverse geographical contexts, including China and Egypt, contribute to a global understanding of safety practices. The findings underscore BIM's efficacy in integrating safety measures from design to construction, with a potential for widespread adoption in both developed and developing countries.

Impact of Using a Formalized Methodology for Conflict Detection Based on 4D-BIM

M Flores, C Mourgues - Journal of Construction Engineering and Management, 2024, Volume 150, Issue 7

DOI : https://doi.org/10.1061/JCEMD4.COENG-14415

In construction projects, when resources assigned to two or more simultaneous activities share the same workspace, they generate time-space conflicts associated with congestion, safety, and quality issues. The use of building information modeling (BIM) methodologies, particularly four-dimensional (4D) models, offers the possibility to facilitate the identification of these types of conflicts. Existing literature has proposed formal methods for conflict detection; however, these largely focus on automating computational analyses without

providing a practical and useful procedure for planners. Moreover, previous research has not evaluated the impact of using formal conflict detection methodologies. To address these gaps, this study proposes and evaluates the use of a formal conflict detection methodology in workspaces based on 4D-BIM. The research methodology includes a first stage that develops and validates the formalized conflict detection methodology through a literature review and interviews with field professionals. The second stage quantifies the impact of using the proposed methodology through an experiment that compares the effectiveness and efficiency of a group of planners in detecting conflicts using 4D-BIM models with and without the proposed methodology. The results demonstrate that the formalized methodology enhances the planning process by increasing the detection of conflicts from 18% to 82%. Additionally, the formalized methodology reduces review time by 23% and enhances user experience. These findings contribute to improving the planning process by managing and reducing time-space conflicts in construction schedules. Consequently, the construction process will become more efficient by averting issues related to productivity, safety, and quality based on the identification of workspace conflicts. Last, the proposed methodology contributes to a better adoption of BIM by providing a structured procedure for using the 4D-BIM model to support planning processes.

Development and testing of immersive virtual reality environment for safe unmanned aerial vehicle usage in construction scenarios

M Szóstak, AM Mahamadu, A Prabhakaran, DC Pérez… - Safety Science, 2024, Volume 176

DOI : https://doi.org/10.1016/j.ssci.2024.106547

Robotics and autonomous systems are increasingly being used on construction sites to complete tasks and complement human effort. One such autonomous system is unmanned aerial vehicles (UAV), although their wrong use could be potentially hazardous to humans and the environment. Given its relative novelty in construction, there remains a dearth of knowledge about safety risks associated with their use as well as knowledge on skills and protocols for their safe operation. With construction being one of the most dangerous and accident-prone sectors, there is even more impetus to develop UAV safety competence. In this study, we explore the application of immersive virtual reality (VR) use for purposes of safety training pertaining to the use of UAVs in construction scenarios. Whereas, previous studies, focussed on effectiveness of VR as a tool for training individuals on UAV operations and safety risks in general, this study evaluates its effectiveness across distinctive themes of safety in order to compare its effectiveness in different domains of UAV safety. The study adopts design science for development of bespoke UAV safety training tool in VR using Building Information Modelling (BIM) and game engine-driven virtual prototyping. The immersive training tool was then applied in an experiment of participants (n = 100) with (n = 50) constituting a control group using more traditional training methods and a series of pre/post-test assessments. The findings confirmed the relative superiority of VR training over traditional methods, improving performance and retention by up to 22 % on average. The immersive VR was found to be most effective on participants retention of knowledge in general flight preparation, air traffic documentation, visibility management and warning signals. Further usability tests were performed on all participants (n = 100) revealing general presence and positive attitudes towards VR based UAV safety training when compared to traditional training. From a practice perspective this research proofs the effectiveness of a VR approach as more cost effective and safe approach to UAV training for both academia and practice with added advantage of being more realistic simulation of the UAV risk scenarios.