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A Review Paper On Automation In Construction

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Abstract
As there is rapid advancements in technology that allow to do complex tasks, automated machines are going to move from factories and the manufacturing sector to the building and construction sector in this modern world. The construction business is dealing with problems like declining profits, low construction worker productivity, a high number of accidents, poor quality, inadequate building site control, etc. Automation and robotics are the solutions to these problems. The findings demonstrated that automation has a positive impact on lowering costs, saving time, enhancing quality and raising productivity in the construction industry. In order to reduce dangers at work sites, increase quality, and lower building costs, this study makes an effort to use robots in the construction industry. To demonstrate the suitability of robots in the construction industry, a contextual research has been taken into consideration.

Keywords : Automation, robotics, construction, quality, cost, time.

Introduction

Concrete is widely recognized as the fundamental material for construction, with over 15 billion tons of it being produced worldwide on an annual basis. As a result, automating concrete work is crucial in order to reduce expenses and enhance the quality and efficiency of the work. When it comes to building construction, key operations such as erecting and assembling the building skeleton, compacting concrete, laying bricks, and finishing the interior can all benefit from automation, which can lower costs, save time, and increase quality and productivity.

The implementation of automation in construction can be seen in the areas like Road and runway construction, Structure building, Building construction, Port development, Tunnel excavation, Factory and industrial operation. These self-driving machines can transport materials and haul heavy items without endangering workers. Robotic technology solutions and sensors can be installed on equipment like forklifts, diggers, and trucks, allowing them to operate without driver inside the cabin. The machines can be programmed with relevant paths and GPS capabilities, enabling remote operation by construction site workers and facilitating more efficient processes.Advantages of implementing automation in the construction industry are numerous. Automated processes ensure consistent quality and precision in the work. They also contribute to reducing the project timeline, improving productivity, and increasing the overall quality of output. The implementation of automation can also lead to a reduction in the project cost, resulting in economic benefits.

Drawbacks of automation in construction include the following:

It can contribute to a rise in unemployment rates.

It may lead to a loss of skilled workers from the country.

Operating the machines requires a high level of skill.

There is a significant investment and maintenance cost associated with automation.

Reprogramming the machines can be time-consuming.

Methodology review

Project research topic is Impact of Automation in Construction of Residential

and Commercial Building. In order to get a comprehensive overview, the initial database results contained journal articles, conference papers, and industry reports. The research's methodology highlights the successes of automation in construction through insightful literature reviews. Twelve items of literature were initially gathered and carefully reviewed. With the knowledge learned from the literature, the project research has been carried out.

Literature review

IOP Conference Series: Materials Science and Engineering 1091 012036 by Akula Prakash et al 2021 : To demonstrate the suitability of robots and machines in the field of construction industry, a contextual research was taken into consideration. In order to reduce dangers at work sites, increase quality, and lower building costs, this study makes an effort to use robots and automatic machines in construction industry. The purpose of the situation are existing robots and machines are not universally adopted in building construction; concerns with the regularly scheduled structure; difficulty in financially legitimizing robot company; and administrative challenges. The construction industry demands a beneficial increase which can not be met by the approaches to conventional procedures that have already reached the limits of their framework and can't further enhance viability.

2021 IOP Conference Series: Materials Science and Engineering 1107 012011 O I Akinradewo et al 2021: The review of literature item was conducted methodically, and journal items were sourced from the Website of Science and Scopus . These include enhancing accuracy of components' dimensions by using lasers for dimension analysis, facilitating the adherence to design specifications through computer-aided design, improving construction product quality by ensuring that specifications are satisfied, achieving economic efficiency by providing worth the money invested, reducing wastage of the material through precise estimates of necessary materials, minimizing construction accidents by employing machines for hazardous construction activities, improving working conditions by providing workers with greater security and safety, and reducing labor costs by deploying machines for construction activities.

(ITcon)Journal of Information Technology in Construction, Volume 27, page 441-460, (DOI: 10.36680/j.itcon.2022.021) : This study provides a comprehensive review of the current state of digitalization and automation across various phases of construction projects. The objective is to identify their origins and current levels of interoperability. The study indicate that there are great difference in the digitalization and automation levels across different phases of construction project life cycle. It is discovered that the initiation phase has limited automation and digitalization, while the design and planning phase has increased automation but limited digitalization. The execution phase has less automation, but a higher degree of digitalization.

(https://doi.org/10.1016/j.autcon.2021.103642) Published by Elsevier B.V march 2021 : The report continues by recommending areas of further research to assure the feasibility of this technology, including developing standards for 3D printing, automating other construction processes, and doing environmental effect and economic life-cycle evaluations. With sustained research and development funding, 3D printing may become a more practical and popular building technique, revolutionizing the way the industry is run in off-the-grid, isolated, and expeditionary settings.

(https://doi.org/10.1016/j.ssci.2022.105925)Published by Elsevier 14 September 2022 : The concept and implementation of a VR module for safety training in the roofing industry are briefly discussed in this study. The VR application was totally created and built utilizing a flow of experts with industry-based knowledge. The results were analyzed using a quantitative method, and many facets of the VR module were looked into. The findings indicated that the VR module has a favorable effect on roofing professionals' opinions of the viability of VR apps as additional teaching aids. Future design and development of VR-based safety applications can take into account the relevant aspects found in this study.

(https://doi.org/10.1016/j.autcon.2022.104591) : The research's three primary contributions are as follows: (1) a quantitative macro-level presentation and discussion of the current

publication situation for robotics in construction; (2) a qualitative identification and discussion of the main areas of robotics in construction research; and (3) a probable future research direction for robotics in construction. Overall, the study summarizes recent developments in robotics in construction research, providing a useful review for the academic and corporate bodies to comprehend the condition now and investigate potential new creative research directions and execution in the future.

IOP Conference Series: Earth and Environment Science 385 012063 by Ayodeji Oke et al 2019 : The study objective is to review the benefit gained from the automation and modern robotics in construction field of South Africa. The quantitative analysis was done for collecting data and information from the responder in South Africa. The replier were the construction manager, Supervisor, Architects, project managers and Quantity Surveyors Engineer. The information and data was analysed by the use of Standard Deviation method and Mean Item Score method. The research discovered and determined that the use of recent robotics and automatic machines in construction leads to improved construction quality by enhancing the precision of construction components, supporting design requirements, reducing project completion time, and allowing for compliance with standards.

Conclusion

The research has successfully demonstrated that incorporating automation in the construction can enhance quality of the projects by improving the accuracy of construction components, adhering to design specifications, reducing project delivery time, and facilitating compliance with industry standards. Therefore, the study suggests that stakeholder and active participants in construction must be willing to assume the financial risks to adopt automation and robotics in order to benefit from these advantages. In order to boost efficiency and improve the quality of work, infrastructure project and construction companies nowadays must implement automated and advanced robotics technology. In way to stimulate the adoption of cutting-edge technology in the field of construction industries, awareness of and promotion of the automation are required. Further more and more research can be done to examine several additional aspects of utilizing automation and robotics in the field of construction of residential and commercial structures.

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