BUILDING SMART AND SAFE CONSTRUCTION SITES WITH DEPENDABLE DECENTRALISED ARTIFICIAL INTELLIGENCE APPLICATIONS

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Abstract:

Problems - Issues / Challenges-Needs
Every building project is unique; it is designed for a specific site, and usually requires the collaboration of several companies with different project roles. In the course of every building project, it is necessary to address a number of problems and issues falling under the broad categories of safety at work, construction site management, management of resources, waste and assets, construction progress monitoring and early (disaster) warning. The goal of the present work is to analyse various use cases where smart operation and safety can be achieved at construction sites with the use of advanced information and communication technologies, particularly, the Internet of Things, Artificial Intelligence, Cloud, Fog, Edge, Blockchain and Smart Contracts technologies.

Solutions - Methods / Results - Findings
Various use cases for smart and safe construction sites are analysed. These include the design of applications for safety, such as the identification, if all persons on a construction site wear helmets, intruder detection, real-time equipment (assets) positioning, access routes control, warning systems for collision detection, waste mapping, construction progress monitoring use cases, and alignment of the collected information with a Building Information Model (BIM).

In order to achieve information integration, a methodology and a distributed system is presented that can be used to turn a specific construction site into a smart and safe construction site by including a specific number of cameras and sensors on the ground, on the actors (such as construction workers, visitors) and objects (such as building equipment, waste, materials etc.), so that data and information can be collected and information, signalisation and notifications can be provided through the use of innovative means, such as smartphones, digital signalisation and actuators.

Smart applications have been designed that involve the use of sensors and video-cameras that steam data towards Fog and Cloud computing resources. A Big Data pipeline is designed in which various Artificial Intelligence (AI) algorithms are used, such as, for example, Tensor Flow based deep learning. The presented applications’ design optimises the operation of a construction site by issuing notifications and at the same time provides the construction workers an improved safety based on information on working hazards, while reducing physical stress. Alerts and notifications are made automatically via mobile IT devices.

Novelty - Value / Relevance to …
The novelty of this work is the use of latest Artificial Intelligence and Fog computing approaches that are applied in the domain of smart construction management. This work is aligned with several initiatives and projects world wide.

Forum statement
With the use of advanced information and communication technologies, particularly the Internet of Things, Artificial Intelligence, Cloud, Fog, Edge, Blockchain and Smart Contracts technologies towards the Smart and safe construction

Keywords:
Safety at work; construction site management; management of resources, waste and assets; construction progress monitoring; early (disaster) warning.

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