VoxelNET: A Digital Middleware Platform for Mining Industry 4.0

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ABSTRACT

Mining Industry 4.0 means a digital transformation of traditional manufacturing processes to incorporate cyber physical systems such as the Internet of Things (IoT), cloud and cognitive computing. Many vendors are producing IoT ICT platforms, but these are often generic, do not include the 3D modelling so critical to mine planning and operations, and do not provide sufficient functionality to meet 'automation needs' while understanding how to convert and integrate human knowledge capital and application-specific work flows e.g. for successful deployment human needs to understand underlying deep machine learning algorithms to accept their use in operations. With dispersed software, IoT cloud providers and coordinate systems, industry struggles to get all of its data and coordinates to align to make sense of collected and measured data, information and knowledge. The automation paradigm involves not only robots but also materials, spatial/geometrical structures and people; all of these must be combined in one system to realise the benefits of improved operational understanding, optimisation and safety. The VoxelNET platform sits above more generic IoT platforms to support these benefits by integrating IoT functions with models of spatial and geometrical structure, materials properties and distributions, operational workflows and artificial intelligence. The systems supports input of environmental, optical and physiological sensors as a basis for directing, supervising, and learning in support of meeting hierarchal needs in a time pressured mine value-chain. Data is not an end-solution in itself –it is what we do with it that will create the added value. VoxelNET with its protocol layer functions as the AI glue that will make otherwise 'dead' data come to life and provide gains that would not otherwise be possible in a data siloed world.