

Modeling, Animating, and Optimizing On-Shore Wind Farm Construction

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Abstract:

Recently, wind energy has been greatly sought after because of the high price and diminishing quantity of fossil fuel resources. This necessitated the construction of wind farms. However, the on-shore wind farm construction process can be a very complicated task primarily because of the challenging location and topography of the remote rural sites where they are typically constructed. This paper takes the initial steps and presents work targeted at efficiently designing and planning the construction process of on-shore wind farms. For this purpose, a generic discrete event simulation (DES) model, illustrating the different construction stages from topographical surveying to wind tower assembly and erection and incorporating general resources data, was created. The developed model's applicability was then tested for a specific site in Marjeyoun, Lebanon, where no wind farm has been constructed, and was verified and validated by animating all processes within a five-dimensional (5D) environment depicting time and cost as the model progressed. The whole process was then optimized by varying the resources' quantities. The obtained results highlight the potential of the proposed approach and prove its effectiveness in simulating, visualizing, and optimizing complex construction processes that offer unique challenges such as those found when constructing on-shore wind farms.

