Automated data collection, simulation and visualization can substantially enhance the process of designing, analysis, planning, and control of many engineering processes. In particular, managing processes that are dynamic in nature can significantly benefit from such techniques. Construction projects are good examples of such processes where a variety of equipment and resources constantly interact inside an evolving environment. Management of such settings requires a platform capable of providing decision-makers with updated information about the status of project entities and assisting site personnel making critical decisions under uncertainty. To this end, the current practice of using historical data or expert judgments as static inputs to create empirical formulations, bar chart schedules, and simulation networks to study project activities, resource operations, and the environment under which a project is taking place does not seem to offer reliable results.

The presented research investigates the requirements and applicability of a data-driven modeling framework capable of collecting and analyzing real time field data from construction equipment. In the developed data collection scheme, a stream of real time data is continuously transferred to a data analysis module to calculate the input parameters required to create dynamic 3D visualizations of ongoing engineering activities, and update the contents of a discrete event simulation (DES) model representing the real engineering process. The generated data-driven simulation model is an effective tool for projecting future progress based on existing performance. Ultimately, the developed framework can be used by project decision-makers for short-term project planning and control since the resulting simulation and visualization are completely based on the latest status of project entities.