

A. GIRETTI, A. CARBONARI, G. NOVEMBRI, F. ROBUFFO. **Estimation of job-site work progress through on-site monitoring.** *Gerontechnology* 2012;11(2):406; doi:10.4017/gt.2012.11.02.348.00 **Purpose**

This paper reports on the development of intelligent probabilistic models for real-time estimation of construction progress, which operate on the basis of a continuous data flow collected by monitoring networks deployed on-site. Several authors listed the advantages that would be provided by the availability of such models, like project performance and quality control, timely on-site inspections, better control of health and safety prescriptions against job injuries and fatalities¹. The findings reported in this paper represent a feasibility study and preliminary examples of Bayesian Networks, which are able to infer the work progress attained at every step, starting from real-time tracks of the construction site activities. Activity tracks are represented as a set of state variables figuring out workers' effort, equipment and materials usage rates and other knowledge about the context. **Method** As estimations are always related to dynamic processes, Dynamic Object Oriented Bayesian Networks have been used to develop a set of first order Hidden Markov Models. Hence, the models are arranged as a sequence of time steps, where each time step propagates evidences collected by the site monitoring sensor network along the time line. The actual cumulative progress is computed as a function of the progress achieved in each time step. Models representing a number of typical tasks (external piping, on-site cast of reinforced concrete floor slab, walls erection, ceiling installation) for a real case of a construction site have been developed. Their structure has been designed as part of a general monitoring framework, covering all the phases from design to execution, where BIM design, monitoring systems, methodological process innovations, intelligent inferences and advanced visualization are combined². **Results & Discussion** The networks have been developed and validated through data collected from a real case, and they have been shown to be able to infer work progress (Figure 1), the accuracy of which depends on the resolution and quality of the collected data.

References

1. Lu W, Huang GQ, Li H. Scenarios for applying RFID technologies in construction project management. *Automation in Construction* 2011;20(2):101-106; doi:10.1016/j.autcon.2010.09.007
2. Giretti A, Carbonari A, Vaccarini M, Robuffo F, Naticchia B. Interoperable approach in support of semi-automated construction management. *Proceedings of the 28th ISARC, Seoul, South Korea; 2011; pp 267-272*

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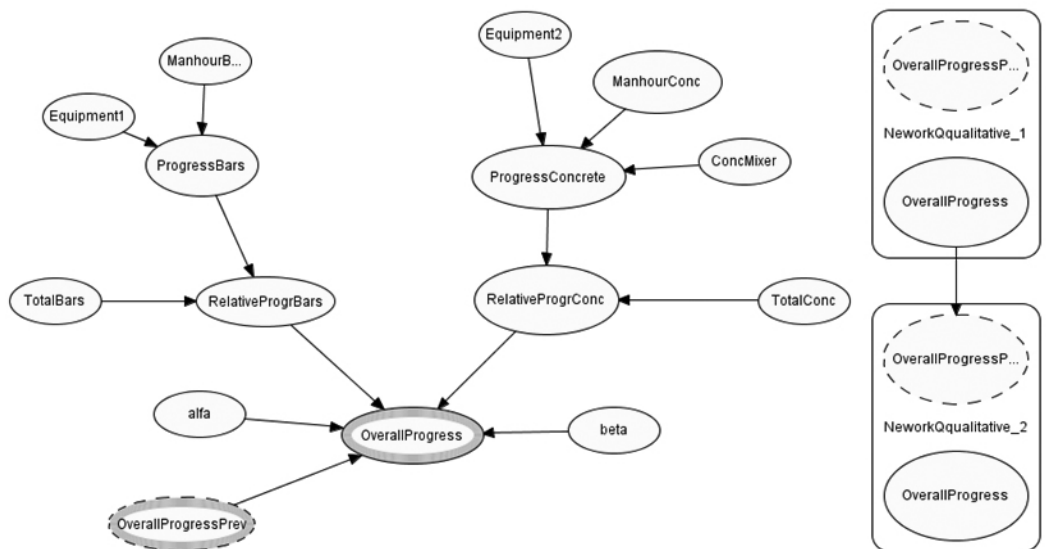


Figure 1. Example of elementary network (left) and dynamic network with instance nodes (right)