Presentation: Energy control of subway stations

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Purpose Underground transportation systems are big energy consumers and have a significant impact on energy consumption at regional level. One third of the networks' energy is required for operating the subsystems of metro stations and surroundings, such as ventilation, vertical transportation and lightning[1]. Although a relatively small percentage of energy can be saved with optimal management of these subsystems, in absolute terms this means large energy savings are obtained. Furthermore, optimal management is a big opportunity for energy efficiency since it involves much smaller investments than those usually applied to transportation by providing new ways for sustainable energy saving solutions. In this perspective, the EU-funded R&D project SEAM4US (Sustainable Energy Management for Underground Stations) is aimed at defining a technological and methodological framework for optimized energy management in public underground spaces, which will be applied to the dynamic control of the energy consumption in Barcelona Passeig de Gracia subway station. **Method** The development of a new class of predictive control logics, behaving consistently in changing environments is at the core of the optimal energy management approach and it is one of the main objectives of this research. This class of control systems is based on advanced environmental models, directly coupled with an environment monitoring sensor network, that is capable of interpreting the sensed data (both indoor and environmental) and of forecasting future states. In order to achieve the necessary level of robustness these models must be able to learn from previous states so they can adapt to the varying environment. The development of this class of environmental models for large underground environments like subway stations involves the elaboration and the integration of different simulation models concerning natural and forced ventilation[2], passenger movement[3], lighting systems, and their integration in a unique formals statistical framework, which is able to manage the uncertainty affecting the sensed data and to learn from the data flow. **Results & Discussion** We will outline the methodological approach to the development of the Passeig de Gracia environmental models for the optimal control of its energy consumption. The adopted hybrid modeling solutions, integrating different classes of simulation means in a unique Bayesian framework[4], and a preliminary architecture of the overall control system will be presented.

References

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Affiliation: Università Politecnica delle Marche, Ancona, Italy; *E:* a.giretti@univpm.it

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