

A semi-automated approach for diagnosing HVAC problems and optimizing control strategy during HVAC corrective maintenance tasks

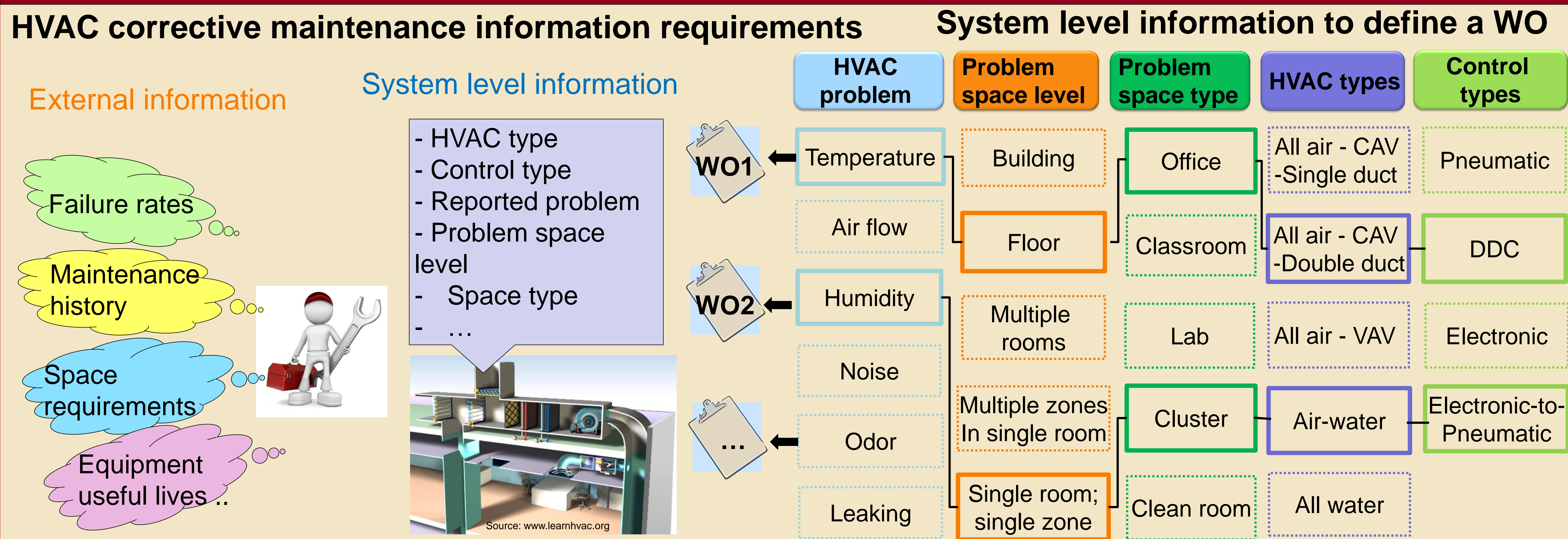
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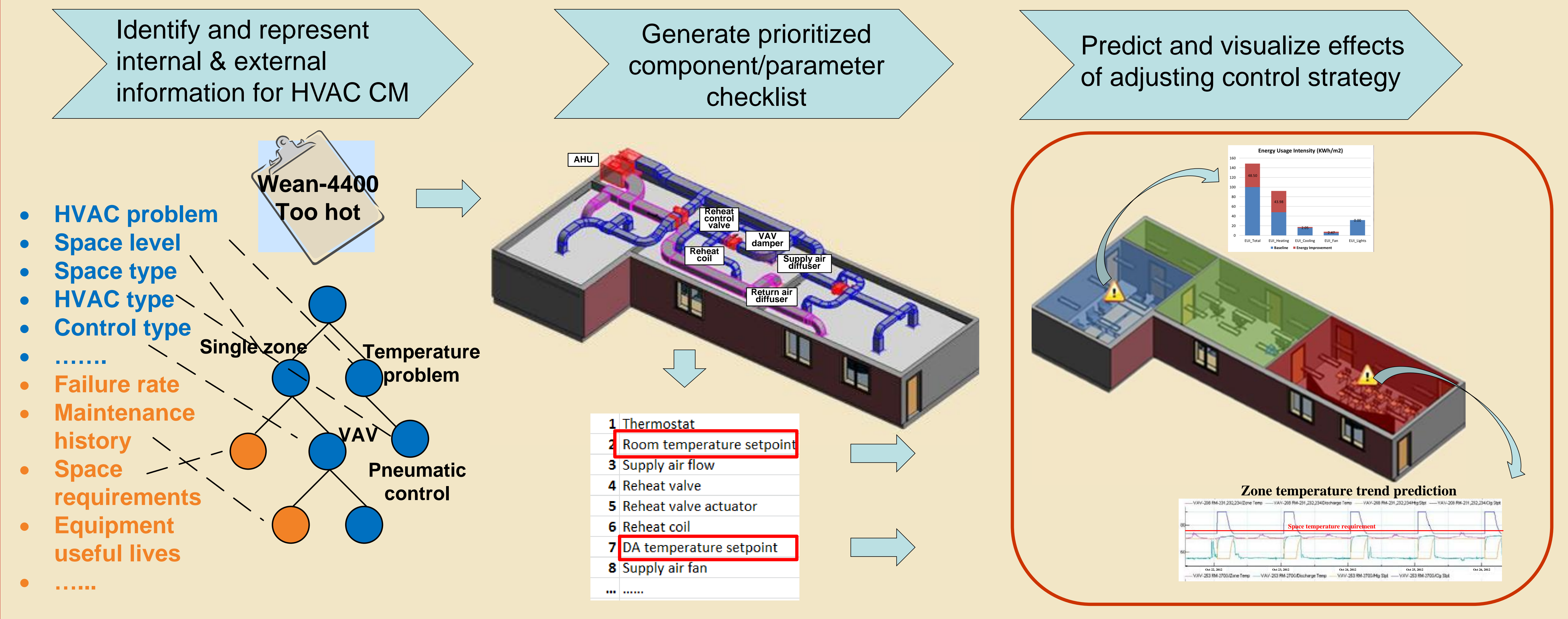
Problem Statement

- HVAC systems, associated components, configuration & control logic are complex and different, even within a single building.
- There are information requirements of expert mechanics that are not captured within computerized tools (BAS and CMMS), but are mostly captured and used by mechanics over time and interpreted in relation to information captured in computerized tools. Such information is critical but hardly available to mechanics in unfamiliar spaces for identifying prioritized maintenance paths for work orders. Case study shows that even expert mechanic needs to spend as long as 2 hours to do field inspection in unfamiliar spaces to understand system-level information.
- Adjustments to control strategy are done without knowing if they fixed the root cause, or just optimized sub-system by compromising other systems. 26% among 112 HVAC historical work orders investigated in 6 months ended up adjusting various setpoints without knowing the effects. Facility operators were believed to respond to local complaints without considering effects to other spaces' environment and energy consumption (Goins, et al. 2012). 29% of the identified problems for building control system are caused by facility operators (Iowa Energy Center, 2003).
- There is a need for formally capturing such additional information not captured in computerized tools, integrating them with data represented in computerized tools, enabling identification of prioritized component/parameter maintenance paths for given HVAC work orders (WOs) and making mechanics aware of consequences of their manual interferences in control systems in terms of energy use and space level requirements.

Initial Research



Vision



Envisioned Contributions

- Information requirements (including system-level & external information) for HVAC corrective maintenance activities
- A formalism to represent these information requirements in relation to BIM
- A reasoning mechanism to automatically generate prioritized component/parameter checklist for a given HVAC work order for corrective maintenance
- An approach to predict and visualize effects of adjusting control strategy