

SmartByte

Leveraging AI to revolutionize home automation for an intuitive, insightful, and user-friendly experience

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INTRODUCTION



SmartByte's objective is to manage the home by observing the residents, learning their behavior patterns and preferences, and deriving home rules that the system can use to manage and assist the residents in their home activities.

The SmartByte project was developed in collaboration with the IEC Israeli Electricity Company and tested in IEC's Hadera study center.

SmartByte can integrate multiple rule sources, including:

1. Residents and the accommodation owner rules.
2. Automated recommendation system based on machine learning techniques that derive rules from observing the behavior of the residents.
3. Regulatory rules.
4. Recommendations from other households by allowing rules to be passed between them.

[See figure A]

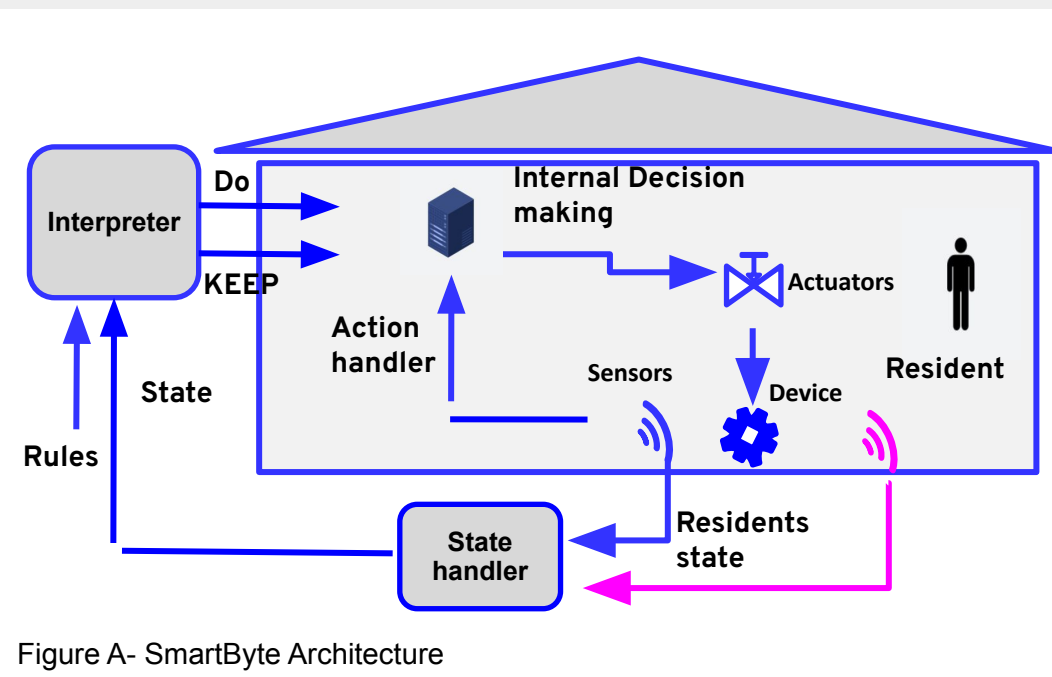


Figure A- SmartByte Architecture

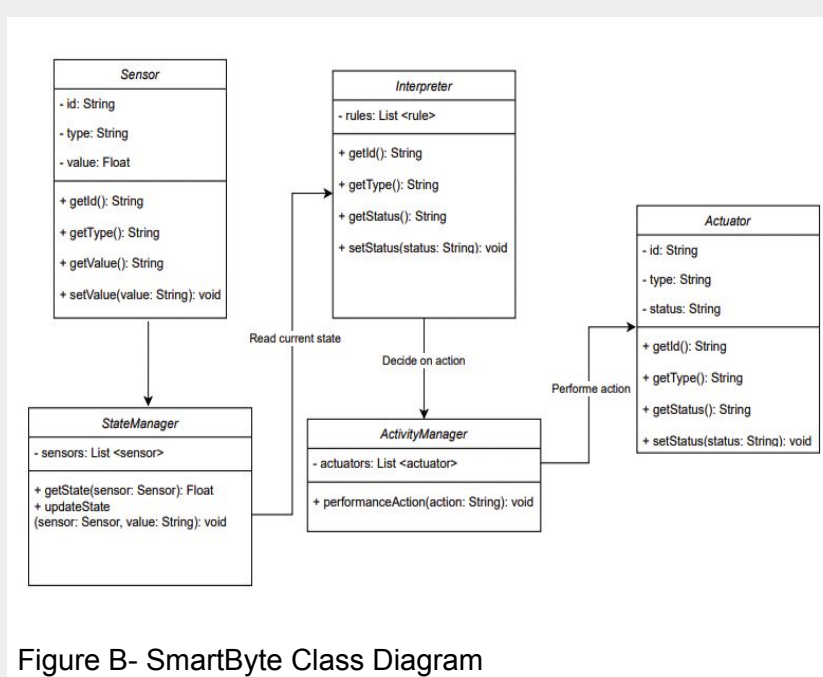


Figure B- SmartByte Class Diagram

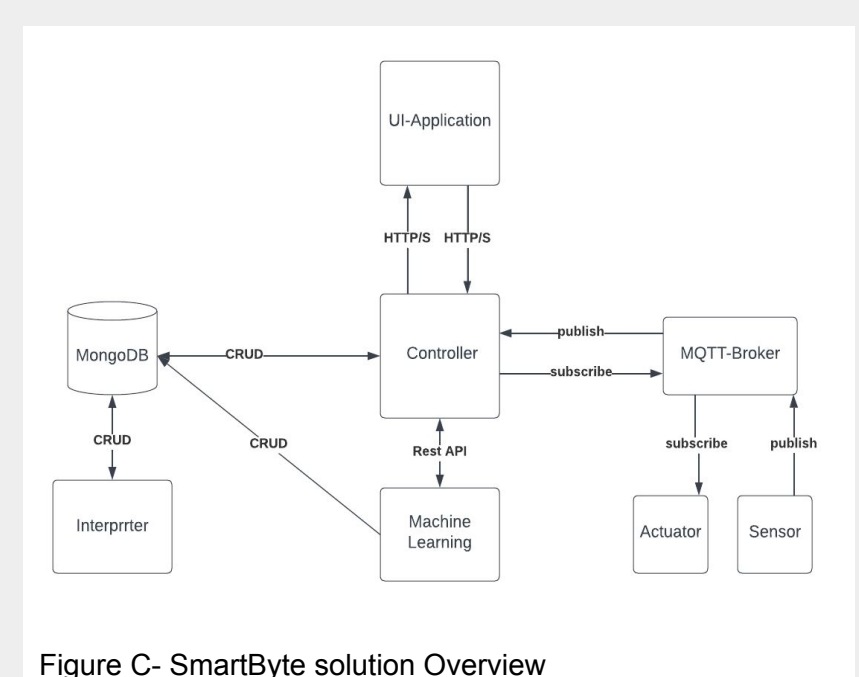


Figure C- SmartByte solution Overview

METHOD

Data Collection and Model Training: Using two years of house data to train a Bayesian network, learning the complex interplay between electrical devices and user behavior.

Adaptive Learning: The network continuously adapts to user interactions and changes in routine [Figure D].

Rule Interpretation and Integration: User-defined operational rules for appliances are interpreted and integrated into the network [Figures A and B]. If contradictions between rules and learned behavior arise, the system provides feedback for adjustment or clarification.

Examples of rules:

IF John IN home AND IS summer THEN KEEP Temp below 22

IF no one IN home AND hour is night THEN TURN lights off IN all rooms

Automated Suggestions: Leveraging learned behavior and user rules, the system offers tailored suggestions for enhanced energy efficiency and convenience

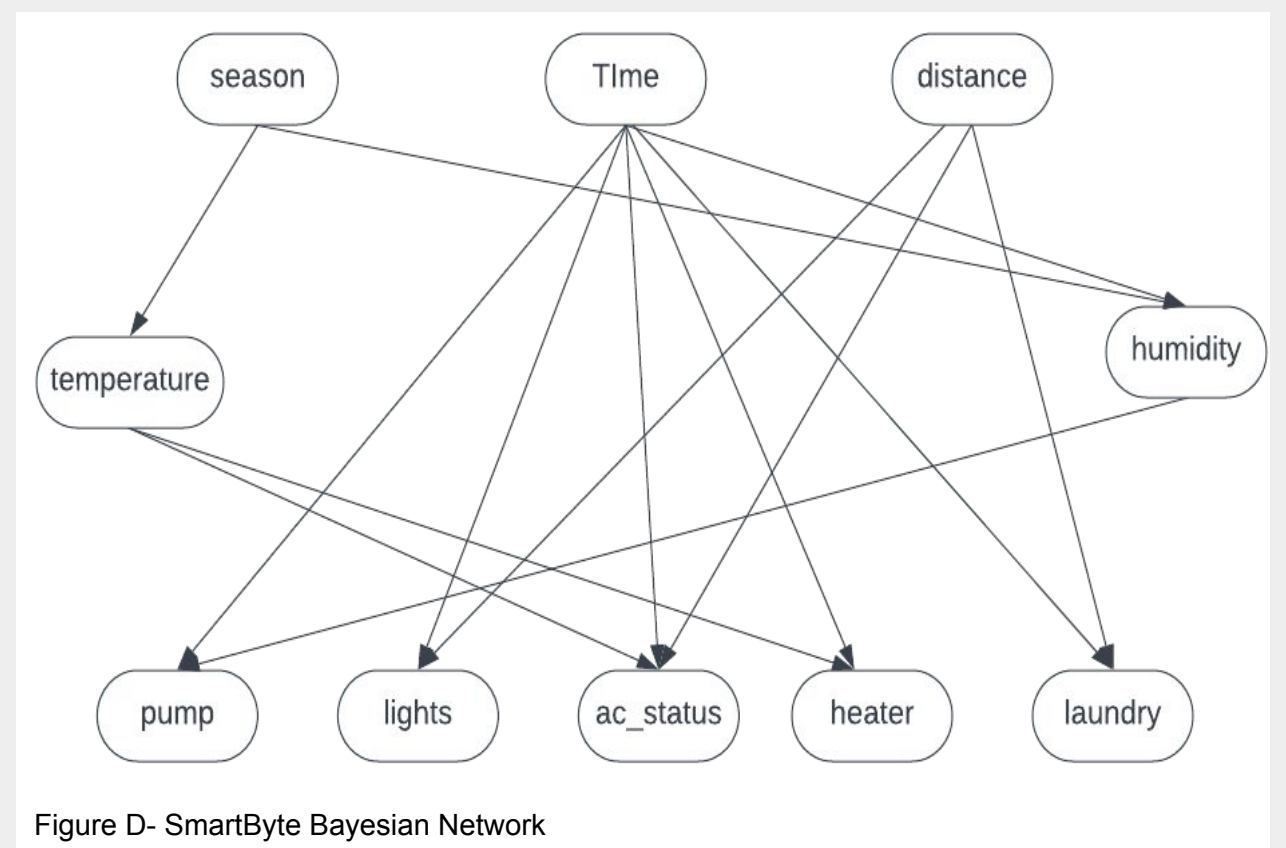


Figure D- SmartByte Bayesian Network

VALIDATION

SmartByte contributes to the emerging field of AI-driven home automation by introducing advanced learning algorithms into intelligent home systems. The project opens new opportunities for residential energy management, demonstrating the potential of AI in understanding user behavior and enhancing energy efficiency in homes.

CONCLUSION AND CONTRIBUTION

SmartByte contributes to the emerging field of AI-driven home automation by introducing advanced learning algorithms into intelligent home systems. The project opens new opportunities for residential energy management, demonstrating the potential of AI in understanding user behavior and enhancing energy efficiency in homes.

LIMITATIONS AND FUTURE WORK

Handling rules which may contradict each other is a challenge that needs addressing in the future.

We also aim to refine our system's rule derivation capabilities, ensuring its relevance and accuracy despite varying user behavior, make a predictive maintenance and create an hierarchy of owners.