

RETROSIM – Multi-Objective Building Retrofit, Simulation and Monitoring on-line optimization tool for Improving Energy Efficiency in Buildings

Summary

A wide range of retrofit technologies exists, which are readily available for building retrofit projects. However, methods and tools to identify the most suitable set of retrofit actions for particular projects are still a major technical challenge.

RETROSIM project focused on using modelling and optimization techniques to develop an online tool to provide stakeholders with sound information to support the definition of intervention measures aimed at minimizing energy use in the building in a cost-effective manner, while considering the occupants' comfort. The main project outcome was a web-based software-as-a-service tool aimed to assist Energy Service Companies (ESCOs) and building owners to carry out building energy assessments and retrofit recommendations easier and faster, saving time and money. The ESCOs were able to use the RETROSIM to deliver standardized reports that are designed to drive action, including financial decisions. Building owners and investors will be able to determine which buildings have opportunities across a portfolio, isolating no-cost and low-cost operational measures for immediate savings. In addition, as information about the building changes or technology prices and characteristics change over time, building owners can always re-evaluate the most cost-effective retrofitting opportunities from our database.

First, the project identified and categorized a comprehensive set of innovative retrofitting actions and renewable energy solutions. This set

of alternatives was stored in a database to be used as input to a software tool to quantitatively compare the merits of different options based on multiple evaluation criteria. In the second step, an innovative hardware system including a set of advanced wireless sensors built upon a wireless communication system that allows for easy deployment in buildings that can be received and installed by the customers, eliminating the need of on-site visits was developed. Later on, an optimization engine based on the previous projects of the team was developed and wrapped around these models to perform the multi-objective optimization (MOO), thus coping with the combinatorial nature of the problem. This fast and efficient MOO approach quantitatively assesses technology choices in a building retrofit project. When complete, the information was compiled and presented in a building performance report. A representative set of buildings was used to exploit this tool in practical settings.

The RETROSIM project was carried out by a team of researchers specialized in mechanical, civil, and electrical engineering who combined the key modelling skills in mechanical engineering, environmental engineering, energy system engineering, building technology engineering, and informatics. The collaboration with Politecnico di Torino (PT) consisted of the participation of the Energy department of the PT as consultants of the proposed project.

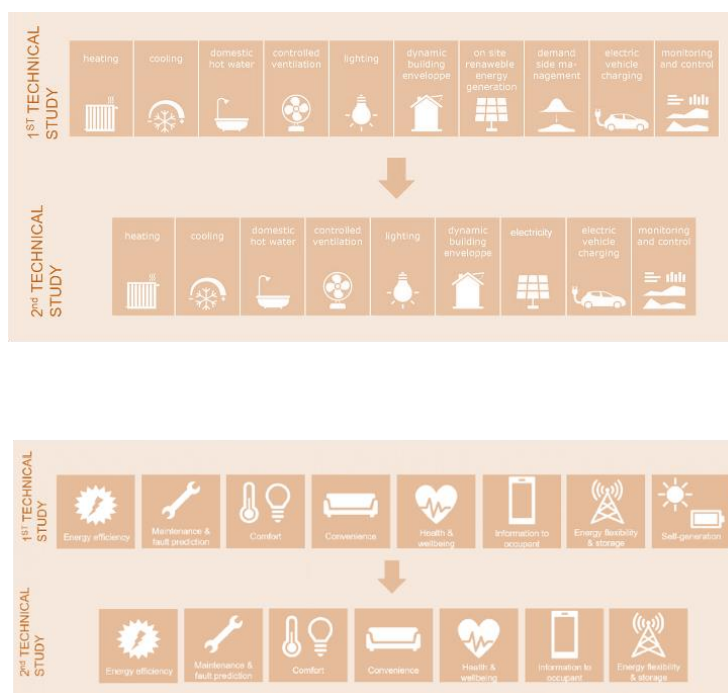


Figure 1. Scheme.

Project Reference

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Leading Institution

ADAI – Associação para o Desenvolvimento da Aerodinâmica Industrial (Portugal)

Partners

INESC Coimbra – Instituto de Engenharia de Sistemas e Computadores de Coimbra (Portugal), Itecons – Instituto de Investigação e Desenvolvimento Tecnológico para a Construção, Energia, Ambiente e Sustentabilidade (Portugal)

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CERIS

Coimbra Hub: 25 423.75€

Project Website

<https://www.itecons.uc.pt/service/s/projects/92>