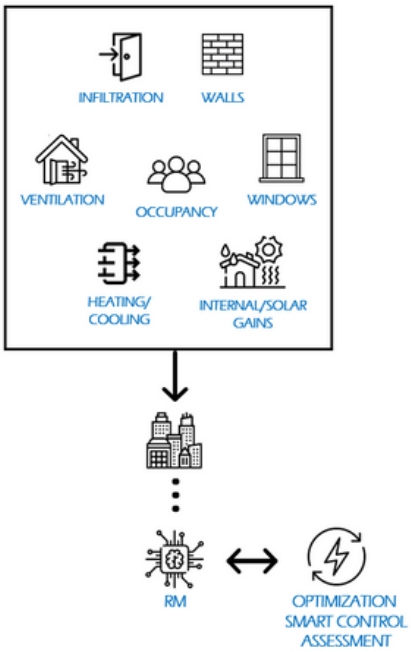
BUILDING REDUCED ENERGY MODELS

INTELLIGENT ALGORITHMS FOR NEXT GENERATION POSITIVE BUILDINGS

IREC
Shaping Energy for a Sustainable Future

THE CONCEPT



ADDED VALUE

- Complex phenomena are simplified
- Lower computational time
- Easy to integrate with existing platforms/devices

TRL

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PRODUCT DESCRIPTION

- **Simplified building behavior algorithms** that predict the energy profile using few resources
- The reduced models (RM) define the key parameters able to **explain and forecast** the energy demands and consumption behaviour
- Can be **adapted** to various cases, ready to be implemented in existing technologies or devices
- Can predict the **user behaviour** and **user interaction** with the building
- **Assessment** and **predictive maintenance** of technologies

APPLICATIONS

- New or retrofitted tertiary and commercial buildings
  - Semi-automated energy audits (energy layers of eBIM)
  - Dynamic recommendations to users (edge computing)
  - Model predictive control for optimal management (BEMS 5.0)
  - Manage building flexibility at district level (PEB/PED)

DESIRED PARTNERS

- Monitoring devices producer
- BIM developers
- BEMS developers
- District tools producers
- DSO and utilities.

EXPECTED BENEFITS

20-30% energy savings

30-50% cost reduction

Improved thermal comfort

Optimized maintainance

technical details

MOTIVATION

In a context of change towards the decarbonisation of the economy, the building sector faces gigantic challenges, both in the building stock and in newly constructed buildings. The Green Deal and the renovation wave establish the way forward that requires a new generation of tools and methodologies capable of meeting the planned challenges in the shortest possible time, the least use of resources, and putting the end user in the main focus.
Intelligent design, management and operation of buildings is a capital pillar in the strategy for the reconversion of the building sector, which should allow for optimized renovations in terms of cost and consumption, efficient use of existing buildings, and new flexible buildings as part of positive energy districts. In this context, the use of Resistances and Capacitances (RC) models, integrated into targeted products and services within RM, ensures maximum reliability of results at minimum cost of resources, and offers a set of new market services with broad commercial potential.

KEY ELEMENTS

- RM aims to equip intelligent existing devices and tools which will be able to take profit on the new IT advancements (5G)
- RM evolved from reference ISOs to different precision levels
- Based on up to 17 characteristic parameters of buildings; the models use 6 transitive input variables to obtain the thermal zones behaviour
- RC models could be easily adapted to case, through calibrated white models or monitored data sets
- Easy scripts based on matricial formulation to be adapted to any platform
- Heating, cooling and free-floating modes availability, with temperature RMSE between 0.15 -0.80 °C
- Fit with real data from short-term (minutes), to medium-term (weeks), even for free-floating conditions

IMPLEMENTATION

Validated in real buildings for **tertiary** (office, sport centres) and **residential** uses, taking into account different climate conditions (**continental - Mediterranean**).

Residential (Terrassa, Spain)

Office buildings (Manresa, Spain)

Some icons used in this catalogue are extracted from https://www.flaticon.com/