

BIMERR

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BIMERR

www.bimerr.eu



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THE BIMERR TOOLS

BIMERR is designing and developing a Renovation 4.0 toolkit which comprises tools to support renovation stakeholders throughout the renovation process of existing buildings, from project conception to delivery. It includes tools for the automated creation of enhanced building information models, a renovation decision support system to aid the designer in exploring available renovation options through an the accurate estimation of renovation impact on building performance as well as a process management tool that will optimize the design and on-site construction process towards optimal coordination and minimization of renovation time and cost.

INTEROPERABILITY FRAMEWORK (BIF)

The main scope of the BIMERR Interoperability Framework (BIF) is to ensure seamless and secure data exchange among the individual BIMERR tools and applications, in order to supply them with all the up-to-date building information they need for their operation and for which they are authorized. BIF utilizes mechanisms that enable semantic and syntactic interoperability, while enforcing access control policies to prevent any illegitimate building data exchange.

RENOVATION DECISION SUPPORT SYSTEM (RENODSS)

RenoDSS provides an accurate estimation of the energy, cost, and environmental impact trade-offs of alternative renovation scenarios. The estimation of post-renovation energy consumption is based on energy data models, structural and geometrical properties of the building, materials, HVAC systems, residents' usage profile, as well as weather data. RenoDSS also takes the environmental impact of the renovation and the interaction with surrounding buildings into account. All KPIs and details of possible renovation scenarios are shown in an intuitive user interface which enables the renovation designer to select the optimal renovation scenario in terms of costs, energy consumption, and environmental impact.



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PROCESS & WORKFLOW MODELLING & AUTOMATION TOOLKIT (PWMA)

PWMA provides a set of tools to design, verify, simulate, execute, monitor and analyze the reconstruction process. It orchestrates the tasks of the reconstruction process and provides UI for all the key stakeholders of the process to cover all phases of the reconstruction.

SCAN-TO-BIM

The Scan-to-BIM Tool is a software solution for the (semi-)automated generation of as-is Building Information Models of existing buildings from reality capture data (mainly 3D point clouds and pictures). The tool deploys innovative data processing techniques, including machine learning, to deliver IFC models that can be meaningfully used for assessing building energy performance assessment and planning refurbishment. The tool is developed using open-source technology and manipulates data in open formats (e.g. E57 and IFC).

AUGMENTED REALITY ENABLED IN-SITU BUILDING FEATURE ANNOTATION (ARIBFA)

The ARIBFA tool will be responsible for presenting BIM 3D visualisations and spatially annotated information on site during the renovation process to architects, contractors and building managers through an Augmented Reality (AR) interface. The main functionalities covered by ARIBFA involve the localization of the user in an indoor environment, based on which will be overlaid on top of the physical location of the building. Using object recognition methodologies, elements to be changed or worked upon during the renovation will be highlighted in the AR visualization, as well as Health and Safety annotations and designated work areas as defined in the daily work schedule.

PROFILING RESIDENT USAGE OF BUILDING SYSTEM (PRUBS)

The accuracy of a 3D zonal-type simulations based on widely used simulation engines (e.g. EnergyPlus) is highly affected by the level of detail of its input data, where recent studies have shown that the occupant behavior data consist the major cause of uncertainty in the building energy performance estimation results. Hence, having a deeper understanding and properly modelling the occupant behavior have been of paramount importance within IEA EBC Annex 66, where data, methods and models have been developed and applied to understand and reduce the gap between simulated and measured building energy performance by representing occupant behavior in a standardized XML schema (obXML). PRUBS leverage the outcomes of Annex 66, adopting obXML as its populated data model, and applying Machine Learning algorithms on IoT data streams provided by a sensor network that will be designed and installed to the pilot sites, generates occupant behaviour profiles that mimic the inhabitants' actions. These profiles are subsequently used to project the building system (e.g. heating/cooling) utilization boundaries that lie within the comfort zone of the residents.

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BUILDING INFORMATION COLLECTION APPLICATION (BICA)

The Building Information Collection Application (BICA) is a smartphone application enabling building residents to provide complementary information (such as notes and photos) to the already recorded building information in the BIM, thus accelerating the overall collection of data required for the initial renovation scenario modelling process. Through BICA's UI, residents' can provide their input spontaneously on their home indoor/outdoor areas, or at the request of the building surveyors/engineers, in order to enrich the pre-designed as-is BIM model with energy related equipment, their characteristics, building's weak points, and other related hidden components within the building (pipes, cables, etc.) that they might be aware. In addition, through BICA, residents and owners can view health and safety (H&S) instructions related to the ongoing renovation processes within the building issued by the H&S managers, while they can also create new H&S issues, when they spot a possible H&S issue/hazard in the on-building-site.

BIMERR ONTOLOGY NETWORK

The BIMERR ontology network represents the semantic models that describe the different aspects of building renovation processes (e.g. energy efficiency, occupancy, building information models, etc.). Such models are defined following a modular approach, that is in the shape of a network, in which each domain (KPI, materials, building, etc.) could be reuse independently. The ontology network is implemented in OWL (Web Ontology Language) and available in different formats at bimerr.iot.linkeddata.es.

BUILDING ENERGY PERFORMANCE ESTIMATION MODULE (BEPE)

The utilization of Building Energy Performance Estimation (BEPE) simulation has gained significant attention recently that stems from its capability to accurately predict the energy performance of building sector under specific conditions. Among a wide range of calculation methodologies, the 3D zonal-type simulation approximation (e.g. EnergyPlus) is frequently used in many envisaged and practical use scenarios, as it manages to strike a balance between accuracy and computational complexity. However, 3D zonal-type BEPE models' preparation suffers from two major drawbacks: (1) the models' preparation is a very time-consuming process due to the difficulty to collect relevant information, often requiring more time than is available due to project's deadlines, and (2) it is a non-standardized process that produces BEP simulation models whose results can significantly vary from one modeler to another according to their experience. Within BIMERR, Industry Foundation Classes (IFC) files are used to streamline and expedite the collection of such information, while our BEPE approach introduce a methodology to automatically translate IFC to EnergyPlus input data, making the BEPE simulation modelling process much more expedient and less vulnerable to modelling errors. BEPE module, as a component of the RenoDSS, is responsible for estimating the building energy performance before and after the renovation interventions under examination. It enables the RenoDSS user to explore various what-if scenarios, quickly run energy models (or simulations) to estimate the energy performance and fine-tune the interventions to explore the trade-offs.

Contact Us

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Contact us to share your feedbacks and ideas on this page.

BUILDING INFORMATION SECURE PROVISIONING TOOL (BISP)

The Building Information Secure Provisioning Tool aims to provide data protection, confidentiality and integrity for every dataset that is requested through the BIF. In this context, the following requirements of the BIMERR system must be taken under consideration: a) the potential users (data providers and data consumers) of the BIMERR framework, as well as their datasets, can be registered to (or removed from) to the BIMERR platform any time, requiring a dynamic mechanism of controlling data access and being agnostic to the underlying datasets respecting the relevant access policies of each party, b) the BIMERR platform must handle the access policies applied by each party and respond to any level of complexity they might by defined, c) address the need of interoperability of the BIF and provide the requested data to the format that is supported by the relevant data consumer.

The mission of the BIMERR project is to design and develop an ICT-enabled Renovation 4.0 toolkit comprising tools for Architecture, Engineering & Construction (AEC) stakeholder support throughout the energy efficiency renovation process of existing buildings.
