User Manual

Controlling Adaptable Buildings

Produced by Mr Robot – Version 1.0 – March 2017

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Introduction

What Is the Building Control System?

The Building control system is a control system with an integrated virtual test environment in which the control system can be tested without being embedded in the real system. The system hopes to provide comfort and service in an energy efficient way. The system allows monitoring and control of energy usage and temperature within a given building. The control of these is achieved by the usage of automatic lighting. The integrated virtual test environment allows the impact of new features to be tested.

What Is the Building Control System For?

The building control system controls the parts of the building that can respond to human or environmental stimuli to provide comfort and service in an energy efficient way (e.g. automated lighting; automated air condition). The building control system is created with the objective to reduce the overall impact a building has on the environment. This will be achieved by using resources in a more efficient way. Moreover, the control system aims to reduce the cost of maintaining a building long term as the amount of energy used in maintenance will be reduced. With the aim to increase awareness as to the amount of energy a building consumes.

Getting Started

The Building control system is a control system with an integrated virtual test environment in which the control system can be tested without being embedded in the real system. When the system is executed the Main Menu, window will open first. The user will then be able to draw the rooms the building has and simulate the energy consumption each room contributes and thus the energy consumption of the whole building. This is achieved by adding relevant energy consumers to the rooms and tailoring the attributes of each energy consumer to meet the needs of the user. The user can view a graphical representation of the current energy consumed within the building.

Libraries

The external libraries currently used within the building control system:
1. Apache commons which is dedicated to creating and maintaining reusable Java components. Our developers have made an effort to ensure that their components have minimal dependencies on other software libraries, so that these components can be deployed easily.
2.Junit Hamcrest a framework that assists writing software tests in the Java. It supports creating customized assertion matchers allowing match rules to be defined declaratively.
3.SQlite-JDBC is a library for accessing and creating SQLite database files in Java.

How to Use the Building Control System

Figure 1.0 - Main Menu

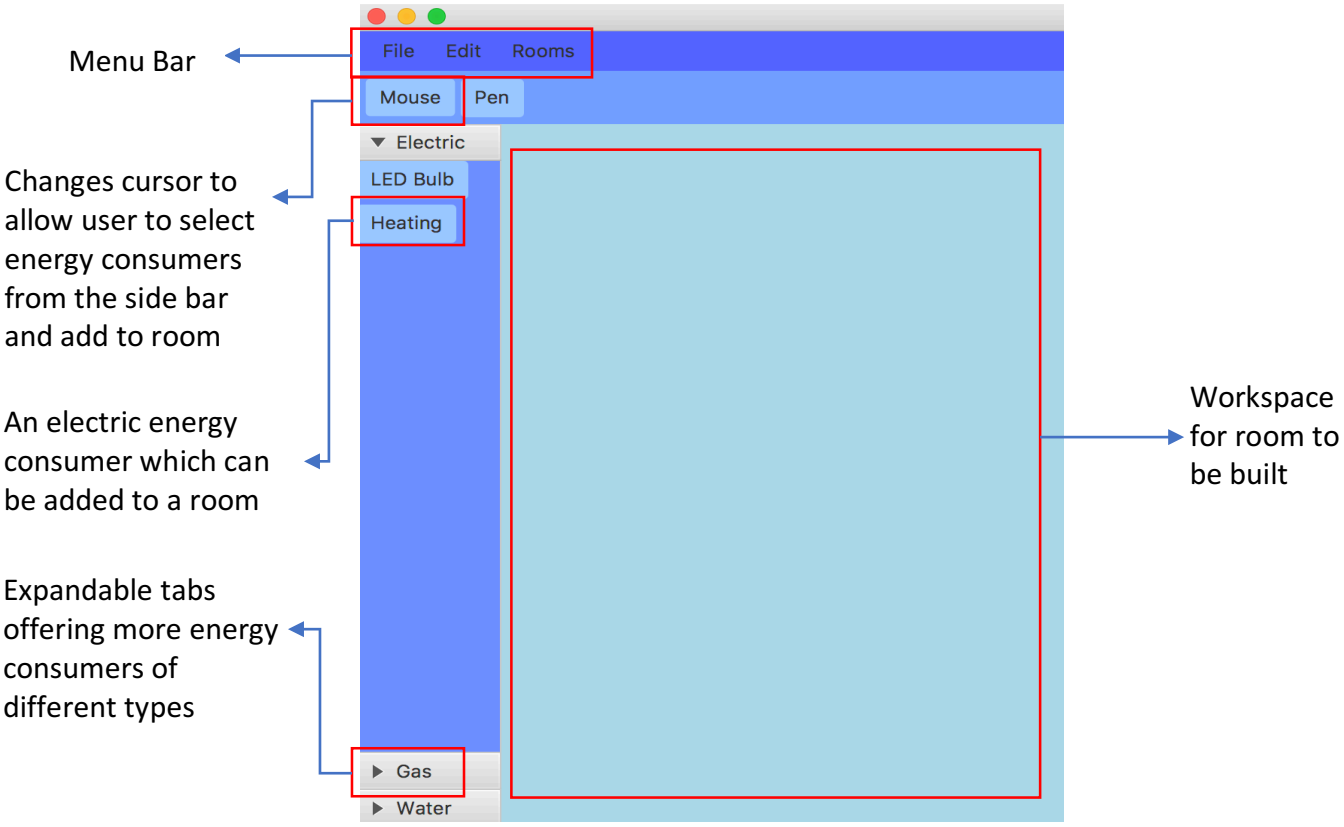


Figure 1.1 – Create Room Window

How to draw a room

To draw a room the user must select the pen button and draw each wall of the room in the workspace using the mouse. A red line with appear after each click to guide the user as to where the wall will appear.

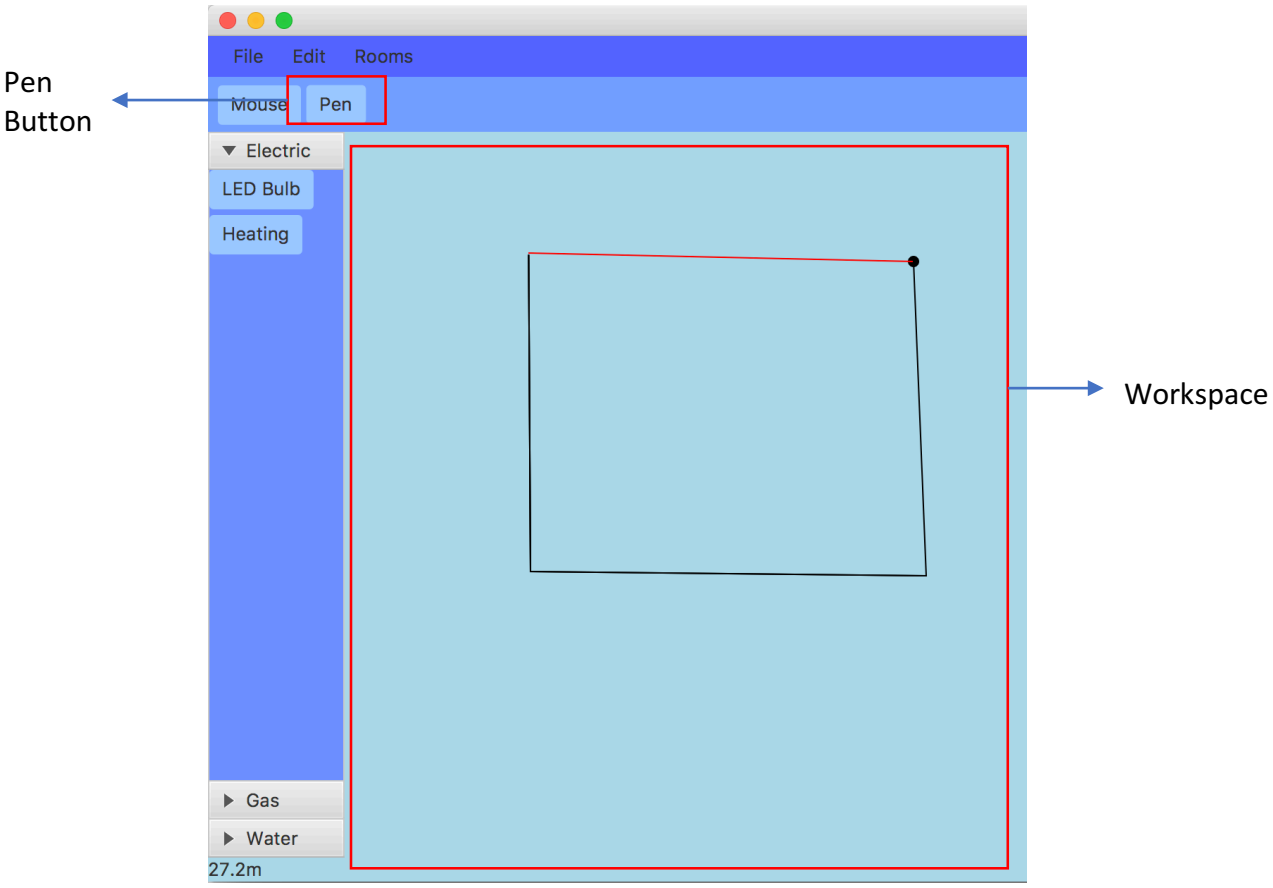


Figure 1.2 – Drawing room

Adding/Deleting energy consumers

To add an energy consumer, you can select a consumer from the left side bar. By drag and drop the user can place an energy consumer into the room. Once an energy consumer is selected the attributes relevant to that consumer will appear in the top right corner. By changing values of these attributes the user can tailor the energy consumer to their needs. Below is an example of three light bulbs added to a room.

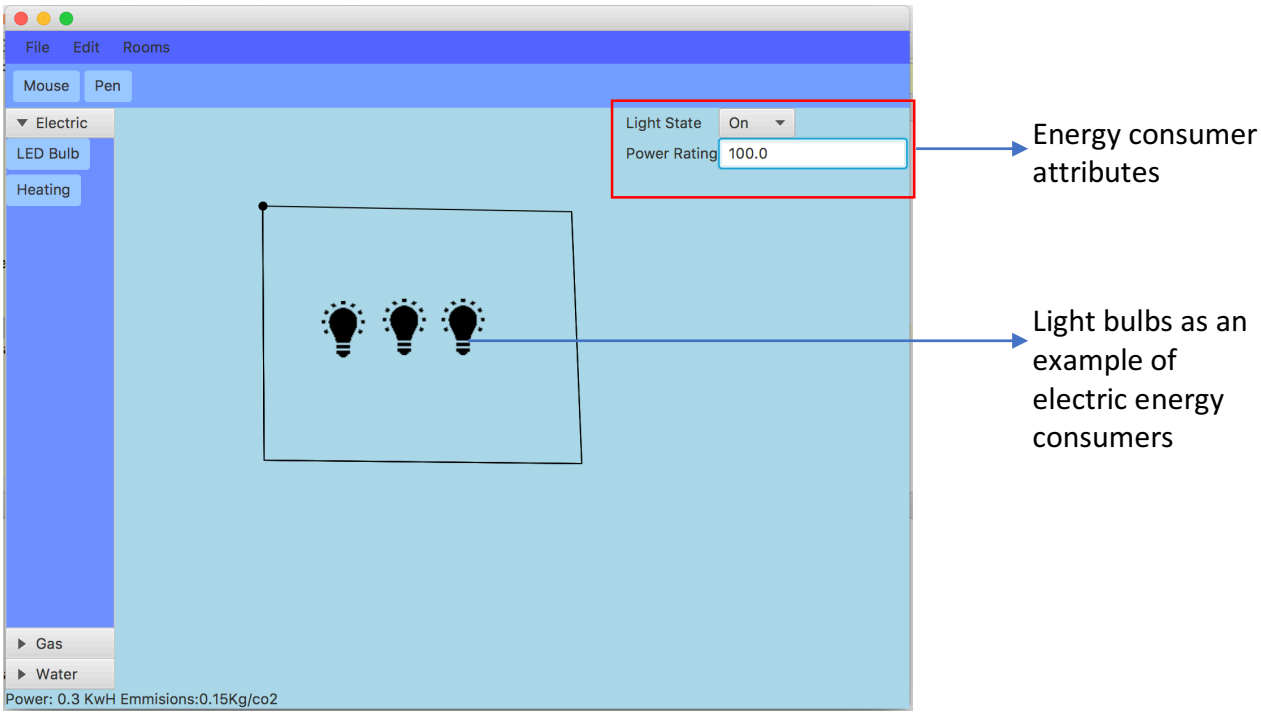


Figure 1.3 – Room containing three light bulbs

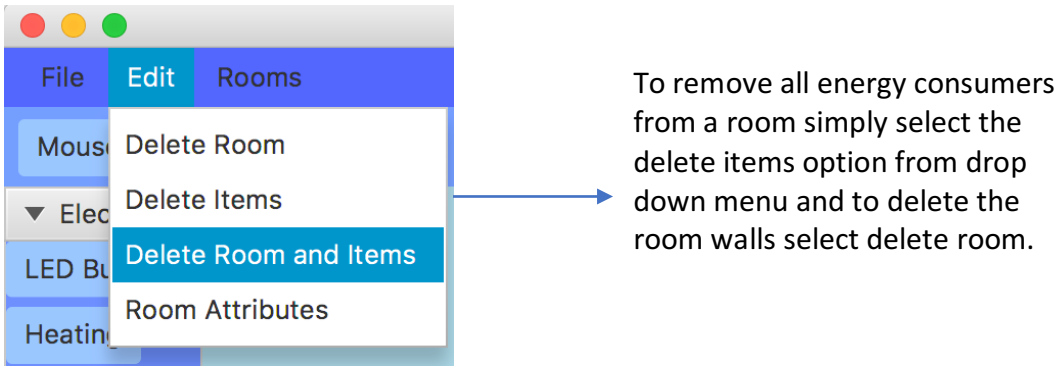


Figure 1.4 – Showing how to remove energy consumers

Room Saving and Loading

A room can be saved by selecting the save option from the drop-down menu and loaded back into the workspace by selecting the open file option.

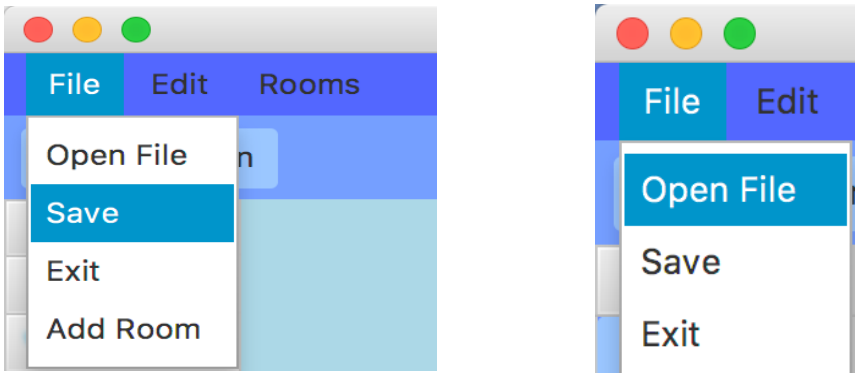


Figure 1.5 – Showing save room function and how to access saved room

Adding Room

A building may have multiple rooms to add a room simply select file from the menu bar and choose add room. To access newly created room select rooms from menu bar and select new room.

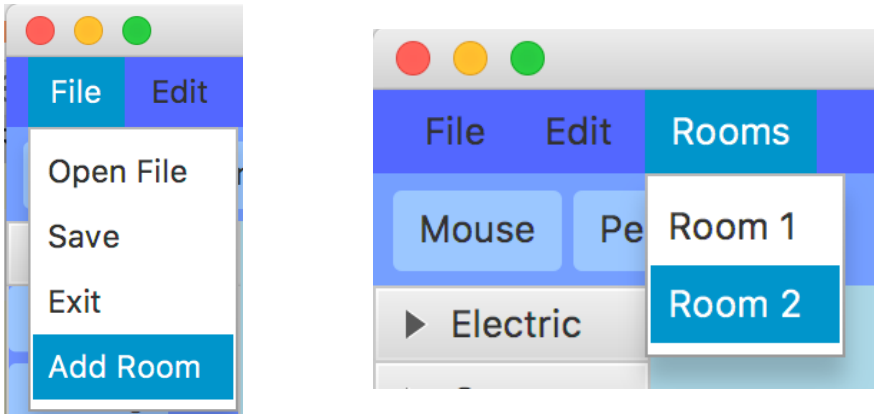
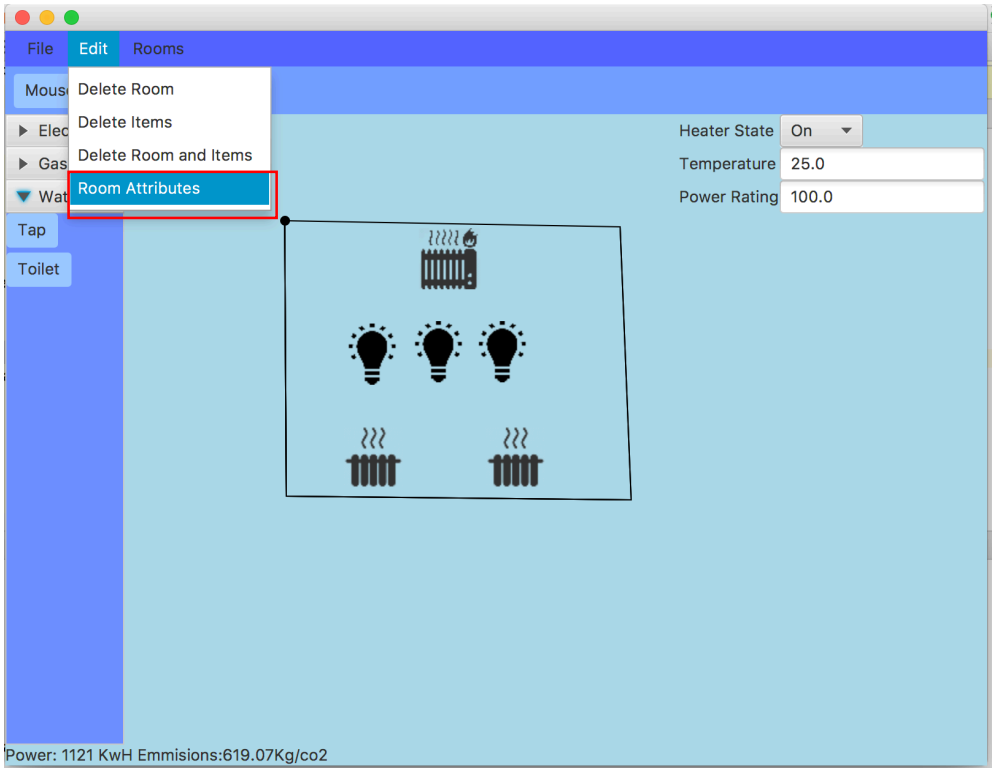


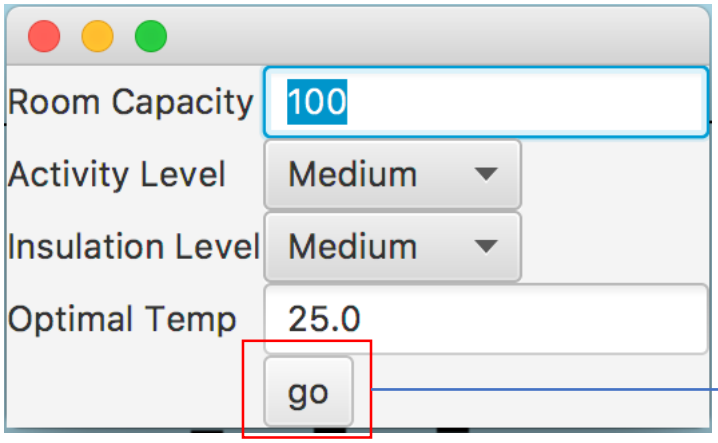
Figure 1.6 – Showing Add Room function

Energy Usage Statistics



Once the room is complete select edit in the menu bar and choose Room attributes option, this will open a window which allows customization of the room.

Figure 1.7 – Room containing multiple energy consumers



Room attributes window, allows customization of the room. There are four attributes that can be changed room capacity, activity level, insulation level and the optimal temperature. Once they are set clicking the go button will produce a graphical representation of the rooms current energy usage.

Figure 1.8 – Room Attributes

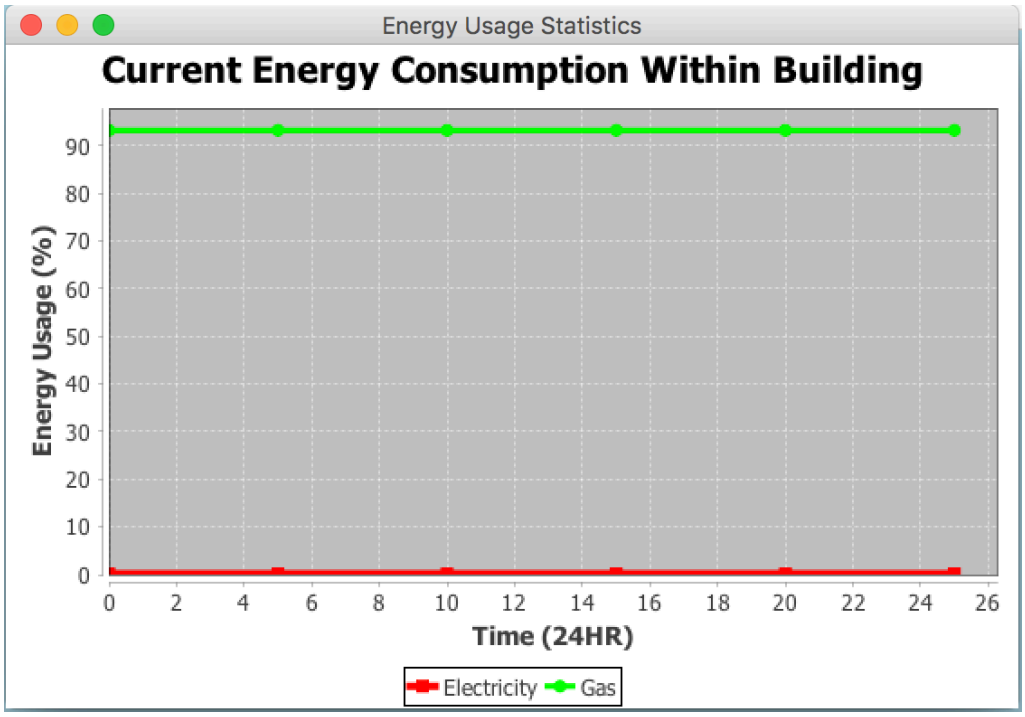
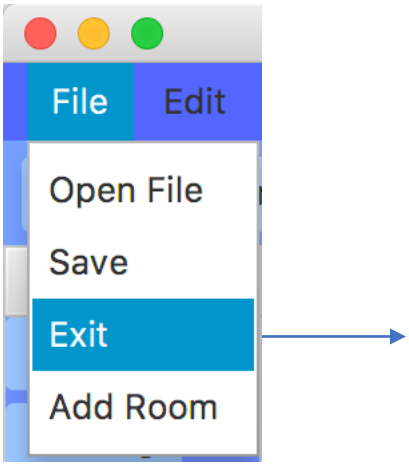


Figure 1.9 – Graph displaying current energy consumption

The current energy consumption of the building shown over a 24-hour period. With X and Y axis showing time and energy usage in percentage. The graphs shows electricity usage and gas usage which is dependent upon which energy consumers are used as well as the optimal room temperature chosen.

Exit the Program



To exit the program simply select File from the menu bar followed by the Exit option from the drop-down menu.

Figure 2.0 – How to exit the program