Energy Efficiency Educator

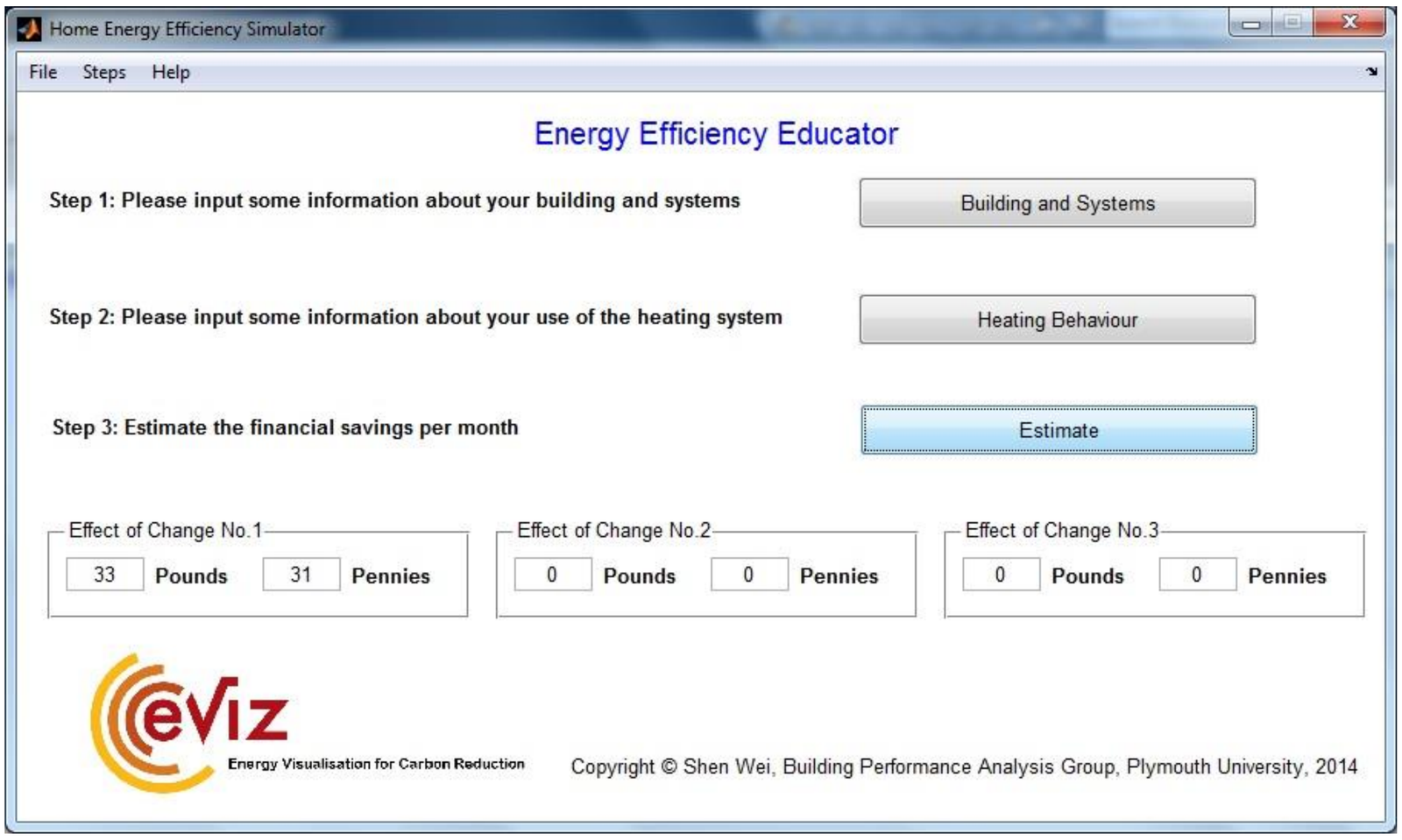
Early Stages of an Interactive Tool to Help Reduce Heating Energy Demand in Residential Buildings

Shen Wei[1,2*], Julie Goodhew[1*], Yaqub Rafiq[1], Sabine Pahl[1] and Pieter de Wilde[1]
[1]Plymouth University, UK
[2]Loughborough University, UK

Engineering and Physical Sciences Research Council

Introduction:

An Energy Efficiency Educator (EEE) is being developed as part of the Energy Visualization for Carbon Reduction (eViz) research project in the UK. The EEE aims to respond to householders preference for energy information tailored to their home (Abrahmse et al., 2005; Guy and Shove, 2000). It combines dynamic building simulation with a user-friendly interface to allow exploration of tailored options that leads to better decisions in non-experts. The EEE uses EnergyPlus as the simulation engine and is currently being developed using the Matlab Graphical User Interface toolkit. This paper presents some initial qualitative feedback from a pilot study (N = 14) exploring the tool with real building occupants, so as to assess the usefulness of such a tool and how potential tool users respond to it. These findings will enhance and inform further development of this tool.



Focus group: Research Questions

1. Did users accept the EEE (and the building simulation approach)
2. User preferences - tailored prediction with complex data input or a simplified prediction that is easier to start
3. User suggestions for improvements- the Graphic User Interface /functionality of EEE

Answers:

1. Majority of users likely to use it in their daily life for energy saving. Would be used to check the validity of energy costs, choose energy saving actions and optimise the level of warmth vs lowest cost.
2. However, there was a call for more detail *"I would only use is if it showed my own, accurate energy use for the last two weeks"*
3. A more tailored function was preferred but participants found some data points difficult to input

"Is a concrete floor low in insulation?"

"Can the tool take into account high ceilings? The year in which house was built should be considered".

"How can people working part time choose the correct schedule?"

1. Suggestions:

Include a way of detailing unique pattern of occupancy

Clarify and rename behaviour 1,2 and 3 options so that users better understand that these represent the 'model' or prediction, based on users' hypothesised changes to their daily behaviour

Gathering more information - window opening behaviour, individual room control, to get a more tailored simulation model

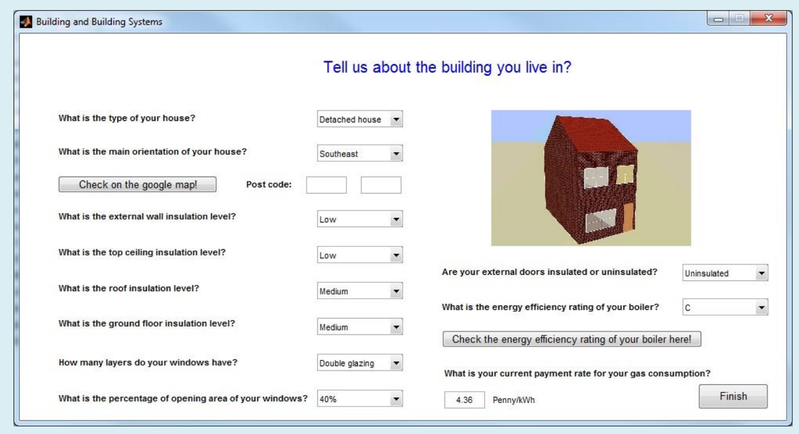
Questions to be framed so that the user provides information about the construction type rather than asking the user to judge the level of insulations

Consider including more costs, payback periods for actions, and reference to energy bills.

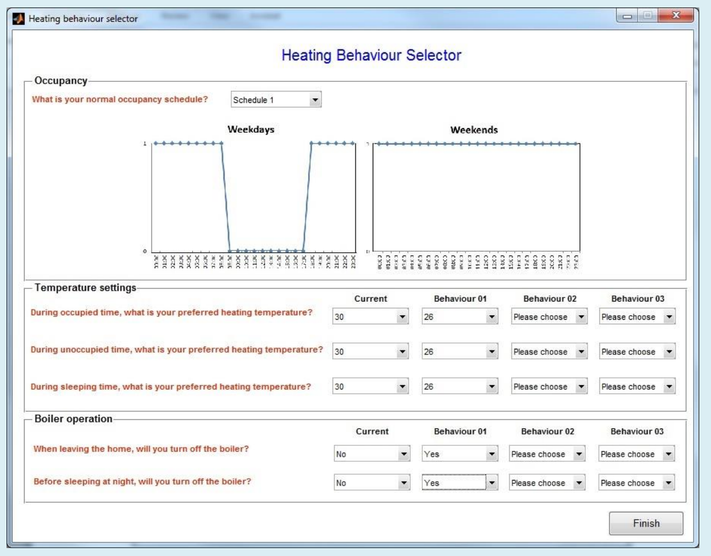
The EEE

Three main steps lead to information on behavioural changes (e.g. turning down the thermostatic setting or reducing the daily use of the heating system):

Step 1: Define basic information about the building being investigated and its heating system.



Step 2: Define current behaviour on using the heating system and the behaviour to change to, including both thermostatic setting and boiler use



Step 3: Invoke EnergyPlus to estimate the effectiveness of all behavioural changes the results will be shown in the main window.

Conclusions:

In conclusion, the EEE tool was conceived from research findings suggesting that building users require advice on promoting the energy efficiency of their buildings, but this needs to be tailored to the specific situation of their home. The small pilot study reported here provides positive feedback on users' acceptance of the EEE, but building users, in order to accept the predictions of the EEE, require a high level of detail specific to the their own buildings to inform the EEE computations.

References

ABRAHAMSE, W., STEG, L., VLEK, C. & ROTHENGATTER, T. 2005. A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology,* 25, 273-291.

GUY, S. & SHOVE, E. 2000. *A Sociology of Energy, Buildings and the Environment: Constructing Knowledge, Designing Practice*, Routledge.

Contact: S.Wei2@lboro.ac.uk
julie.goodhew@plymouth.ac.uk