Towards an agent-based model for A/C purchasing prediction
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In this work, we present a methodology to assess the effect that periods of hot weather might have on households' intentions and decisions to purchase domestic air conditioning machines, considering perceived norms and behavioural control. Our approach combines building simulation, surveys and agent based modelling for this purpose.

As well as the rise in global mean surface temperature in the following decades, climate change is expected to increase the likelihood of severe weather events such as heat waves. The UK is a heating-dominated country, but a extremely hot summer or heat wave could trigger householders to consider purchasing air conditioning (A/C) machines (as has been seen in Australia). If the scale of these interventions in dwellings increases, the UK's annual electricity demand profile could change substantially compared to current profiles.

3 pillars:
• Probabilistic future weather files (Prometheus) applied to a realistic synthetic building stock model.
• Questionnaires sent to household to explore the relationship between overheating intensity and intention to purchase air conditioning machine (planned work).
• Agent-based model in which the decisions of the agents (households) depend on the internal conditions of their homes.

Building models were validated using real internal temperature data from 70 homes in Exeter, UK. After, the models were simulated with EnergyPlus using future weather files.

Surveys will be administered at the end of August 2014 to establish the potential relationship between overheating intensity and psychological factors involved in buying A/C.

Individual human agents were modelled according to the theory of planned behaviour and are organised in a small-world social network.

Agent-based model simulations were performed for three locations in the UK using Overheating Intensity as an input to the model and a fixed high perceived behavioural control. In this example four, five and three households out of 70 actually installed an A/C machine within the 60 years period 2030-2090 depending on the location.

The framework presented allows for the simulation of 'what-if' scenarios and seems to be a useful tool for quantifying the problem at hand. Once completed, the framework can be used by policy makers to investigate the consequences of particular interventions prior to their introduction and realization. We have seen that although temperature increases will have a significant impact, some A/C machines may be installed in homes that are prone to overheating in current weather conditions. Preventative measures such as the physical refurbishment of such properties could be employed to minimise the purchase of A/C machines and resulting impact on energy demand.

The agent-based model needs real survey data from households in which internal temperatures are monitored to establish the relationship between intention and overheating. We will measure existing attitudes, social norms, perceived behavioural control and intentions of the occupants with the help of carefully designed questionnaires and validate the model both at the micro level of input as at the macro level of output with questionnaires administered in August 2014.