TOWARDS INTEGRATED DECISION SUPPORT FOR SUSTAINABLE URBAN PLANNING

Darren Robinson

Solar Energy and Building Physics Laboratory, Ecole Polytechnic Fédérale de Lausanne, Station 18, CH-1015 Lausanne, Switzerland.

INTRODUCTION

Over half of the global population is now living within urban settlements in which some three quarters of global resource consumption takes place. The environmental consequences of this urbanisation are both profound and increasing. It is thus important that our cities evolve in the most sustainable way possible. To guide this process it is useful to test the environmental consequences of alternative urban planning scenarios. To this end, we propose the development of a new advanced computer modelling paradigm and discuss progress that is under way to realise it.

BACKGROUND

Significant progress has been made in the last thirty years in the modelling of urban spatial dynamics and in the modelling of transport. Indeed several computer models exist which integrate the two, to varying degrees of sophistication. Some good progress has also been made in urban environmental modelling during the last decade, culminating in software which simulates building-related resource flows in an integrated way. But no attempt has thus far been made to unify these approaches and so provide for a comprehensive basis for modelling building and transport related resource flows and how these may evolve with time, in response (amongst other influences) to urban growth and land use change. Such a tool would provide a powerful support tool for urban planners and legislators to make informed decisions regarding the sustainability of alternative proposals and so guide the development of urban settlements along more sustainable trajectories.

METHODOLOGY

Cities are comprised of actors [firms, individuals] which react to economic, governance, technological and educational stimuli and to the actions of their peers. Indeed cites exhibit complex emergent behaviour resulting from these individual reactions. In principal we can model the key behavioural mechanisms of these actors. In particular we can model the:

- creation, growth and relocation of firms,
- birth, relocation and death of individuals,
- the development of buildings and infrastructure to accommodate them.

A coherent basis for achieving this is in the form of a multi agent simulation paradigm (a kind of sim-city if you will).

The next challenge is to couple transport models with building-related resource flow models. For this, multi agent simulation once again provides the answer. State of the art building models include stochastic models for predicting the presence and behaviour of occupants; in particular their interactions with windows, blinds, lights and appliances (water and electrical). A natural progression would be to model occupants as agents that perform their daily tasks, react to local environmental stimuli and move within and between buildings. For this latter, these occupants may be exchanged from buildings to relevant modes of transport and vice versa.

The great challenge is to achieve this objective in a computationally tractable way.

CONCLUSIONS

Developments in computer models of urban spatial dynamics, transportation and building-related resource flows are reaching maturity. The time is ripe for integrating these models within a multi agent simulation paradigm. Such a tool would of an invaluable support for urban planning decision makers to guide the development of new and existing towns and cities along a more sustainable trajectory.