Faculty of Design

2020

Using systemic models in games and simulations for participatory planning

Palavalli, Bharath and Harsha, K

Using systemic models in games and simulations to for participatory planning

Bharath M. Palavalli (bharath@fieldsofview.in) and Harsha Krishna (harsha@fieldsofview.in)

Fields of View, Bangalore

Abstract

Planning for large Indian cities presents a complex problem to planners due to a number of factors, three of them being the scale of the cities, the diversity of people and the inequity among the population. Effective participatory approaches to planning aim to address the inherent inequity (stemming from levels of income, class, caste, gender, etc.) among stakeholders by including the needs of the marginalised. Such methods should allow for the collection of people's aspirations, their needs and preferences, this leads to a set of outcomes that can then be negotiated between the stakeholders.

In traditional approaches, in order to develop plans or implement urban infrastructure, a pilot project is created/implemented for each plan option, based on the input from different people, and to test them in the real world. For example, selecting a small region in the city to test a bus rapid transit system (BRT) to check for its efficacy and acceptance. However, apart from the financial and other resource costs, it requires changes to governance and administrative processes in order to create, monitor and analyse such a pilot. This makes the pilot-based approach expensive and time-consuming. Recently, the ethical concerns of pilots and randomised control trials have been well documented.

Simulation models address these gaps by allowing us to test for certain conditions. However, most of these modelling techniques available today were developed in a western context for a western city dweller. These assumptions related to income & expenditure, types of livelihoods, aspirations, type of governance and road network & topology, has influenced the methods of planning. Due to the diversity and the differences in the model assumptions, most plans developed using such techniques either tend to have skewed results or are not relevant to the context.

A new method is required to in order to include the contextual assumptions and thus develop tools and methods that are able to inform the planner about the context and limitations to work within.

In this article, we demonstrate the use of approaches from systems dynamics modelling and the use of participatory modelling to build models of people and processes for development of neighbourhood level plans. We then demonstrate how such models can be used in two ways, 1) As a basis for design of serious games, to elicit preferences, biases and aspirations from people and, 2) As simulation planning tools to develop planning scenarios which can be used to explore different outcomes. We provide examples of both these methods as a means to develop and discover the fundamental context for planning in India.

System Dynamics models for games

We first demonstrate the use of the systems dynamics model for mapping the relationship between affordability, accessibly and adequacy of Bangalore's public transport. We then use this model to create a serious game called "Transport Trilemma". Players, who are researchers or experts in the domain, use the model to keep the operations of a transportation company going while accounting for accessibility and adequacy of the transport network and affordability of their service.

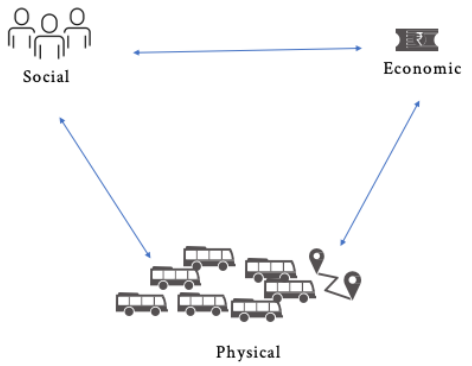

Figure 1 Transportation as a socio-technical system

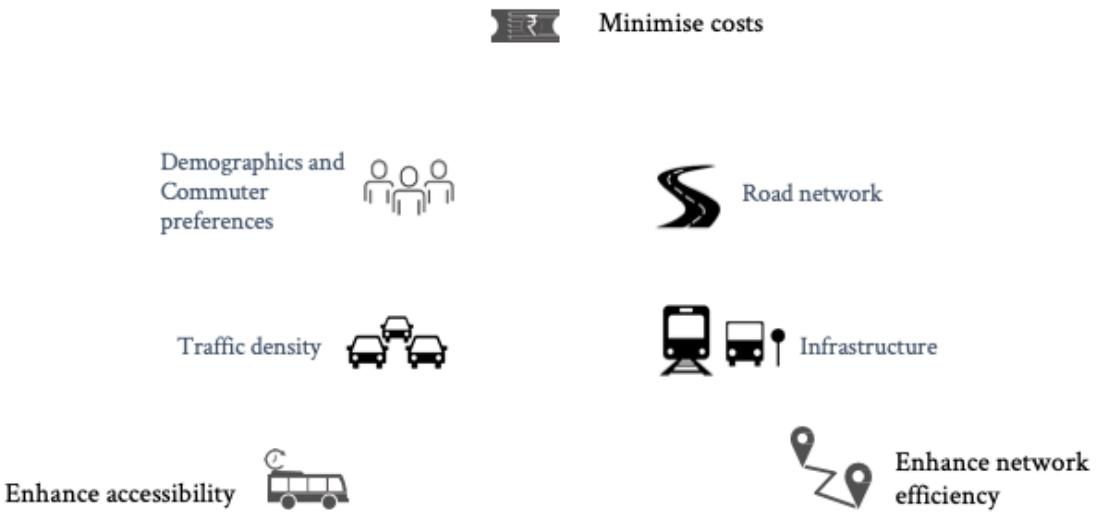

Figure 2 Scenario: Deploying a new route

System Dynamics models for simulation tools

Here we built a systems dynamics model for the urbanisation of Chennai. We focused the model on the use of water, generation of waste and sewerage for the Greater Chennai Corporation (GCC) area. We also built a model for the interaction between various agencies

in Chennai that are involved in urban planning and policy making. We then built a simulation tool that used allowed planners to set parameters for the systems dynamics model and use the interaction between the systems dynamics model and the institutional setup to generate different scenarios of growth.

For example, a planner can set parameters for population growth, the amount of water supply, and capacities for waste management. They can also set goals for individual agencies in terms of their planning objectives for the future. The simulation then tries to align the urban growth with the institutional objectives and develops a set of outcomes for scenarios of low water, high population, etc., The planners can then choose the appropriate trade-offs in their plans to align their further planning objectives. Figure 3 gives the broad overview of the system. Figure 4 illustrates a simulation output for two agencies, GCC (Greater Chennai Corporation) and CMWSSSB (Chennai Metro Water) along different planning parameters such as population, plans, etc., The shaded regions represents the extent of the parameters considered in their respective future plans. The regions overlapping "purple" are the parts of their plan that are aligned with each other.

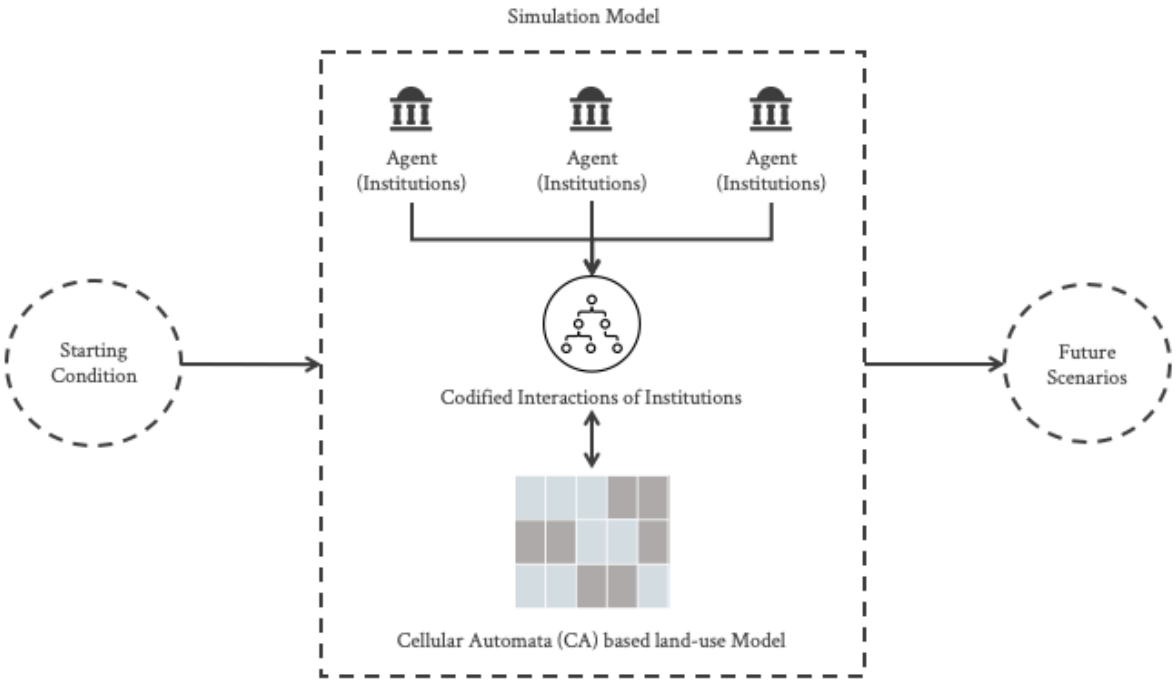

Figure 3 Overview of the planning tool

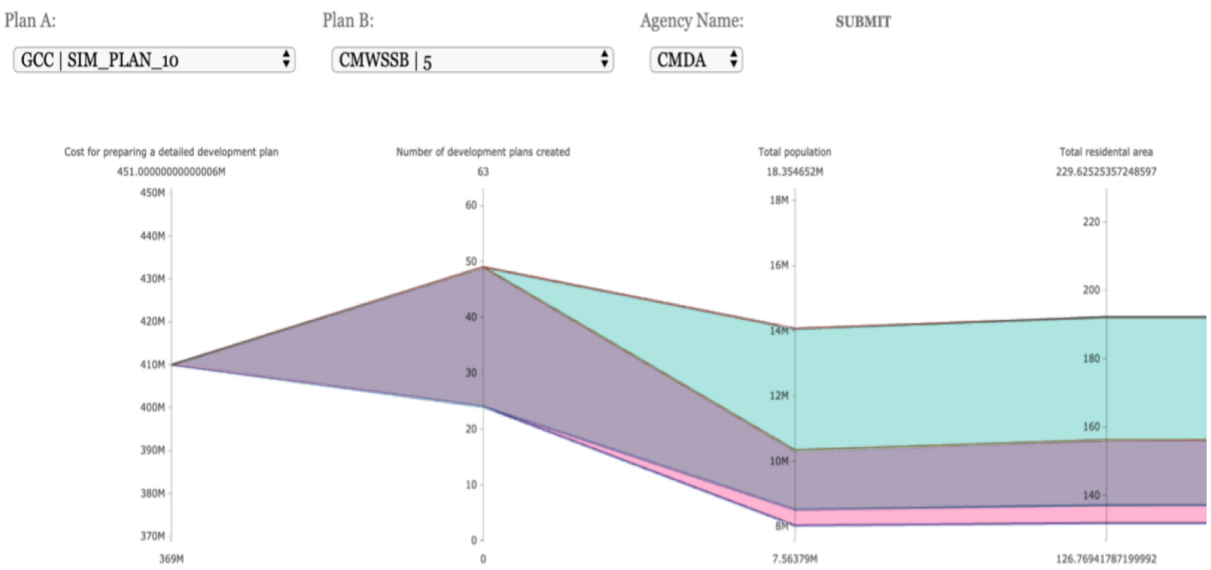

Figure 4 Example of an out from different simulation outcomes for different agencies.