

Space layout affects search efficiency for agents with vision

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Abstract

Groups of mobile sighted individuals, whether insect, animal or human, behave in complex ways as they search their environment for the resources needed to live. Amongst urban human societies search behaviour is complex and emergent since it relates to settlement morphology and land use pattern, both of which themselves result from human activity. Recently, agent simulation experiments have been used to study patterns of emergent behaviour in the dynamics of crowd movement and in the construction of paths through open space. Here we report simulations in which agents are given long distance vision and direct their behaviour in response to information from the entire cone of vision afforded by the morphology of the local environment and their gaze direction. We show that the morphology of the environment and the location and aggregation patterns of resources within that environment affect the efficiency with which these agents can conduct their search. Linear streets and clustered aggregations afford efficient search for multi-target 'comparison' behaviour where agents search amongst a number of targets for a 'best match' to their requirements, whilst dispersed locations are most efficient for single target 'convenience' trips. We propose that urban space morphology and retail location patterns may have evolved to support efficient search. Finally, we argue that knowledge of distributed processes of decision taking such as that involved in search for resources and location selection on the part of resource providers, could lead to a new intellectual framework for land use planning.

Keywords

Retail, simulation, land use, planning

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