Urban Growth: Effects on urban green spaces and implications for planning and policy
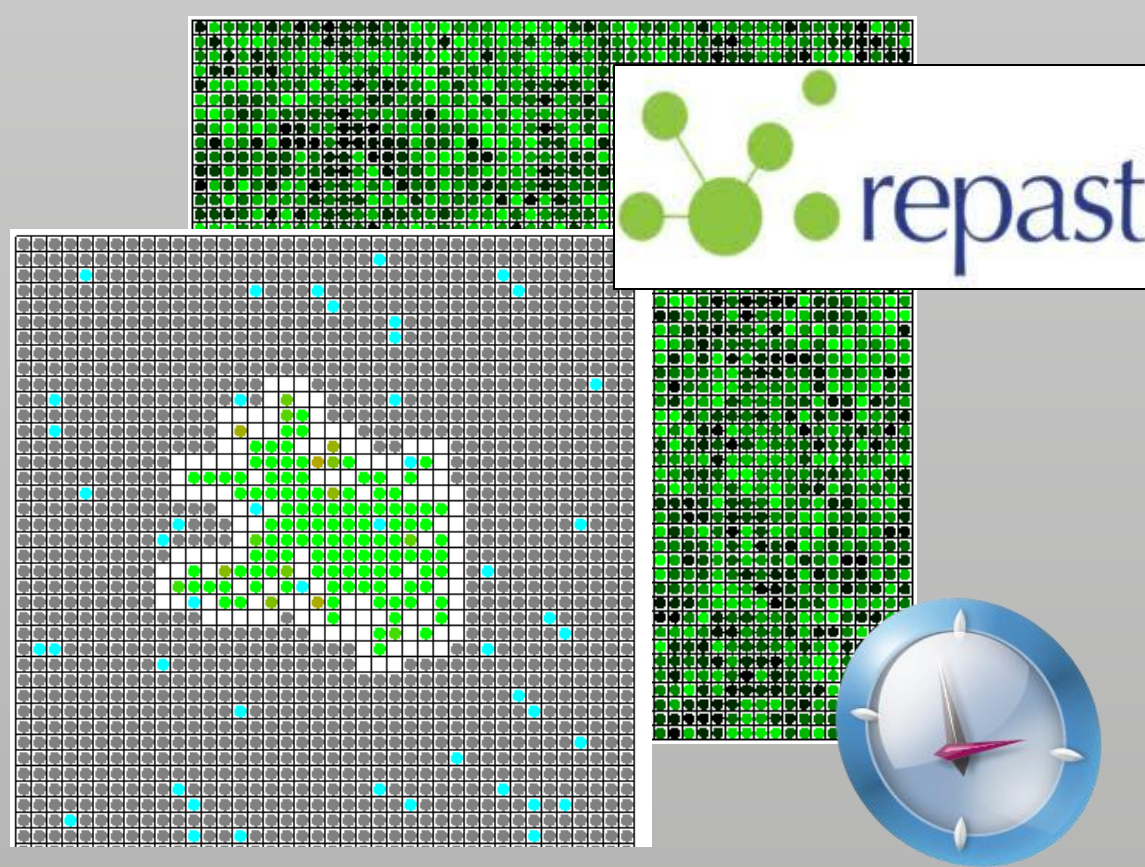
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Supervisor: David W. Corne

How to apply a Genetic Algorithm to a Sequential Planning Problem

GA should deal with future uncertainty: need the support of external tools (Statistical Data)

PROBLEM
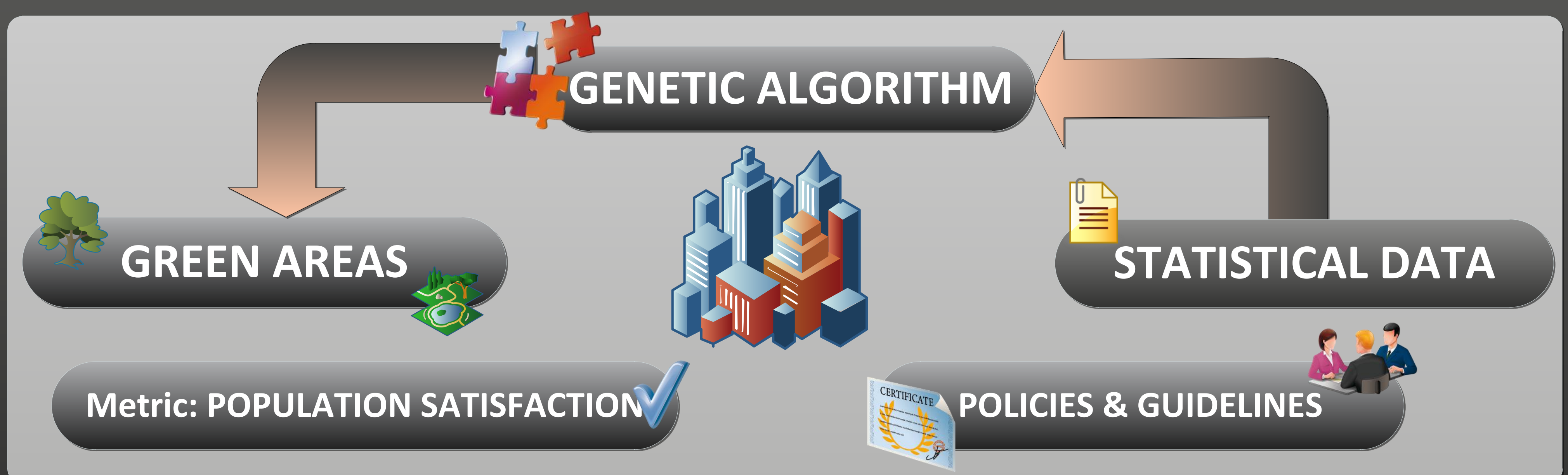
Agent-Based Modelling – Cellular Automata

Description:

Cellular Automata model a city and its surroundings. Each cell has an ecological random value. The city growth has a negative effect on these values. The city is populated with a set of agents which represent families and are modelled by the use of an Agent-Based approach.
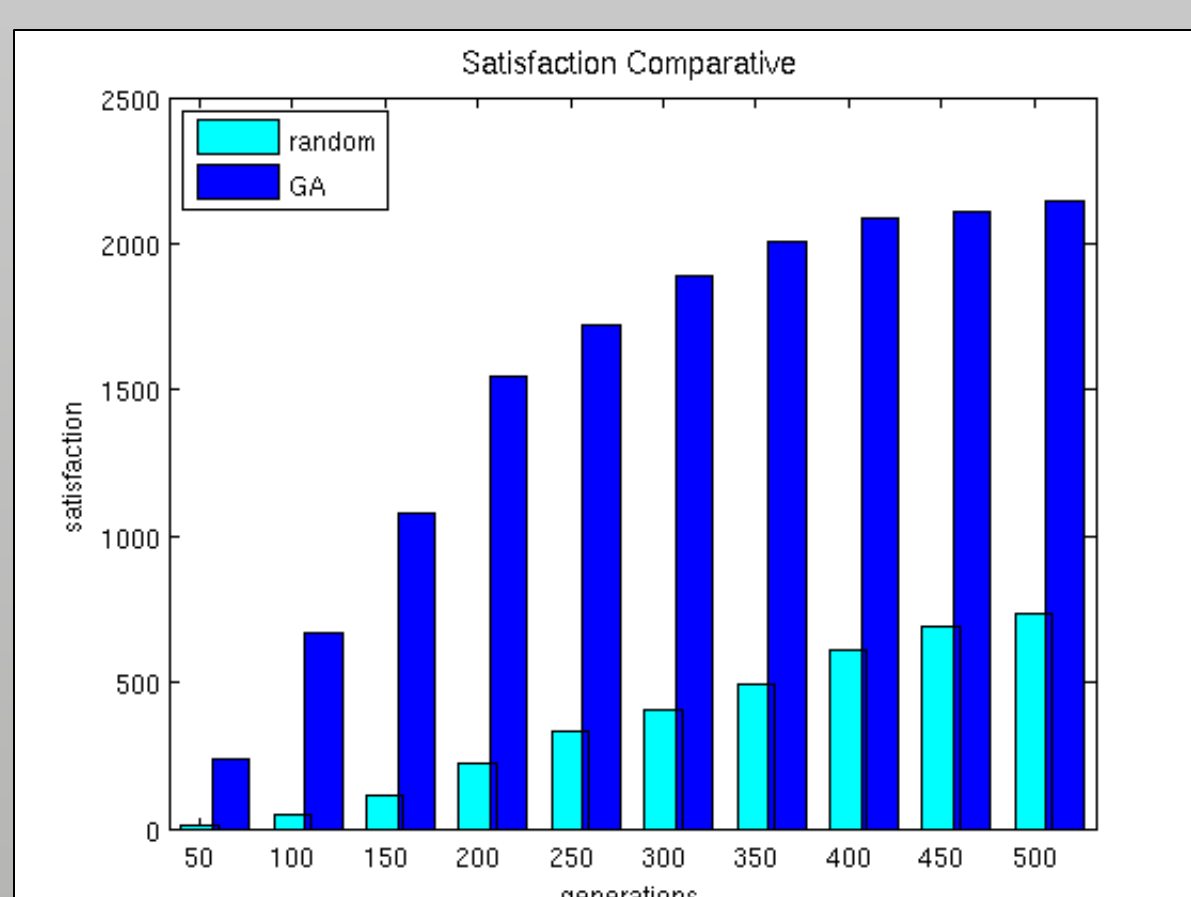
Objective:

Distributing a set of green areas throughout the city and achieving the maximum satisfaction from the inhabitants of the city. An agent is satisficed if it lives close enough of one of these areas.

MODEL

GENETIC ALGORITHM

GREEN AREAS

STATISTICAL DATA

Metric: POPULATION SATISFACTION

POLICIES & GUIDELINES

PROCEDURE

Experiments still in progress. Preliminary data indicates a positive improvement in the satisfaction of the population using a GA-Statistical approach. Next steps:
- Include new metrics like preserve most valuable ecological areas
- Increase the complexity of the model to get closer to real-world scenarios
- Validate the strategy followed by the comparison with other approaches commonly used for sequential planning problems like Reinforcement Learning.

Satisfaction Comparative

	50	100	150	200	250	300	350	400	450	500
Random	7.57	47.93	113.41	222.0418	332.9900	407.0618	491.7709	611.4409	688.5427	731.1727
GA	235.12	670.76	1080.31	1.5460e+03	1.7244e+03	1.8924e+03	2.0061e+03	2.0874e+03	2.1078e+03	2.1454e+03
% Difference	3104.88	1399.60	952.54	696.2622	517.8674	464.9045	407.9329	341.3979	306.1229	293.4221

RESULTS

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PGR Student Poster Day - 23rd August 2012