

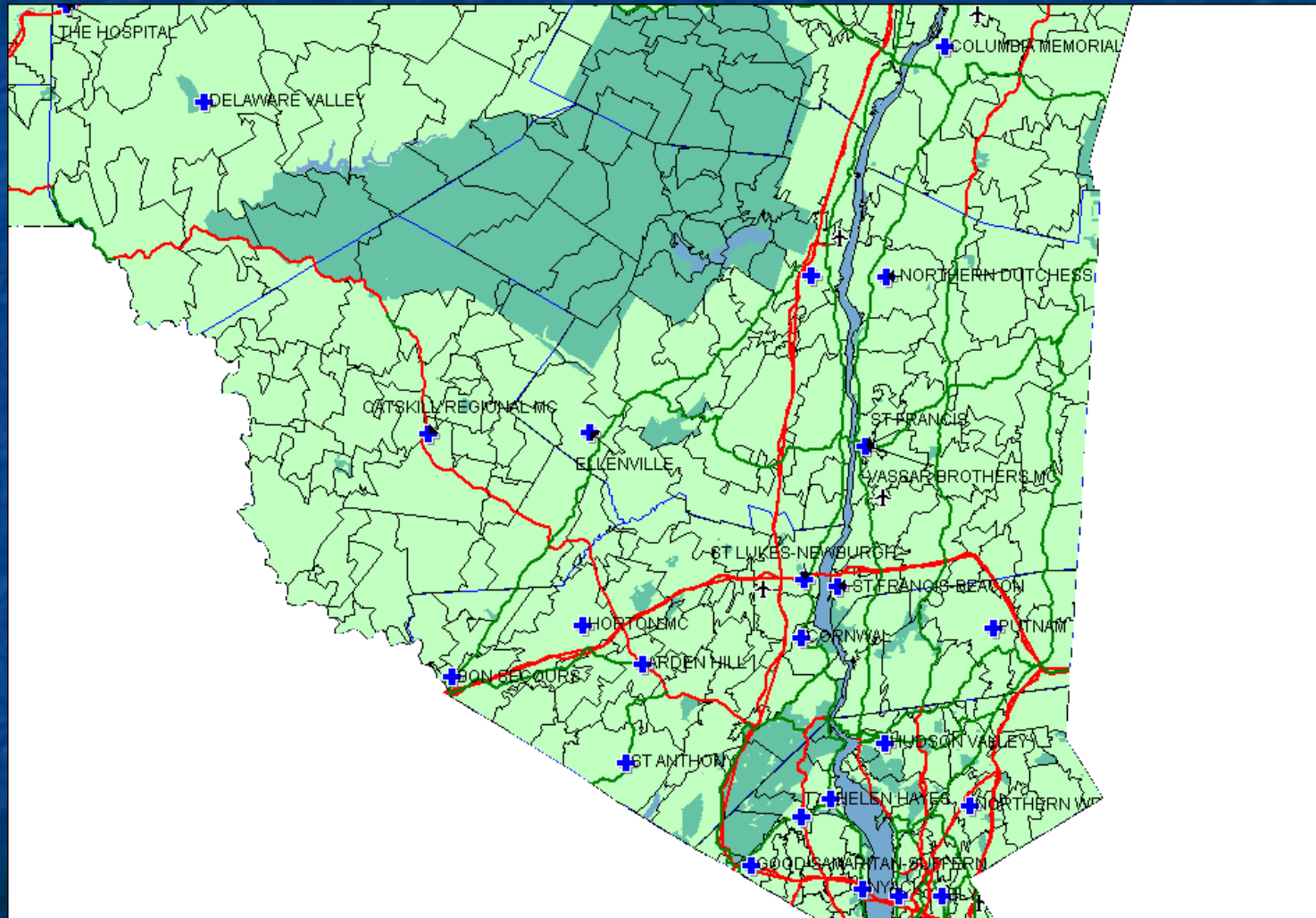
COMPETING FOR NEW
HOSPITAL LOCATIONS: A
SIMULATION MODELING
APPROACH

Hans Levenbach, Petr Dostal, and
Paul Savage,

Overview

- Background
- Data
- Simulation model
- Opportunities for future research

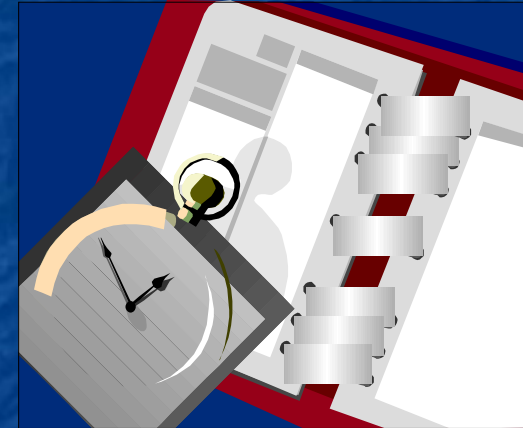
Simulation – Geographical Map



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Improvements In Data Quality

- **Consistency** – data that retains the same significance for demand prediction over time
- **Accuracy** – the extent that data are free from significant error
- **Timeliness** – the committed availability timeframe meets the forecaster's schedule
- **Reliable** – can be depended on when and as promised
- **Affordable** – cost of data acquisition is within budget
- **Ease of use** – how readily users can access data



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Theory - Partial differential equations of second order

$$\frac{\partial D}{\partial t} = K_x \frac{\partial^2 D}{\partial x^2} + K_y \frac{\partial^2 D}{\partial y^2}$$

$$D_{t+1,i,j} = D_{t,i,j} + K \left[K_x (D_{t,i,j-1} - 2D_{t,i,j} + D_{t,i,j+1}) + K_y (D_{t,i+1,j} - 2D_{t,i,j} + D_{t,i-1,j}) \right]$$

$$K = \frac{\nabla t}{(\nabla x)^2}$$



Simulation - parameters

$D_{t,i,j}$ Capacity of the use of hospital - range from $+0\%$ to 100%

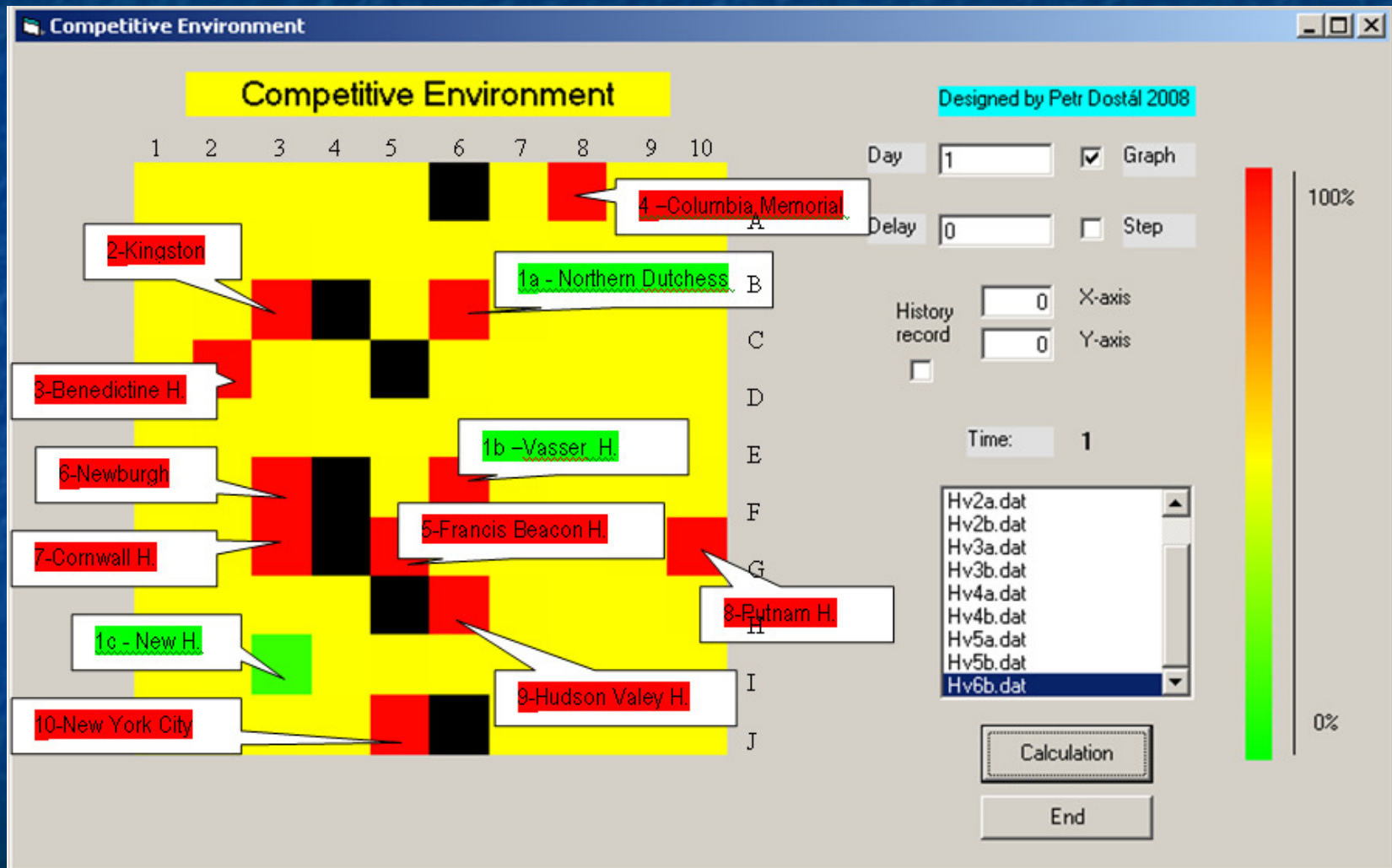
$+100\%$ maximum capacity of the use of hospital
 0% zero capacity of the use of hospital
(from red via yellow to green color)

K, K_x, K_y simulation constant

$O_{i,j}$ cell code

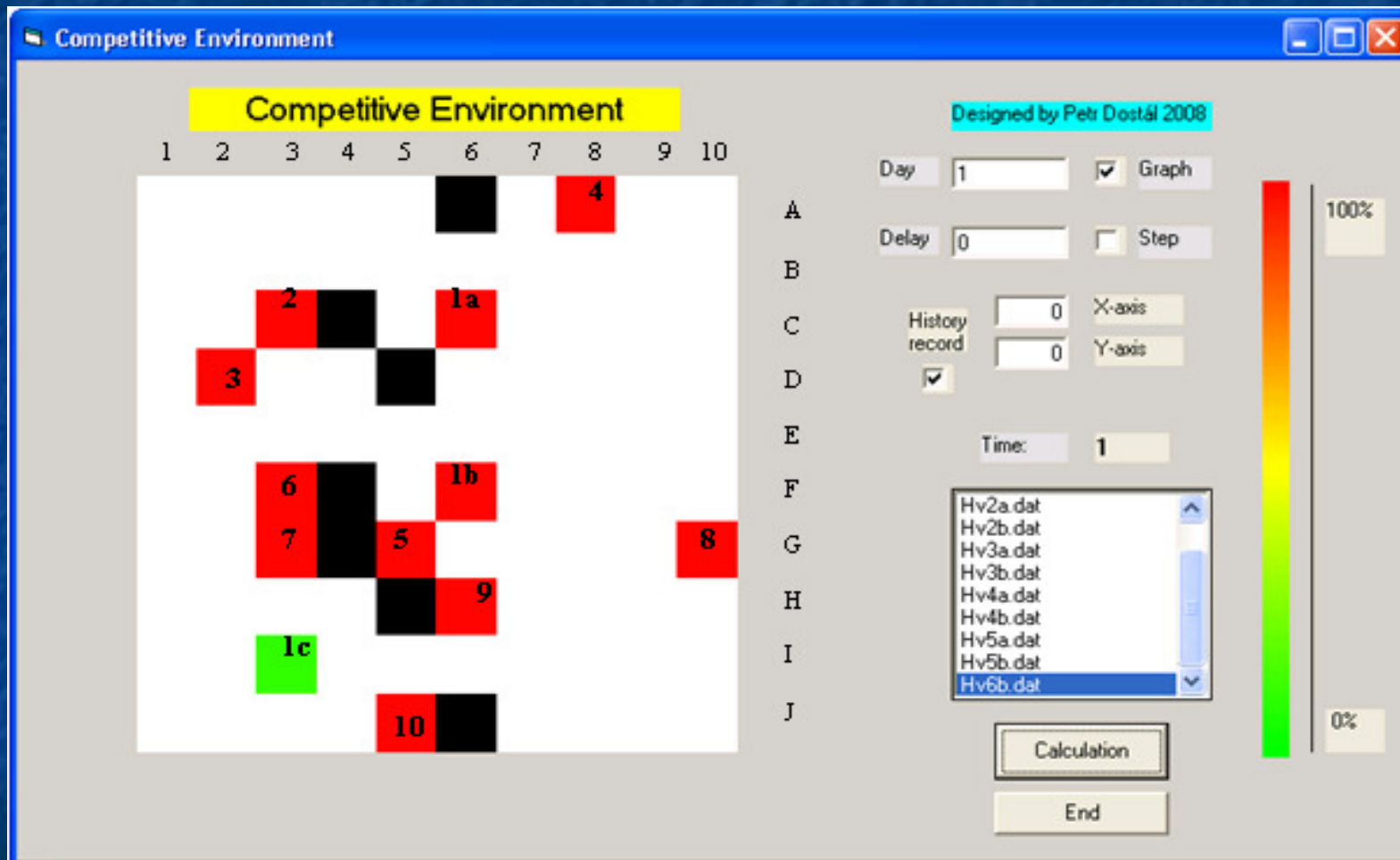
- a) any influence on competitive environment (except initial condition),
- b) solid obstacle (any influence on competitive environment),
- c) positive and constant influence on competitive environment,
- d) positive and variable influence on competitive environment,
- e) negative and constant influence on competitive environment,
- f) negative and variable influence on competitive environment.

Simulated Map of Hospitals



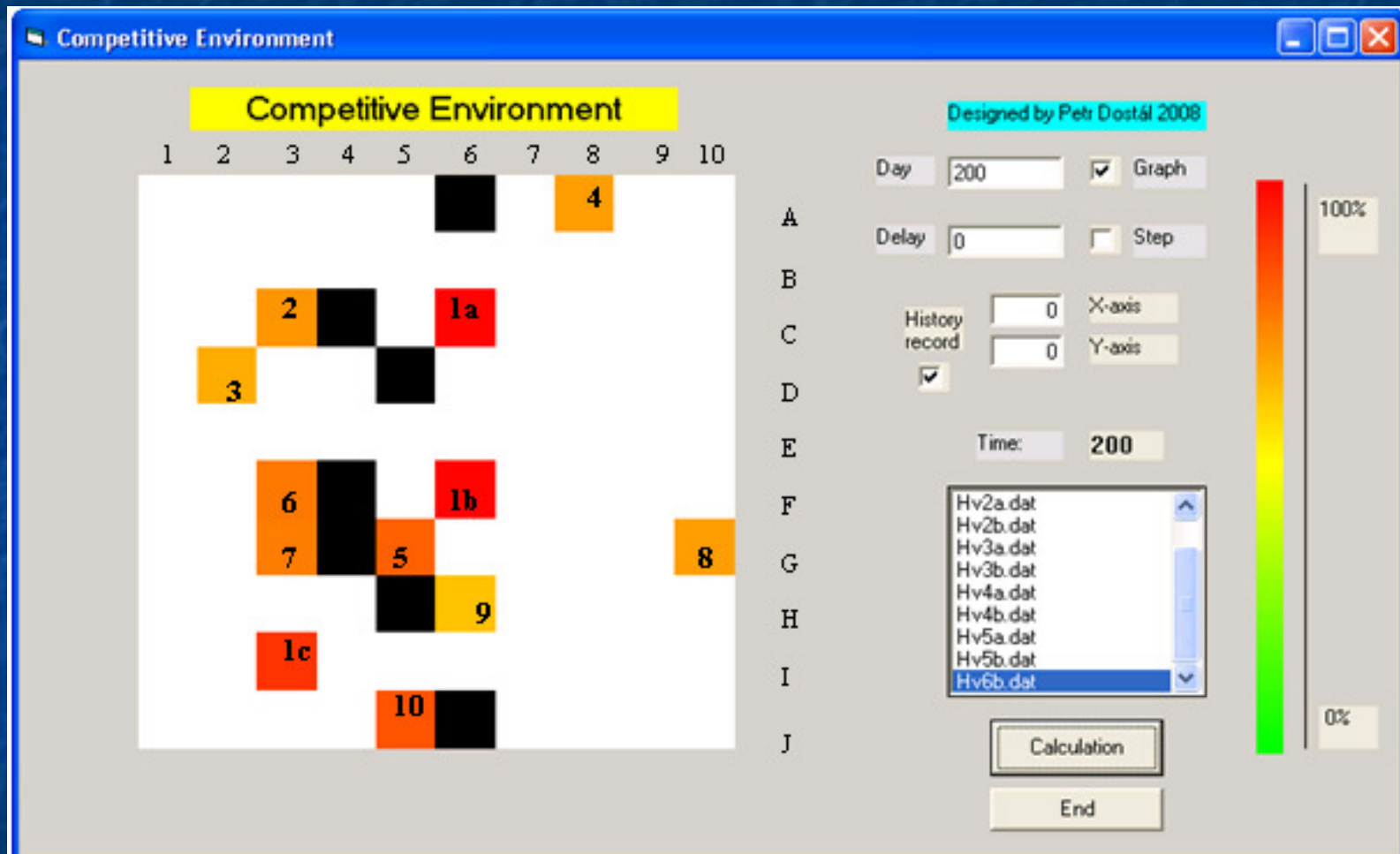
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Simulated Map – Beginning



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Final Simulation – End Time



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Future Research

- Add assumptions about public transportation, housing starts, local economy, quality of healthcare service.
- Breakdown of services into medical, surgical, psychiatry, maternity, etc.
- Breakdown of product lines into cardiac, liver, bones, lung, etc.

References

- [1] DOSTÁL P. Prediction of Competitive Environment in Business, *In 28th International Symposium on Forecasting*, Nice, France, June 22-25, 2008, p.171, 6p., ISSN 1997-4116, ISSN 1997-4124.
- [2] DOSTÁL, P. Competitive Environment Simulation, Kunovice 26.1.07, 2007, International Conference on Soft Computing, s.207-212, ISBN 80-7314-108-6.

