SELF-ORGANIZING MAPS APPLIED TO GAMES

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WHY GAMES?

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Games are rich and dynamic tools for Computational Intelligence

Non-player character behavior learning
Search and planning
Player modeling
Games as AI benchmarks
Procedural content generation
Computational narrative
Believable agentes
AI-assisted game design
General game AI
AI in commercial games

OK, BUT WHAT CAN YOU DO WITH SOM IN GAMES?

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EXTRACT PLAYER BEHAVIOR.

OK, BUT WHAT CAN YOU DO WITH SOM IN GAMES?

COMBINING SELF ORGANIZING MAPS AND MULTILAYER PERCEPTRONS TO LEARN BOT-BEHAVIOR FOR A COMMERCIAL GAME

EUROSIS GAMEON 2003

C. Thurau, Bielefeld University (Germany)
C. Bauckhage, Bielefeld University (Germany)
G. Sagerer, Bielefeld University (Germany)

Historically, NPC behavior is scripted or based on fuzzyfied finite state machines

With practice, players learn and the behavior is obsolete → bad experience

Proposal: learn NPC behavior from human players

SOM used for complexity reduction; each cluster feeds two MLP networks, for player viewangle and player velocity adjustment

All network pairs represent the same behavior, but specialize in different parts of the state space

Results were arbitrarily judged and the researchers concluded that the bot had good in-game performance considering the quality of the training data

PLAYER MODELING USING SELF-ORGANIZATION IN TOMB RAIDER: UNDERWORLD

IEEE - Computational Intelligence and Games (CIG 2009)

Anders Drachen, IT University of Copenhagen
Alessandro Canossa, Denmark School of Design
Georgios N. Yannakakis, IT University of Copenhagen

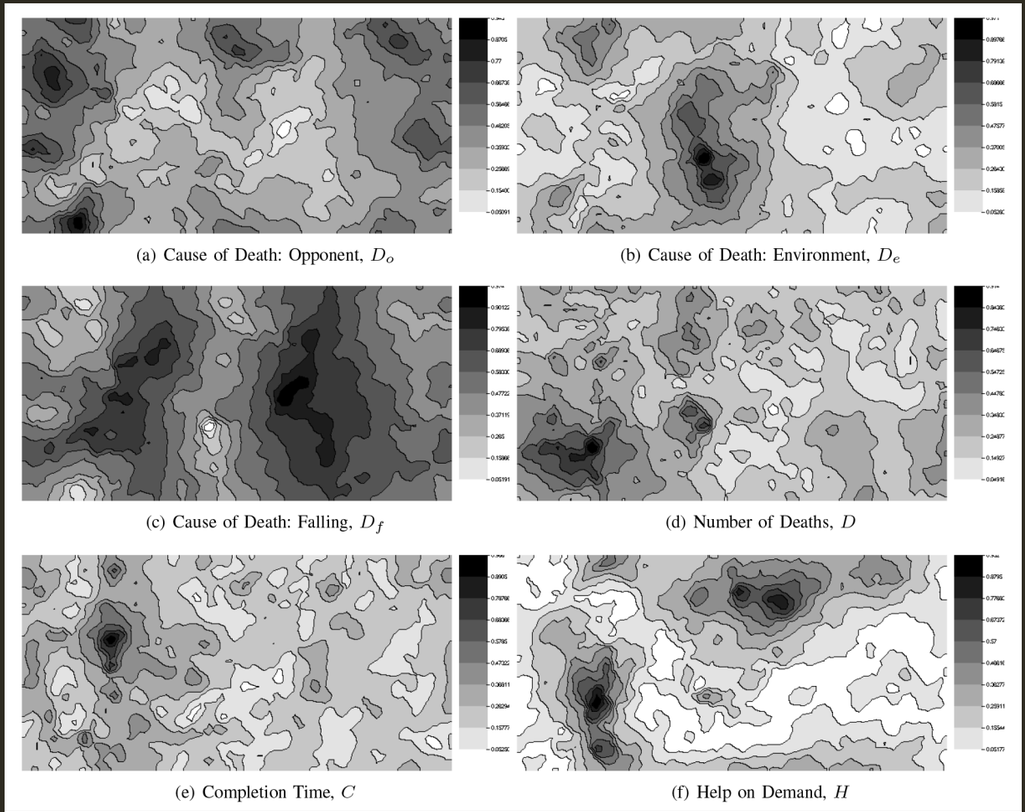
User-oriented testing is a key process in game development: are people playing the intended way? If not, is that good or bad?

1365 players' logs unobstrusively collected and analysed through six statistical features

Preliminar analysis via k-means and Ward's hierarchical clustering to better understand features

SOM identifies dissimilar playing behaviors

The six features can be represented as component planes



(a) Cause of Death: Opponent, D_o

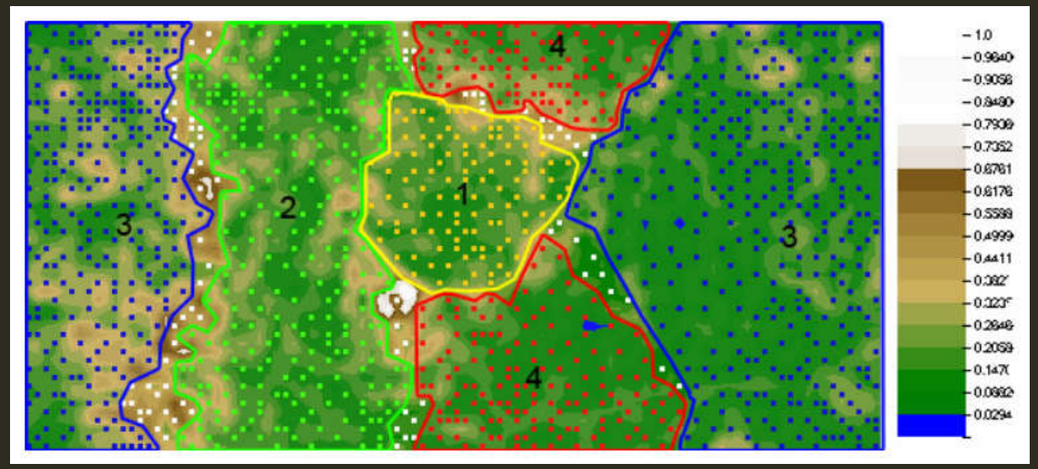
(b) Cause of Death: Environment, D_e

(c) Cause of Death: Falling, D_f

(d) Number of Deaths, D

(e) Completion Time, C

(f) Help on Demand, H



1. Veterans: fast, have few help requests and die few times, mainly by environment
2. Solvers: slow-paced, have few help requests and die more by falling
3. Pacifists: fairly fast, have average help requests and die more by enemies
4. Runners: fast, have varying help requests and die often by enemies and environment

CLUSTERIZATION OF AN ONLINE GAME COMMUNITY THROUGH SELF-ORGANIZING MAPS AND AN EVOLVED FUZZY SYSTEM

Fourth International Conference on Natural Computation (ICNC 2008)

Lia C. Rodrigues, Mackenzie
Clodoaldo A. M. Lima, Mackenzie
Pedro P. B. de Oliveira, Mackenzie
Pollyana N. Mustaro, Mackenzie

MMORPGs: virtual society

Thousands of simultaneous players

Clusterization for social analysis

GA-designed fuzzy system to determine relevant inputs for clusterization

Fitness is a function of quantization error (resolution) and topographic error (preservation)

12 variables (about player, character, preferences and social networks)

Quality of the map: preservation is more important than resolution

USO DE REDES DE KOHONEN PARA IDENTIFICAÇÃO DE PERFIS DE JOGADORES NO WORLD OF WARCRAFT

SBC - Simpósio Brasileiro de Jogos e Entretenimento (SBGames 2009)

Lia C. R. Lopes, Instituto de Pesquisas em Tecnologia e Inovação

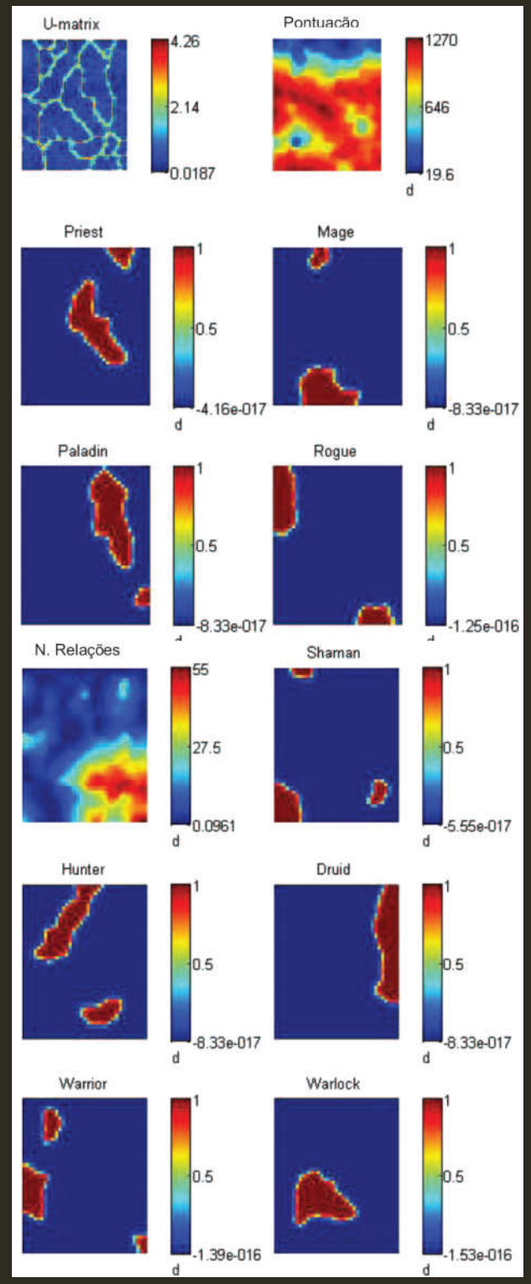
Pollyana N. Mustaro, Mackenzie

Online gaming: cooperative and competitive interactions

Endgame better represents classes, roles and interaction levels

17697 samples, reduced to 591 after guild filtering

Results are coherent with game knowledge



ANALYSIS OF PLAYERS' CONFIGURATIONS BY MEANS OF ARTIFICIAL NEURAL NETWORKS

International Journal of Performance Analysis in Sport, volume 7, number 3, October 2007 (QUALIS 2014 PhysEd A2/CompSci B4)

Jörg M. Jäger, Westfälische Wilhelms-Universität Münster

Jürgen Perl, Johannes Gutenberg Universität Mainz

Wolfgang I. Schöllhorn, Westfälische Wilhelms-Universität Münster

Tactical behavior: *what* the players do *when* and *where*

SOM can detect and group configurations

Configurations: *when* and *where* as a team

Time continuous data presents a challenge for training SOMs

DyCoN: adaptive learning rate and distance

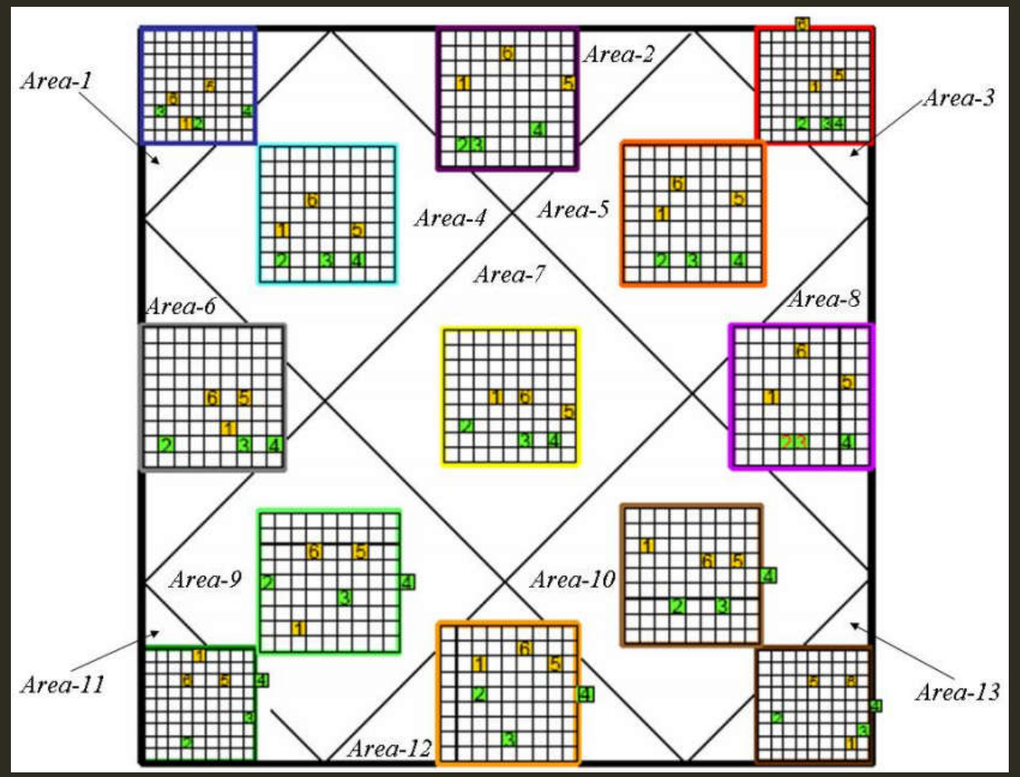
Initial proposal: detect trajectories of configurations

Data set: German female national team versus five opposing teams, during the Volleyball World Championship of 2002

Time series manually split into phases of rallies

Small data sets complemented by generated data (Monte Carlo) for training

Clusters represent different configurations



Trajectory classification was unsuccessful

Experiments focused on discrete configurations

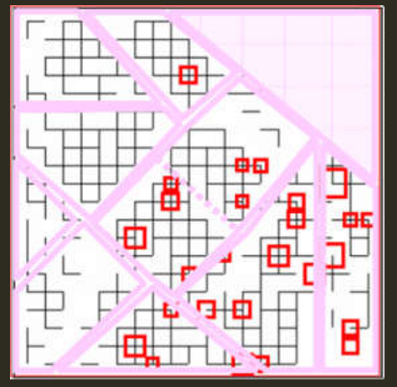
Tactical flexibility is a must for success

Championship finals: Germany vs. Italy

Italy won; experiment results show the Italian team was more flexible

German team presented less configurations more frequently

Italian team presented more configurations less frequently



TACTICAL PATTERN RECOGNITION IN SOCCER GAMES BY MEANS OF SPECIAL SELF-ORGANIZING MAPS

Human Movement Science, volume 31, issue 2, April 2012 (QUALIS 2014 PhysEd A1)

Andreas Grunz, German Sports University Cologne (Cognitive Sport Research)

Daniel Memmert, German Sports University Cologne (Cognitive Sport Research)

Jürgen Perl, University Mainz (Informatics)

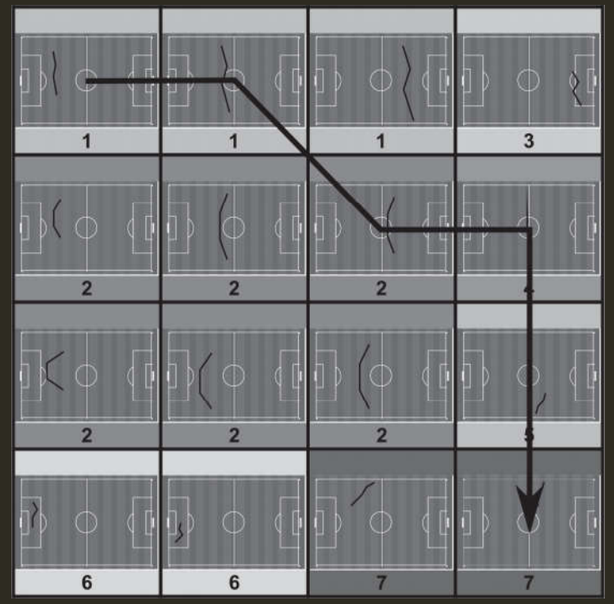
Tactical analysis is possible with high-level telemetry, but complex

Fuzzy systems have been successfully used, but neural networks should present better results in general

Dynamic data sets are a problem → DyCoN

Neurons map constellations of data

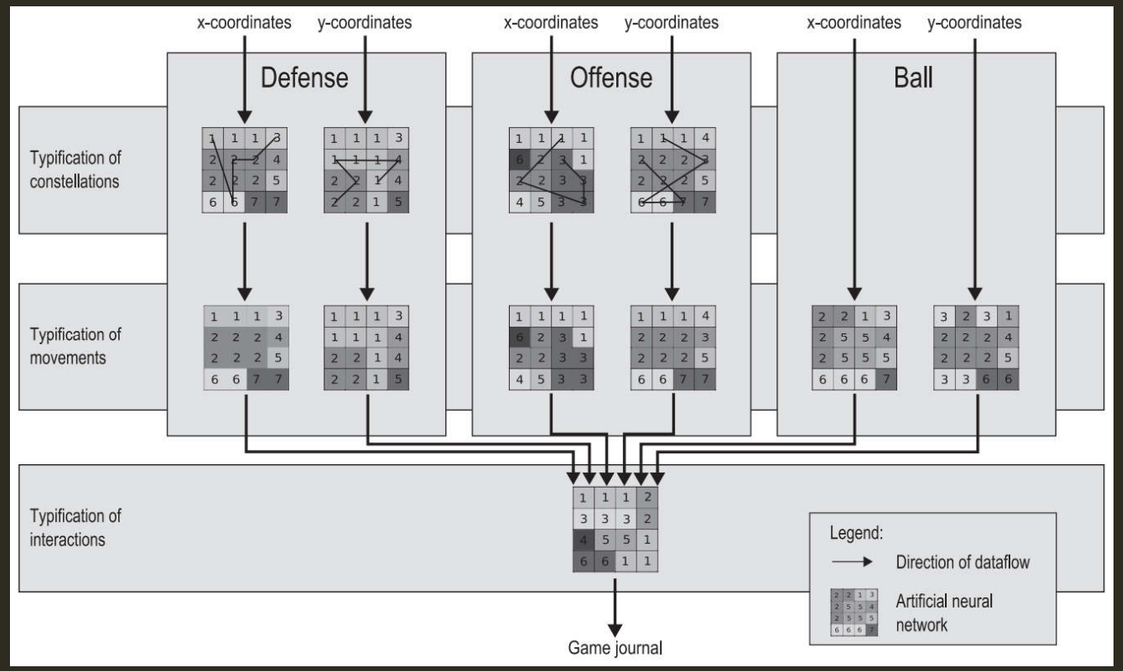
Time series is transformed into a constellation vector



Each sample is split in x-constellation and y-constellation to better retain information

Investigation restricted to game initiations (defense winning the ball to losing the ball)

Defense and offense time series are fed into hierarchical architecture



Manually categorized data is used to automatically classify neurons in third layer

World Cup 2006 finals: 6613 data sets (one per second); 84% of game initiations detected

CONCLUDING REMARKS

Clustering techniques and neural networks can be used in game contexts to facilitate behavior analysis

Tactical analyses in sports are commonplace, but have grown too complex

Game developers and researchers are too estranged

Academy and industry could benefit from cooperations