



AUTONOMOS:

A Distributed and Self-Regulating Approach for Organizing a Large System of Mobile Objects



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Overview



Motivation



Realization of Hovering Data Clouds (HDCs)



Developing Tools and Methods



Outlook



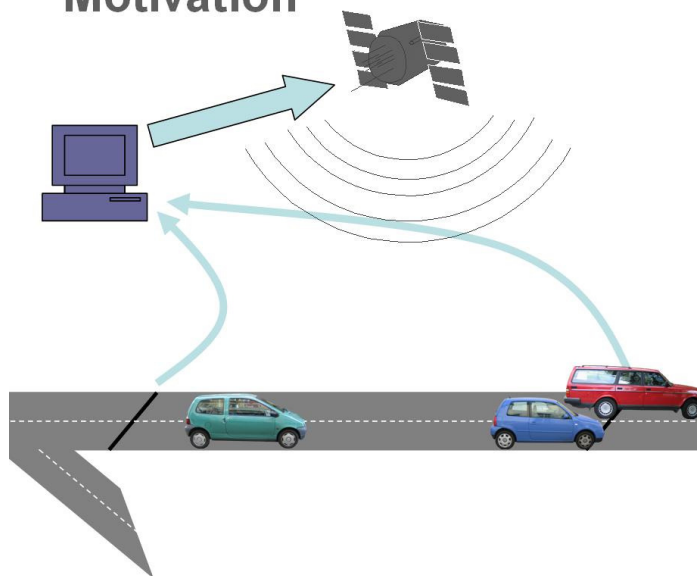
Cooperation



Motivation



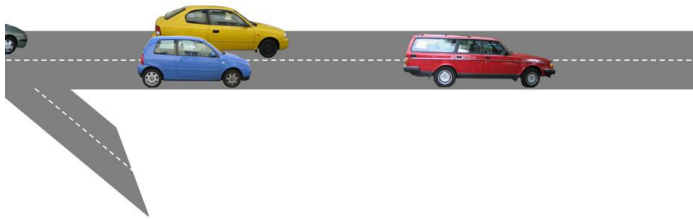
Motivation



- Traffic affects a large number of people
- It features various organic properties
- Previous traffic monitoring
 - Centralized system structure
 - Stationary detectors
 - Central unit for situation analysis
 - Broadcast via radio



Motivation

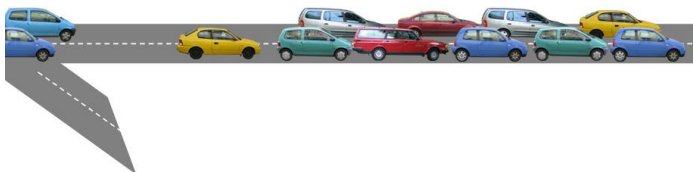


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- Previous traffic monitoring
 - Ad-Hoc Networks
 - Distributed Algorithms



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Motivation

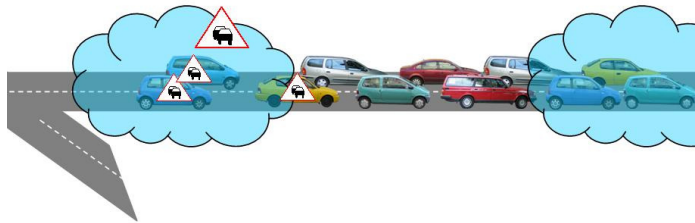


- Basic scenario:
Traffic jam
- Recognition of its
 - formation
 - front and back
 - type
- Transmit corresponding data to other road users
- For that purpose:
Hovering Data Clouds (HDCs)



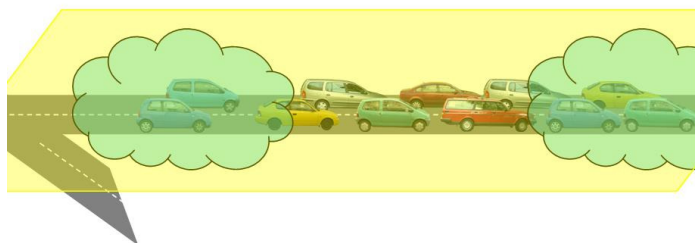
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Motivation



- Hovering Data Clouds:
 - Form as a result of a certain event
 - Hosted by and independent of the individual vehicles
 - Migrate from host to host

Motivation

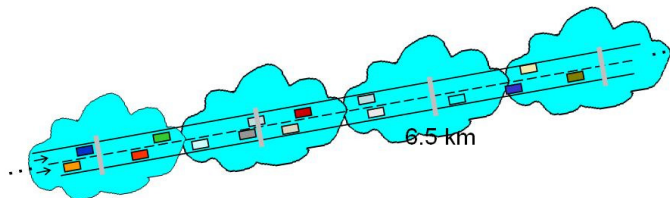


- Hovering Data Clouds:
 - Form as a result of a certain event
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 - Migrate from host to host
- Organic Information Complexes (OIC)



Realization of Hovering Data Clouds (HDCs)

Realization of HDCs

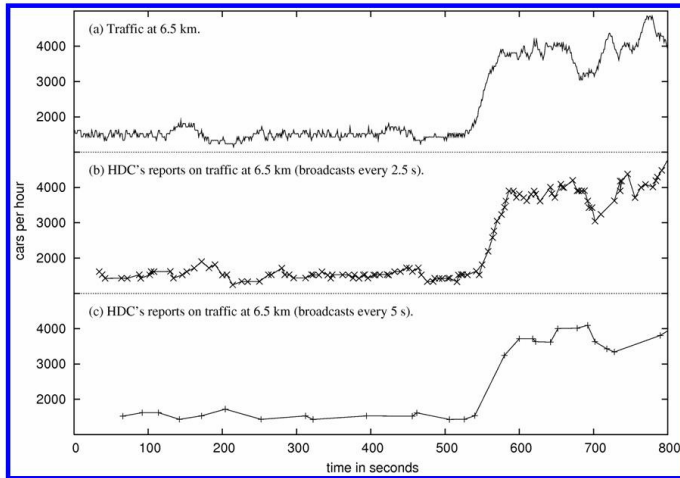


Stationary HDCs

- Not induced by an event
- Tied to a certain place
- Example:
Measure vehicle density
- Interested in:
 - Accuracy
 - Latency
 - Network load



Realization of HDCs

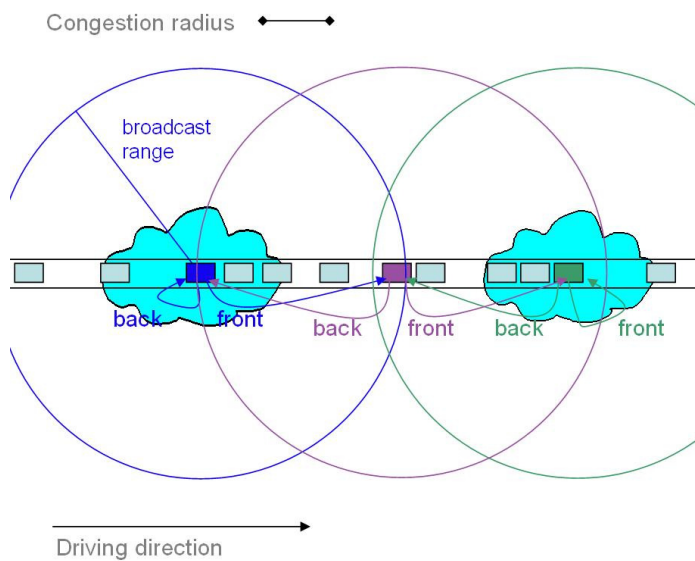


Stationary HDCs

- Not induced by an event
- Tied to a certain place
- Example:
 - Measure vehicle density
- Interested in:
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- Feasibility of HDC concept



Realization of HDCs

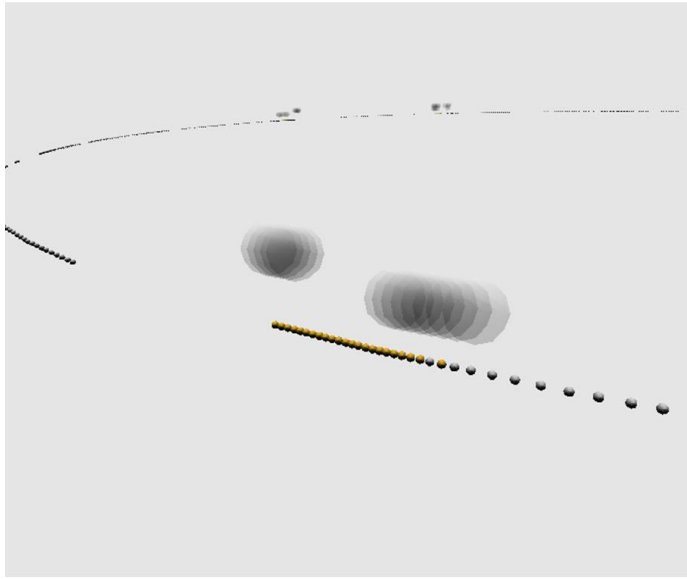


Mobile HDCs

- No pre-planned position
- Induced by an event
- Example:
 - Traffic jam recognition
 - Single-lane road



Realization of HDCs



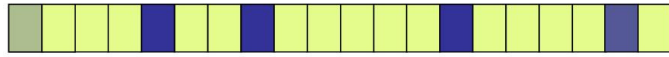
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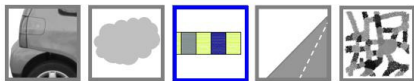


Developing Tools and Methods

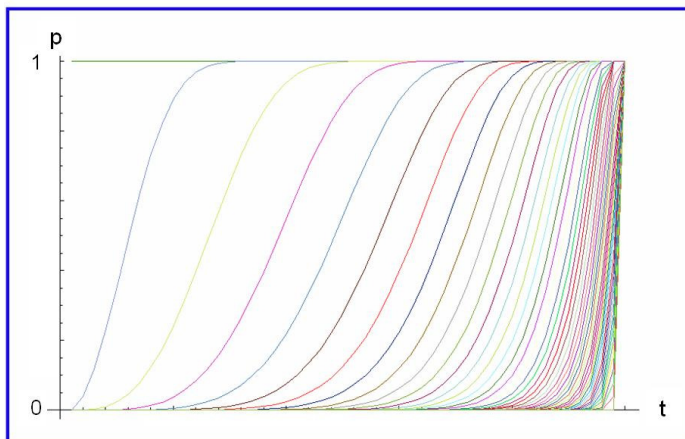
Connected Components



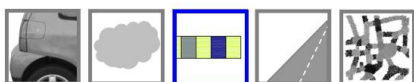
- Another approach for pattern recognition
- Connected components are the maximal connected subgraphs of a graph
- Cell model



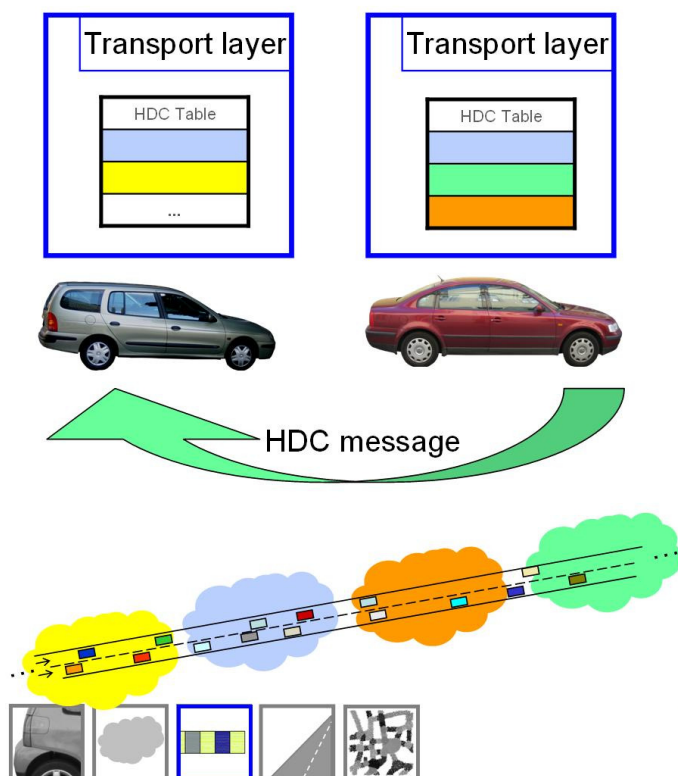
Connected Components



- Another approach for pattern recognition
- Connected components are the maximal connected subgraphs of a graph
- Cell model
- Adjacent nodes determine an edge
- Relation to random graphs
- Connected components are likely to arise at a certain time



Transport mechanism for Hovering Data Clouds



- General-purpose transport layer
- Many-to-many-communication in Mobile Ad-Hoc Networks
- Everybody is allowed to produce data
- Data forwarding in gossip style
- Priorities control extension of HDC and latency

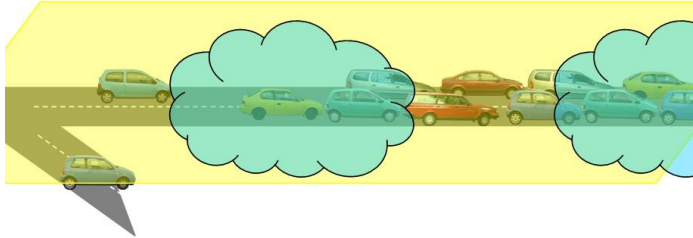
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 Outlook

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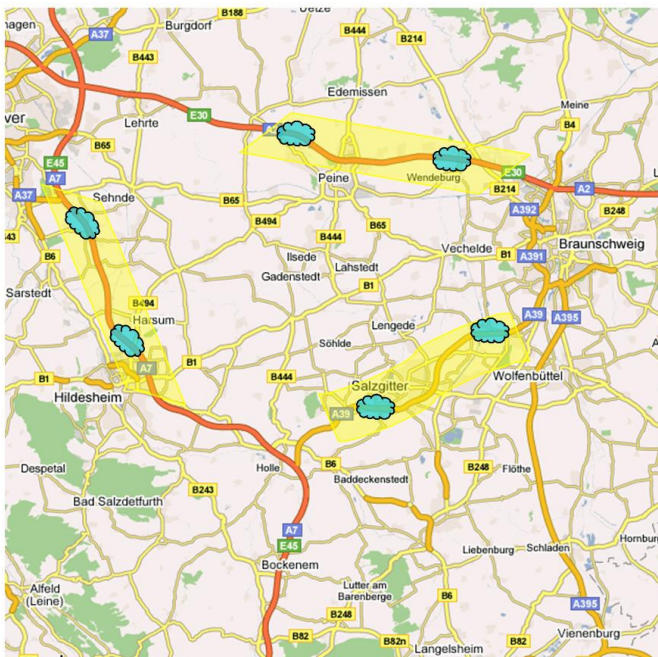
Outlook



- Further scenarios:
 - Convoy
 - Obstacles
 - Fast-lane jam, etc.
- Organic Information Complexes (OICs)
- Adaptable Distributed Strategies (ADSs)



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Cooperation with other projects

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Cooperation with other projects

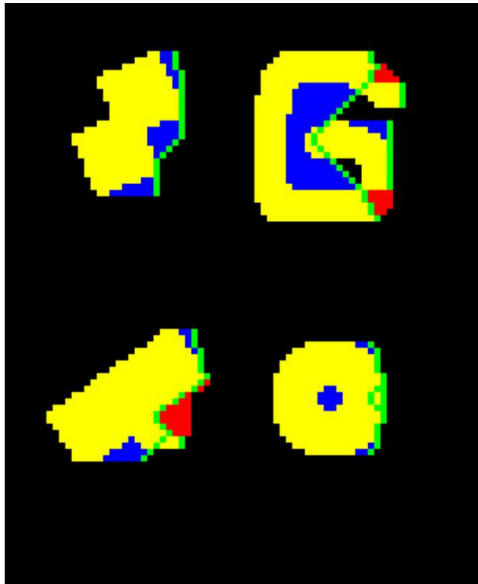


- Related Project:
Organic Traffic Control,
Professor Dr. Christian
Müller-Schloer,
Hannover,
Professor Dr. Hartmut
Schmeck, Karlsruhe



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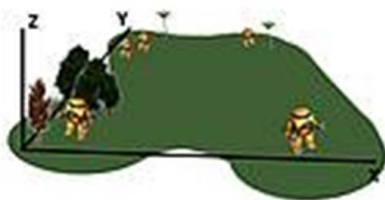
Cooperation with other projects



- Marching Pixels,
Professor Dr. Dietmar
Fey, University of Jena

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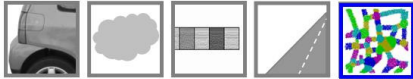
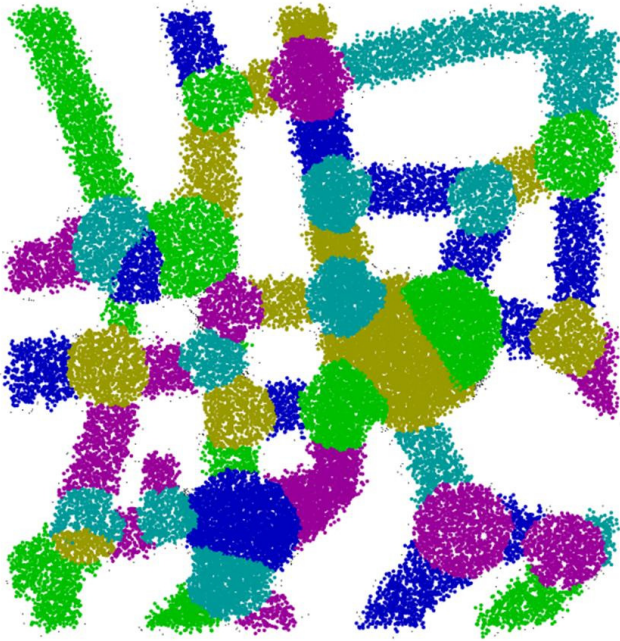
Cooperation with other projects



- Smart Teams: Local
Distributed Strategies
for Self-Organizing
Robotic Exploration
Teams,
Professor Dr. Friedhelm
Meyer auf der Heide,
Paderborn,
Professor Dr. Christian
Schindelhauer, Freiburg

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Cooperation with other projects



- SwarmNet,
Sándor Fekete and
Stefan Fischer
 - Sensor networks
 - Organic



Thank you.

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