TALKATIVE AGENTS
FOR AUTOMATED GENERALISATION OF RURAL AREAS

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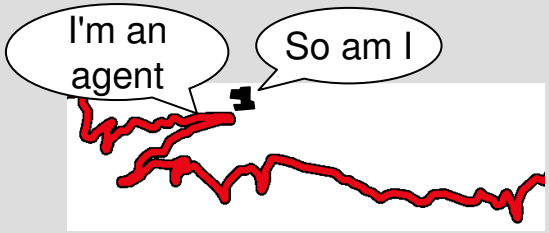
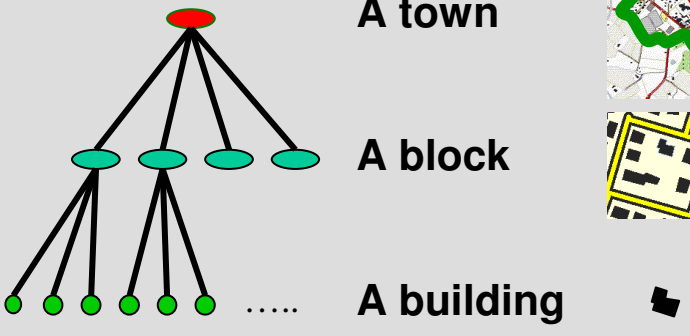
CONTEXT - AGENT PROJECT principles

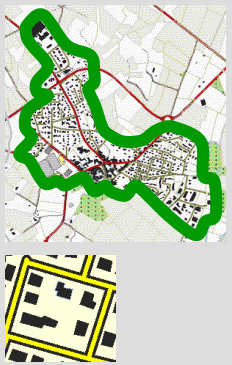
- Geographic objects ⟶ Geo. agents | goal, autonomy of action



⇒ generalisation: constraint driven
local/conflict analysis
step by step

- Hierarchical multi-level model



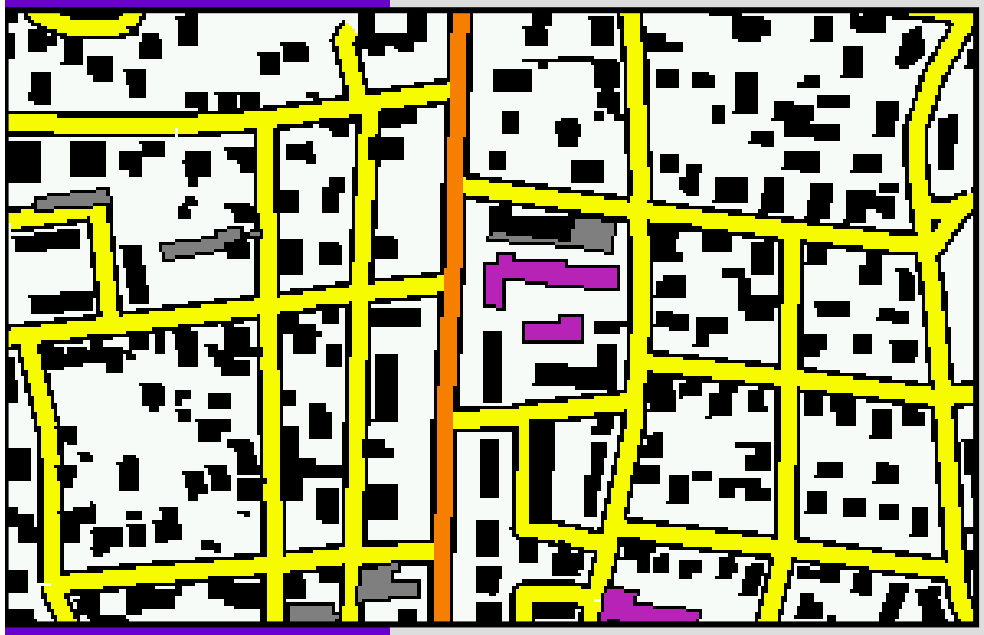


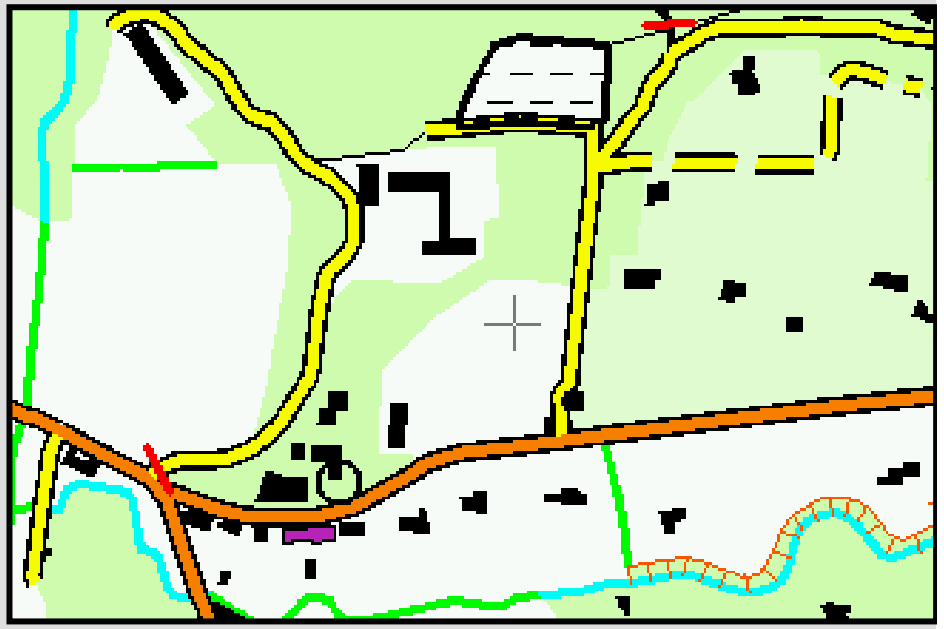
Levels initially not present in the database

MESO AGENTS (GROUPS) DO ORCHESTRATE THE GENERALISATION OF THEIR COMPONENTS

Limits of the AGENT model

- Good results on urban spaces
- Multi-level hierarchical model not adapted for rural spaces



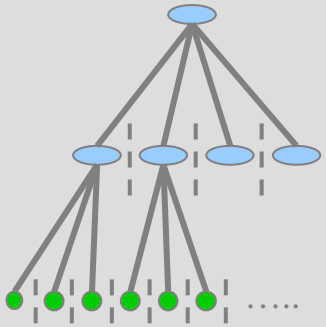


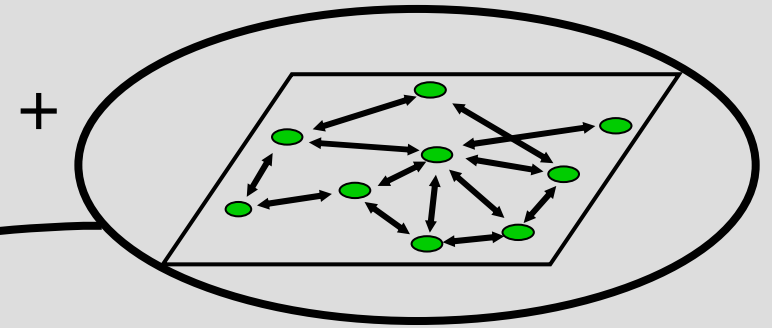
Objective

AGENT

OBJECTIVE

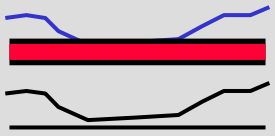
flexibility / efficacy



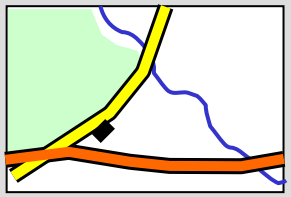


To ensure the respect of explicited **relational constraints**

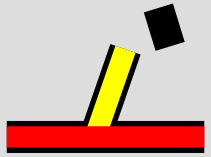
- Non-overlap of symbols



- Maintaining/exaggerating relationships



Topological relationships



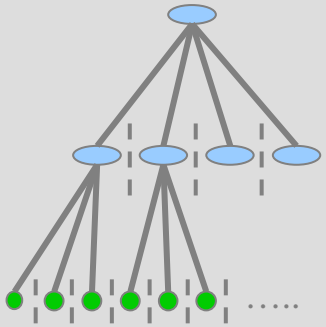
Relative positions

Problematic

AGENT

OBJECTIVE

flexibility / efficacy
complexity



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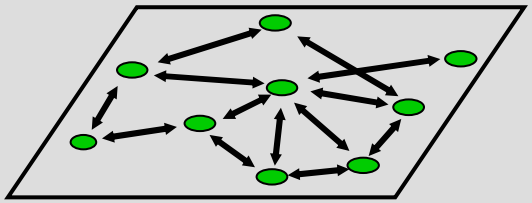


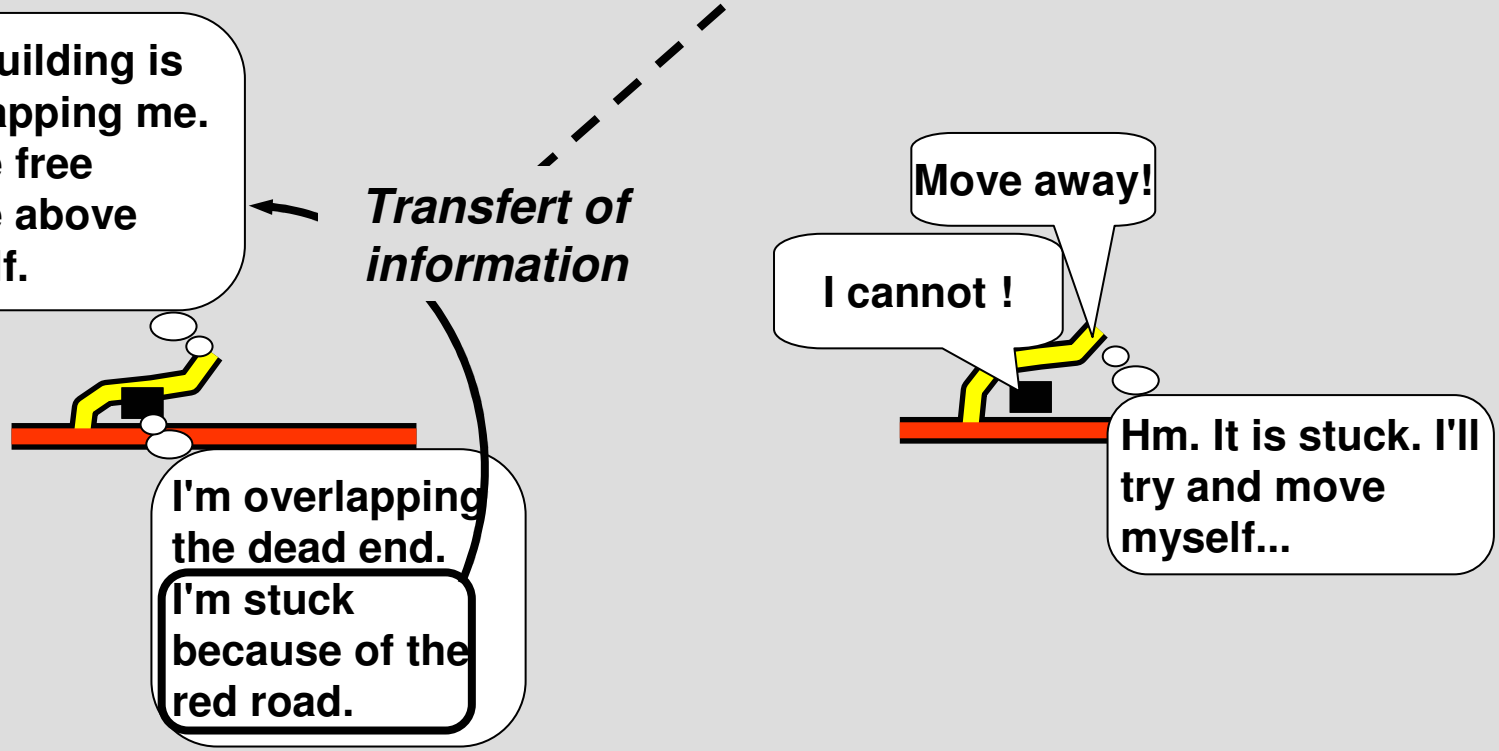
Relational constraints ⇒ Dependencies between agents' actions

⇒ **How can the agents coordinate themselves?**

Approach: agents 'see' and communicate

Perception of the environment

Communication by sending messages



→ **Communication model**

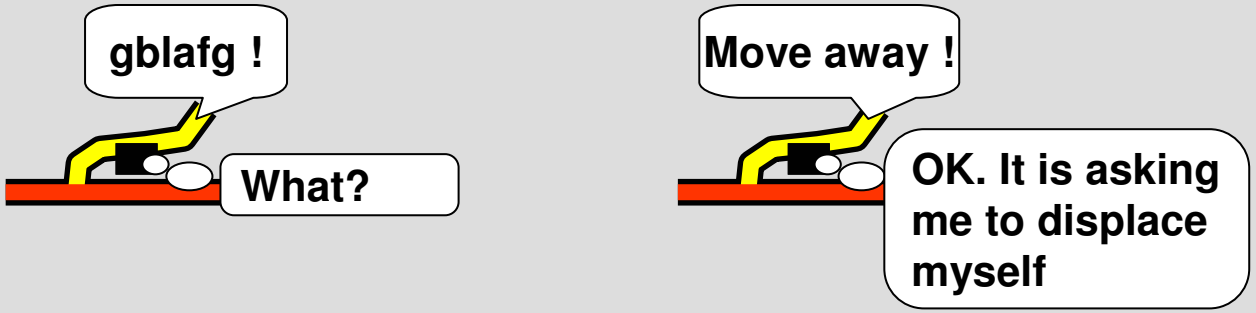
→ **Modelling the environment of an agent**

Communication model - Objectives

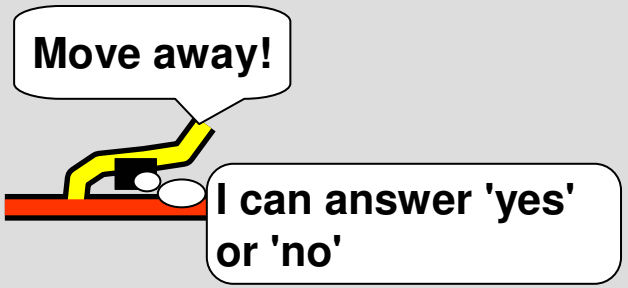
- Agents need to exchange information
- An agent needs to
  - begin with a task
  - **interrupt it's task** to send a message
  - send a message in a **language understood by the other one**
  - **interpret** any received message
  - **go on with its activity** depending on the received messages and tasks in progress
- Only 2-agents conversations considered (dialogs)

Key elements of a communication model

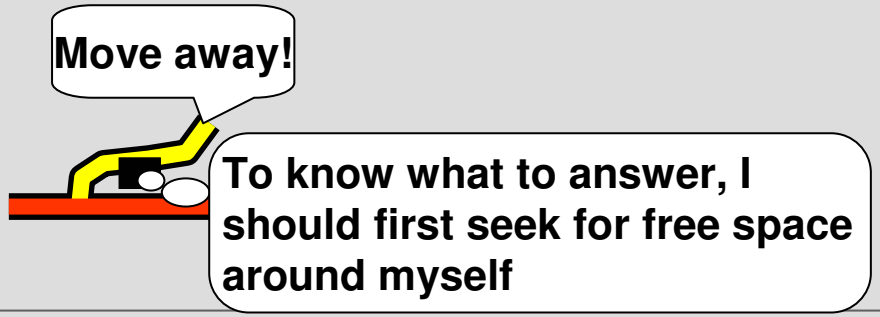
- A **common language**



- A common logic for **chaining messages**



- A logic for **acting in response to a received message**



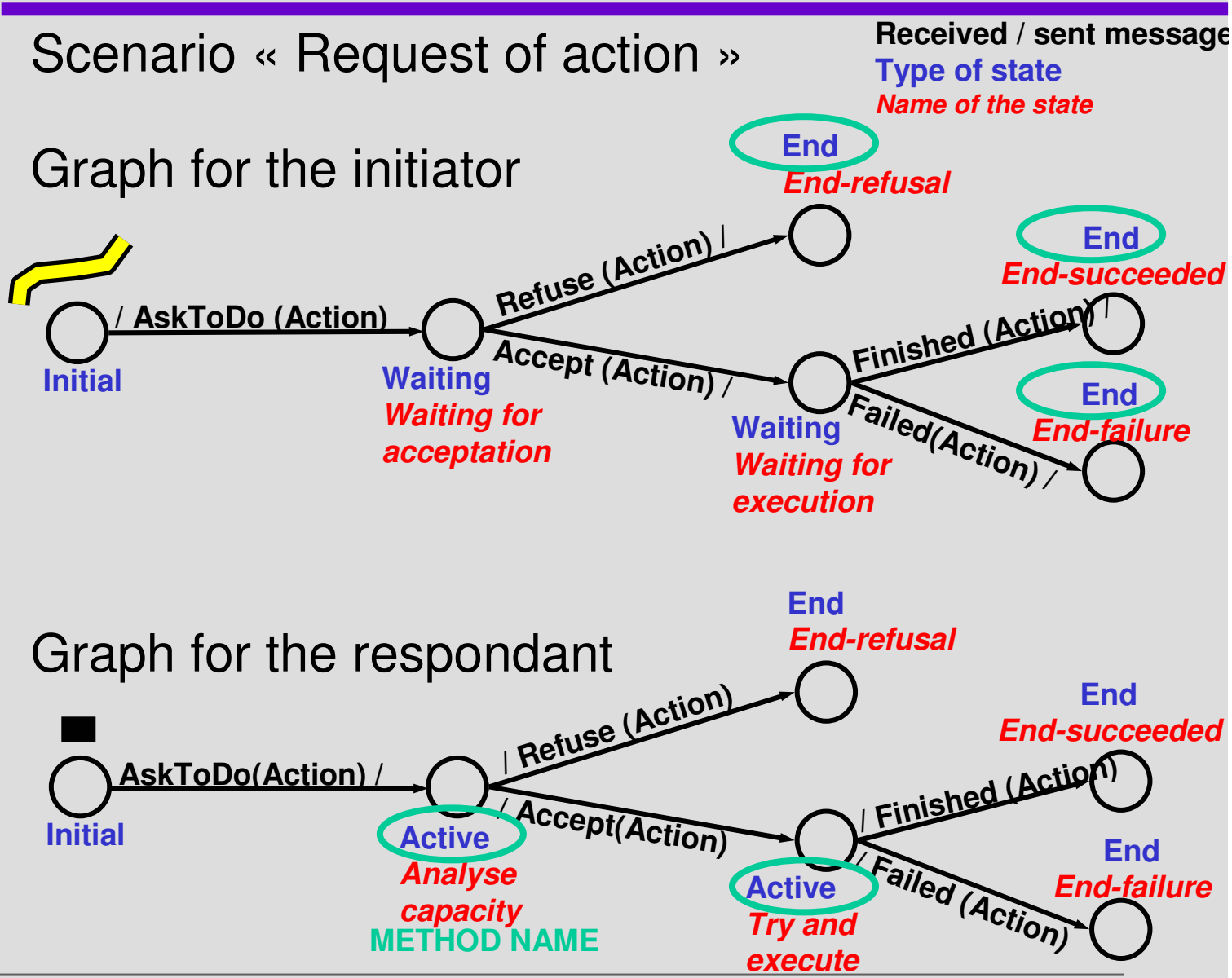
Communication language

- Messages structure: AskToDo(Move away) [Ferber 95]
- Speech Act Theory
  - An utterance = Performative + Argument

    Ask-to-do — Move away
    Deny
    Inform
    Accept
    etc.
- Interest :
  - Small number of performatives
  - Domain-dependant arguments
  - Conversation scenarios based on performatives only

Pre-established scenarios - example

Scenario « Request of action »



Proposed approach

- Principles
- Model for agents communication
- Modelling the spatial environment of an agent

Modelling the spatial environment of an agent

- Objective: each agent has a representation of its spatial environment
  - the agents with which it will possibly interact
  - the relational constraints with these agents

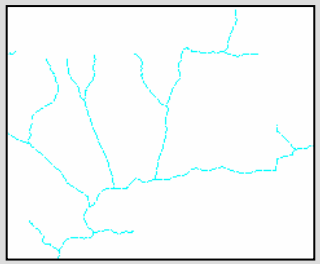
Differents kinds of geographical objects

"Small compacts"

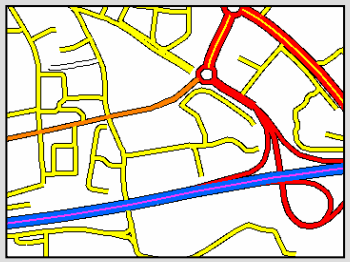
building

touristic symbol

"Network linears"



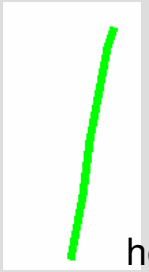
hydrographic segment



road segment

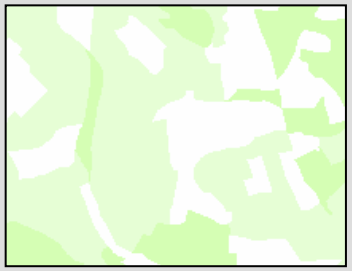
"Independent linears"

embankment



hedge

"Partition areas"



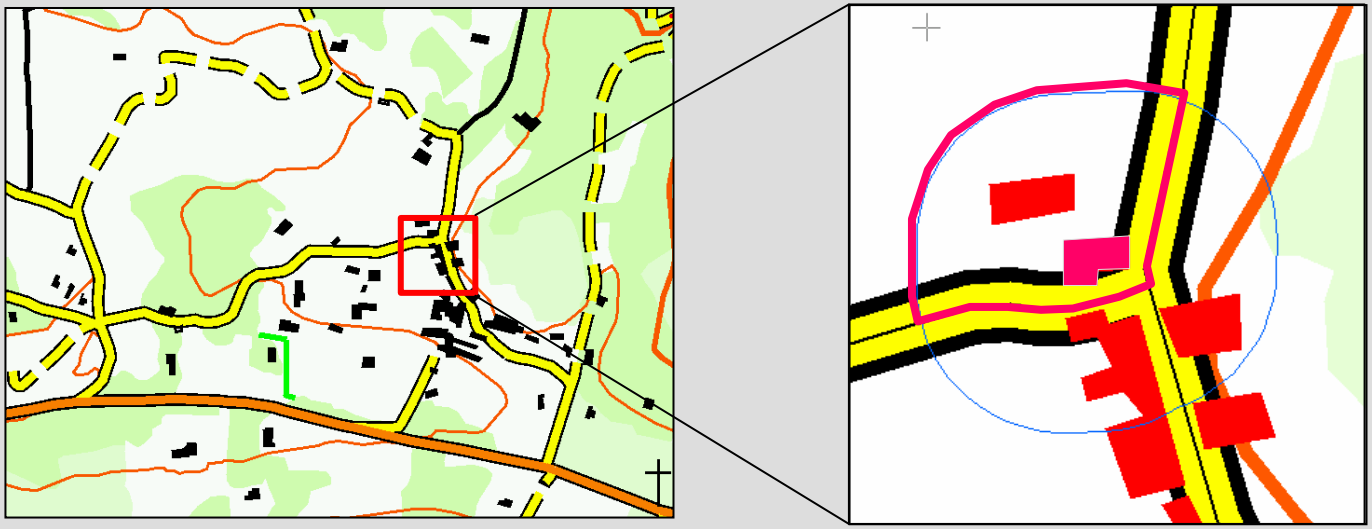
landuse

Search neighbours, then relationships

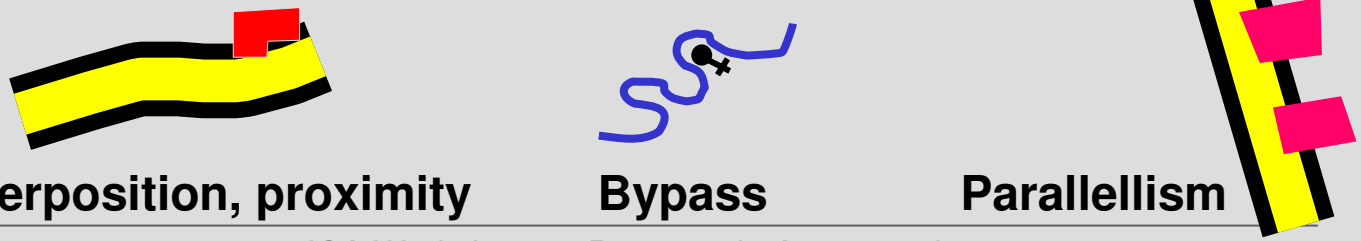
- "Neighbours" :

Agents with which a relational constraint might exist

=> *Environment zone* of an objet = buffer



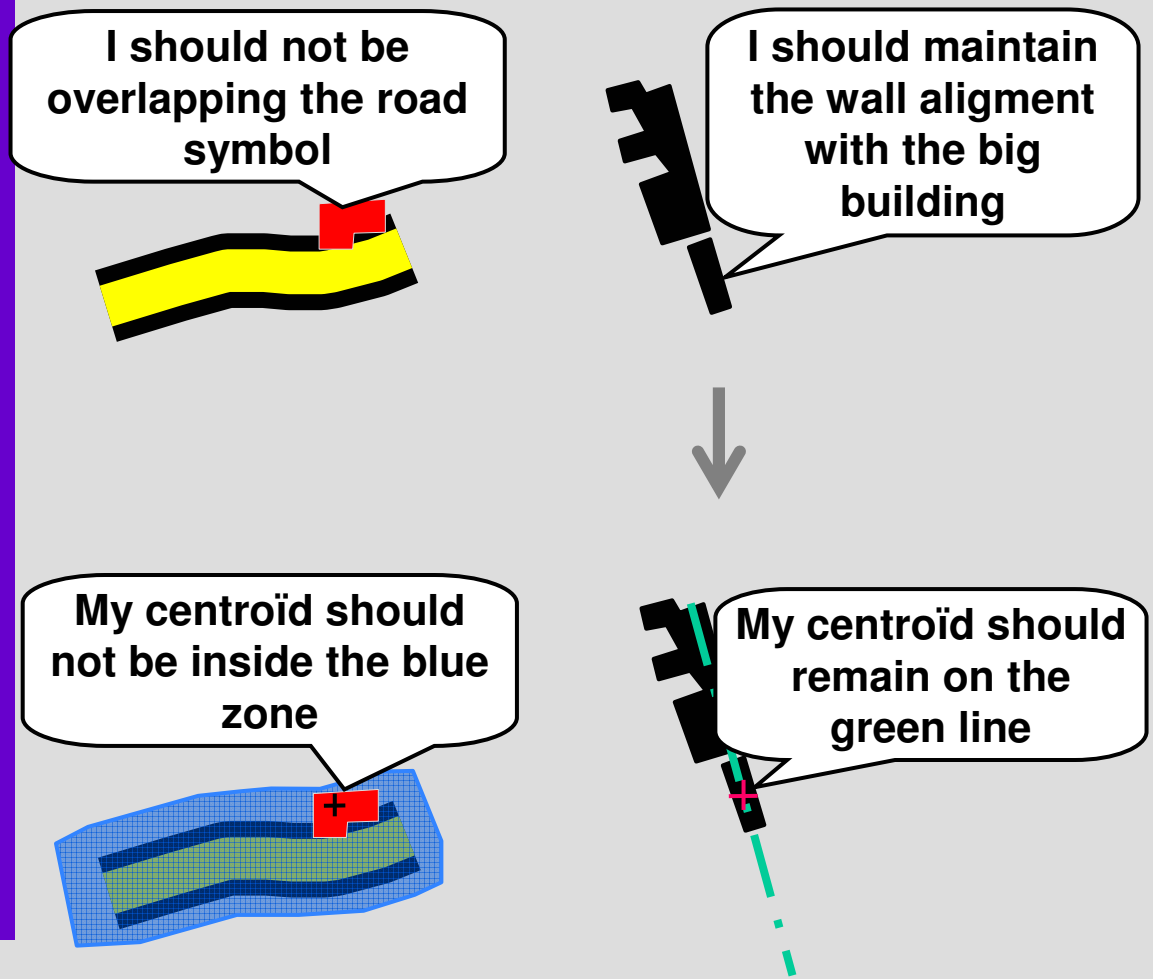
- Relational constraints with each neighbour



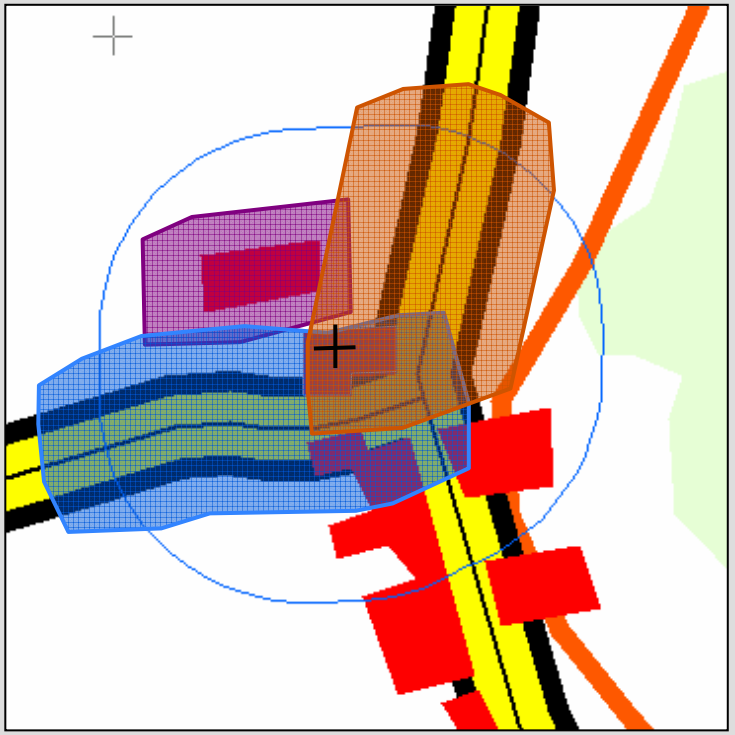
Superposition, proximity **Bypass** **Parallellism**

Relationships do constrain the space

For an object , relational constraint => contrained zone



Use of the "Constrained zones"



- Find a position that optimises the constraints satisfaction
- Know which constraints, shared with which agents, are not satisfied

Results

CONTEXT & OBJECTIVES

PROBLEMATIC

APPROACH

PRINCIPLES

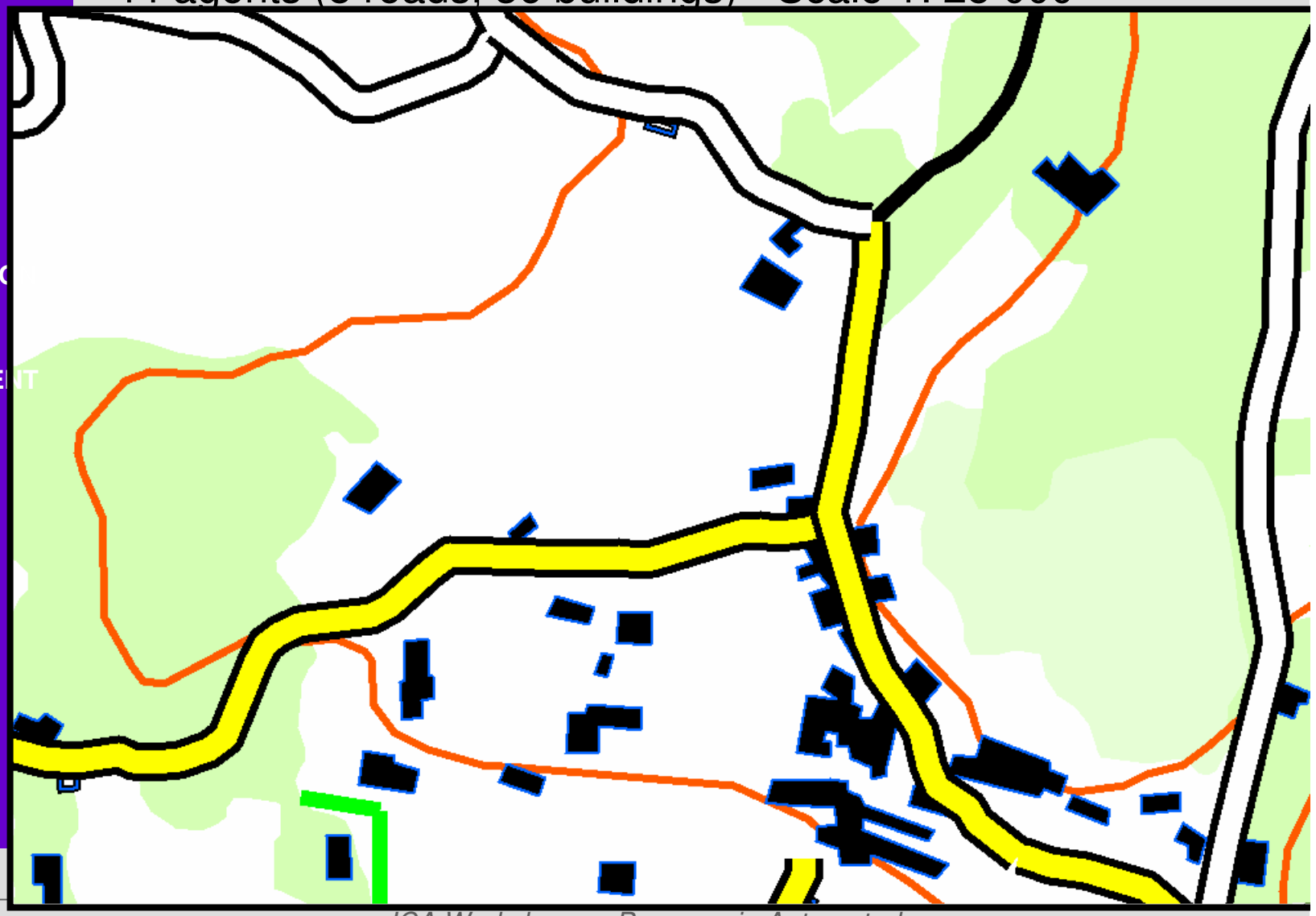
COMMUNICATIC

SPATIAL ENVIRONNEME

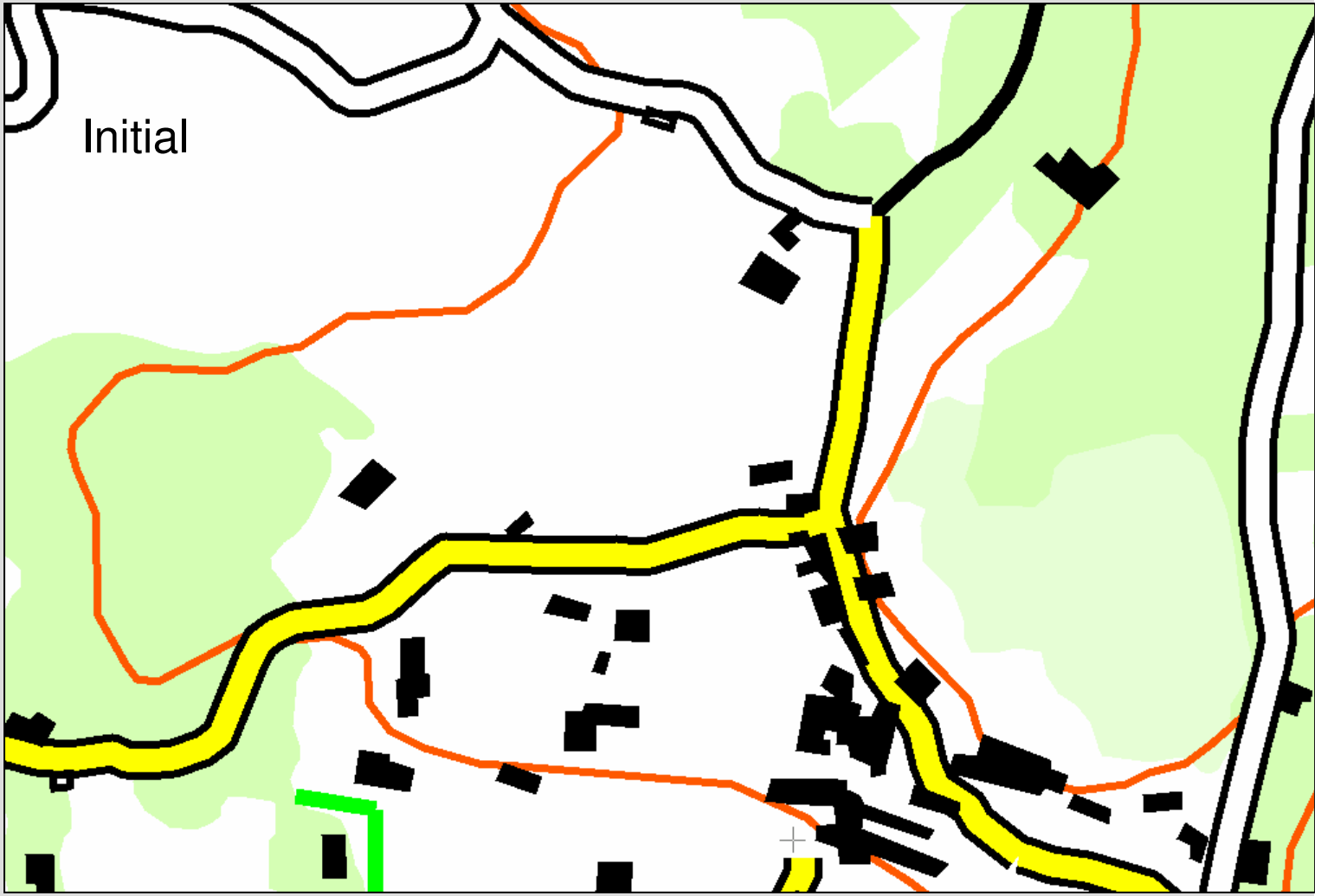
RESULTS

CONCLUSION

44 agents (8 roads, 36 buildings) - Scale 1: 25 000



Results (2) - scale 1:25 000



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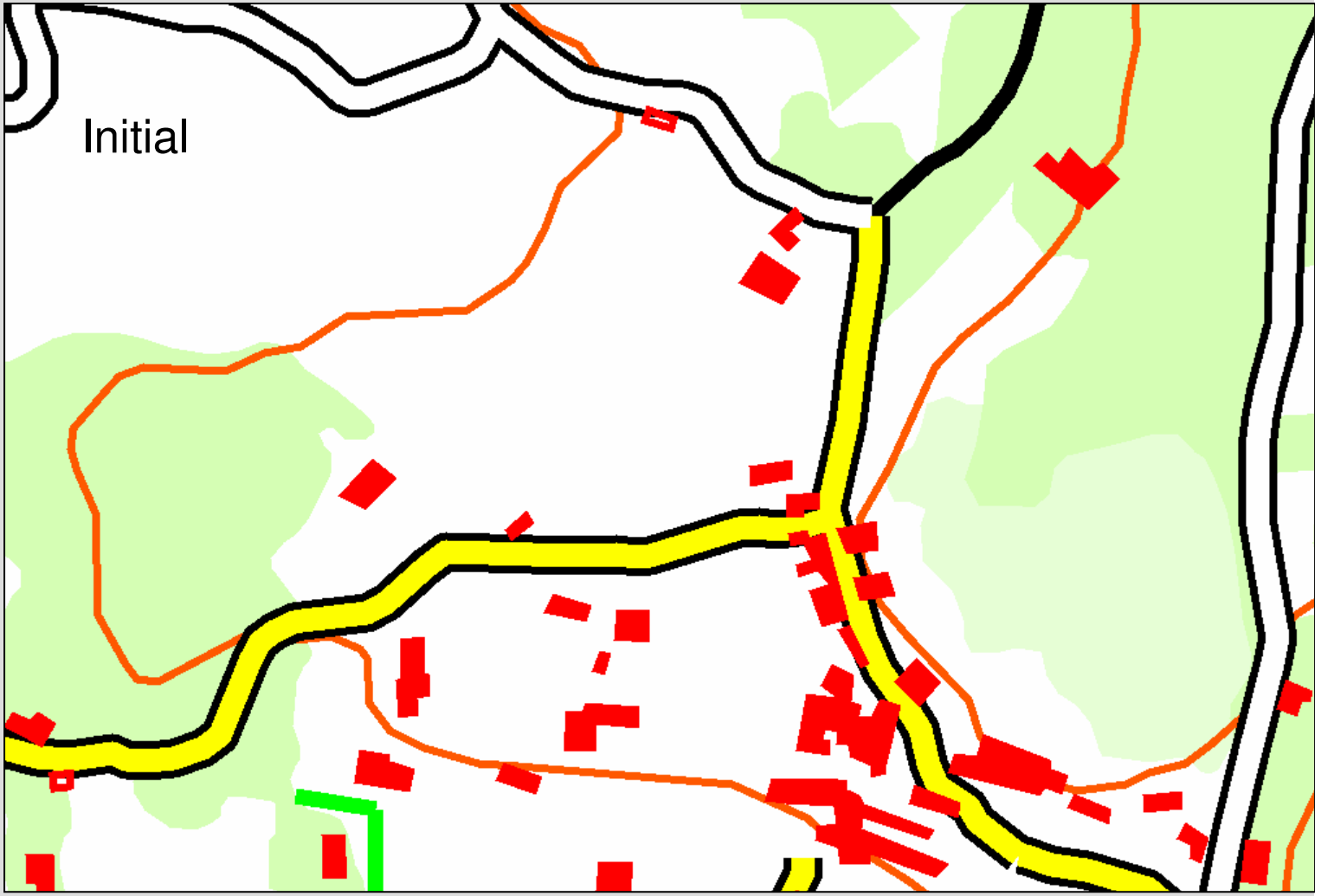

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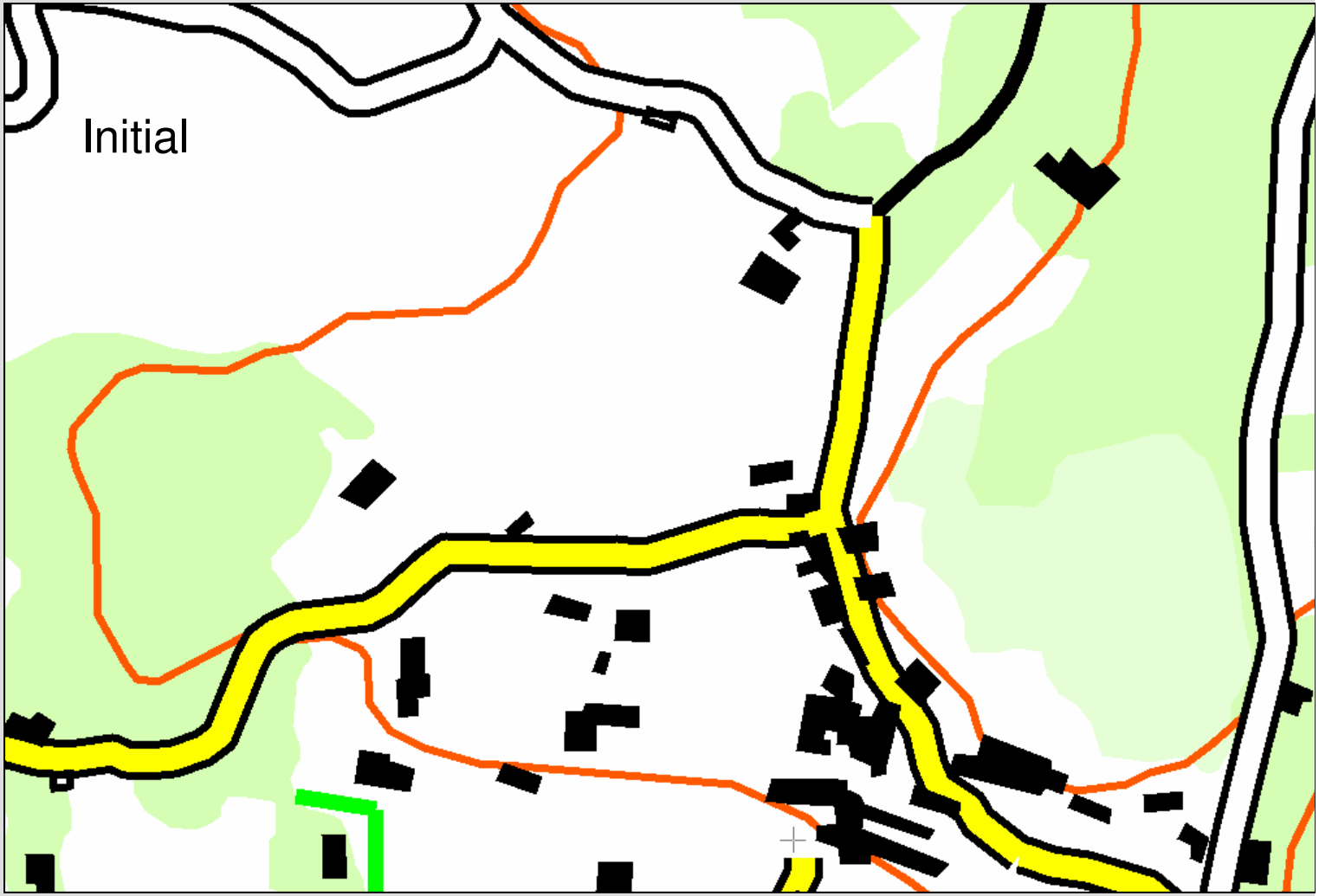

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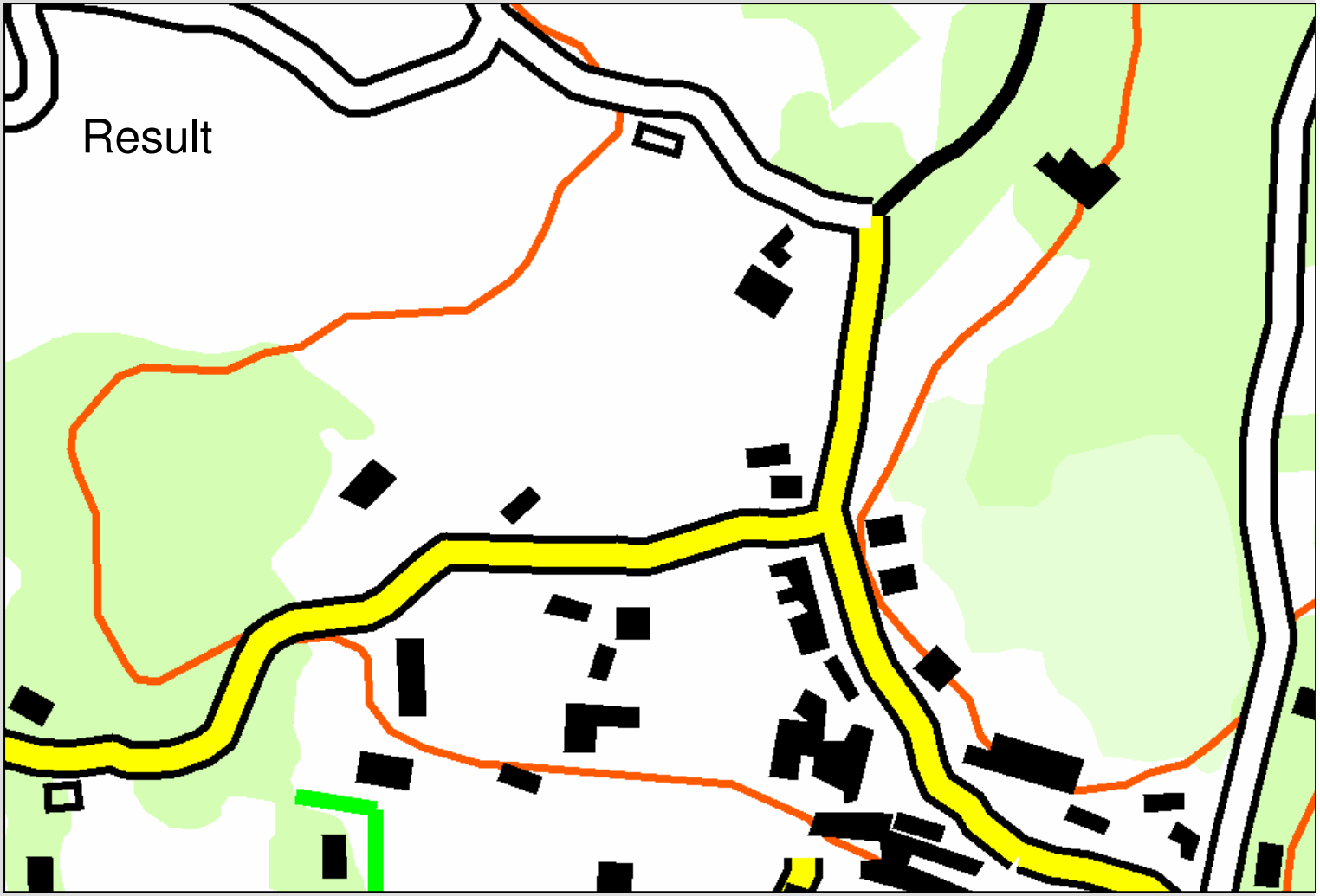

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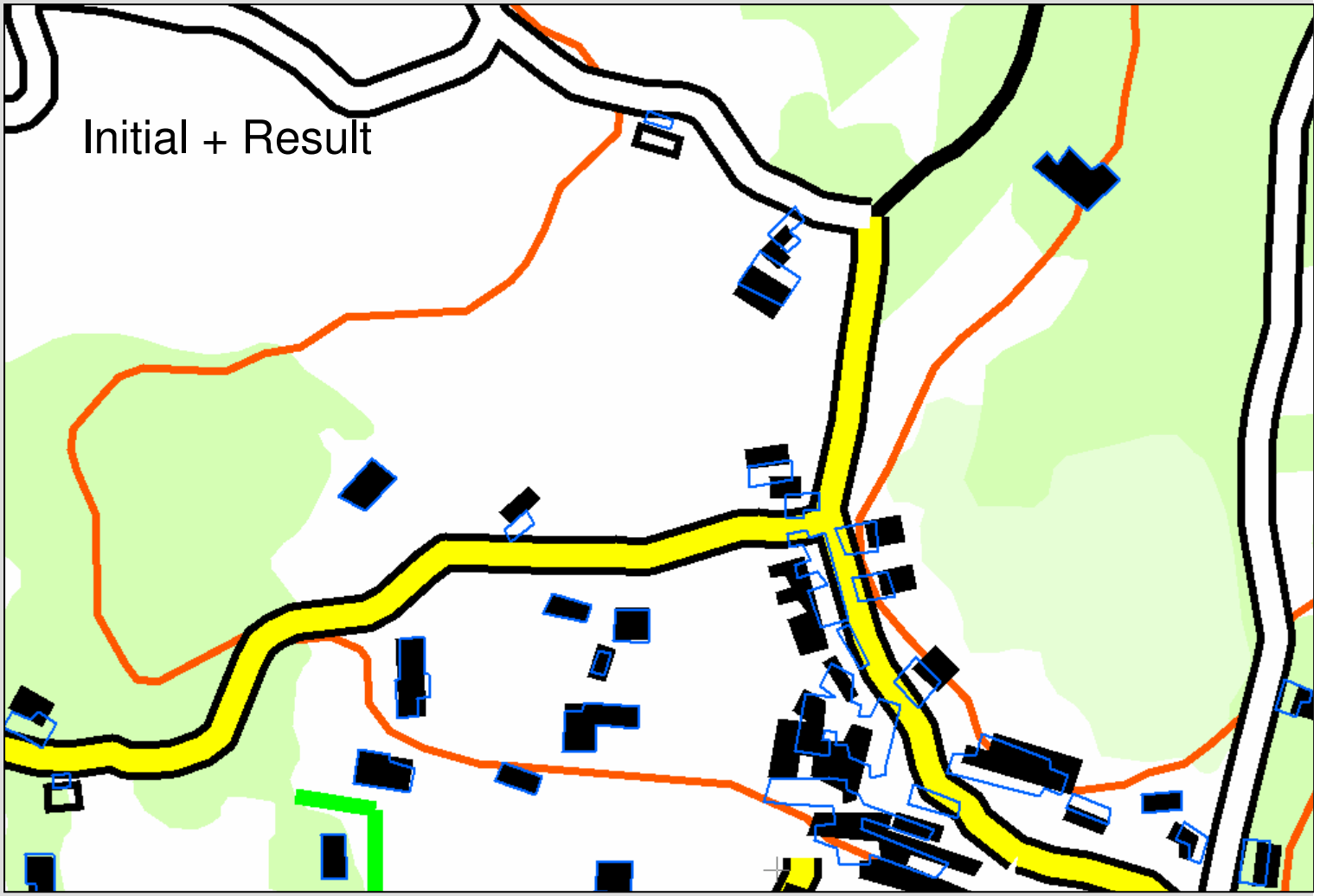
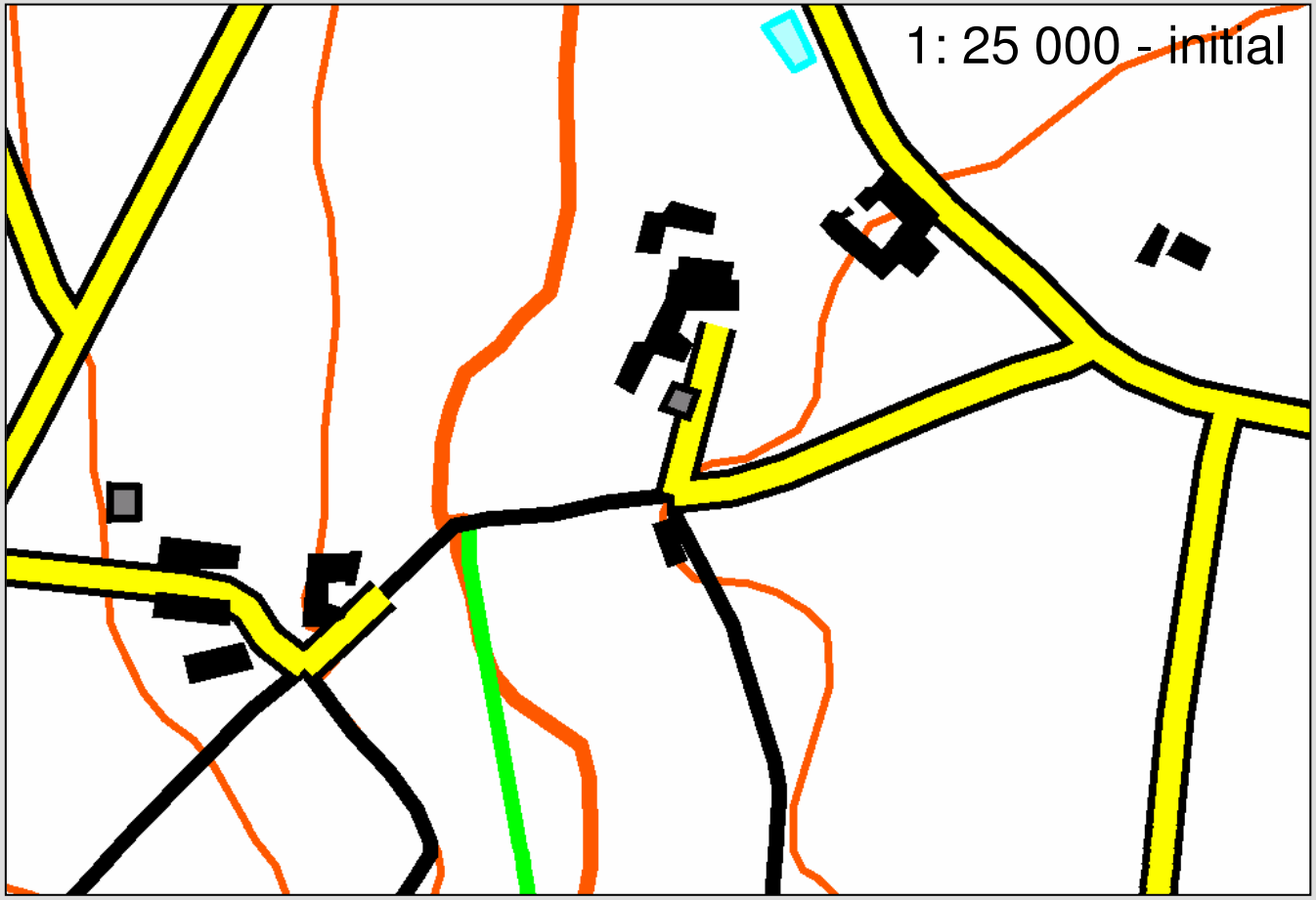


Other results

Simple situation



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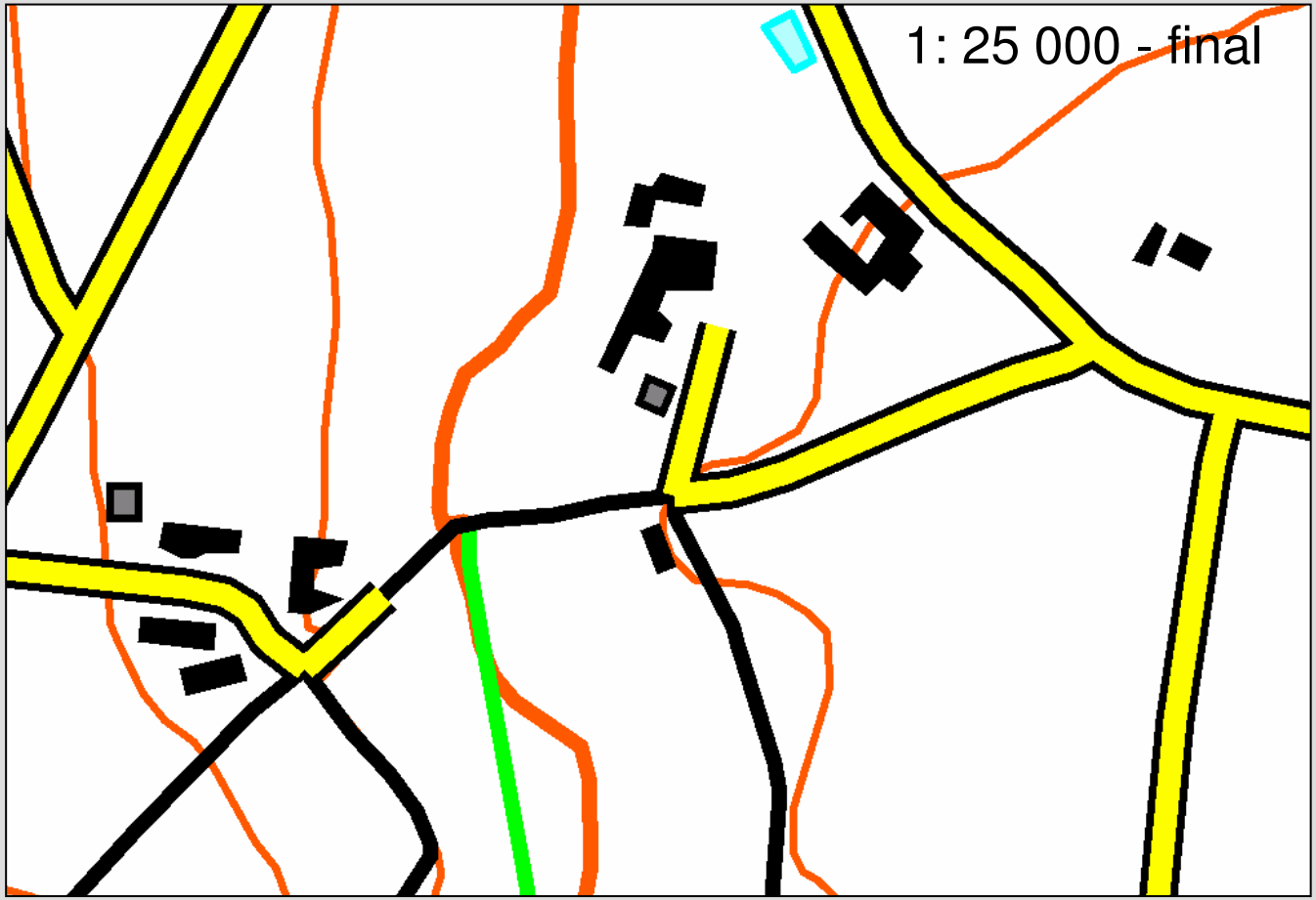

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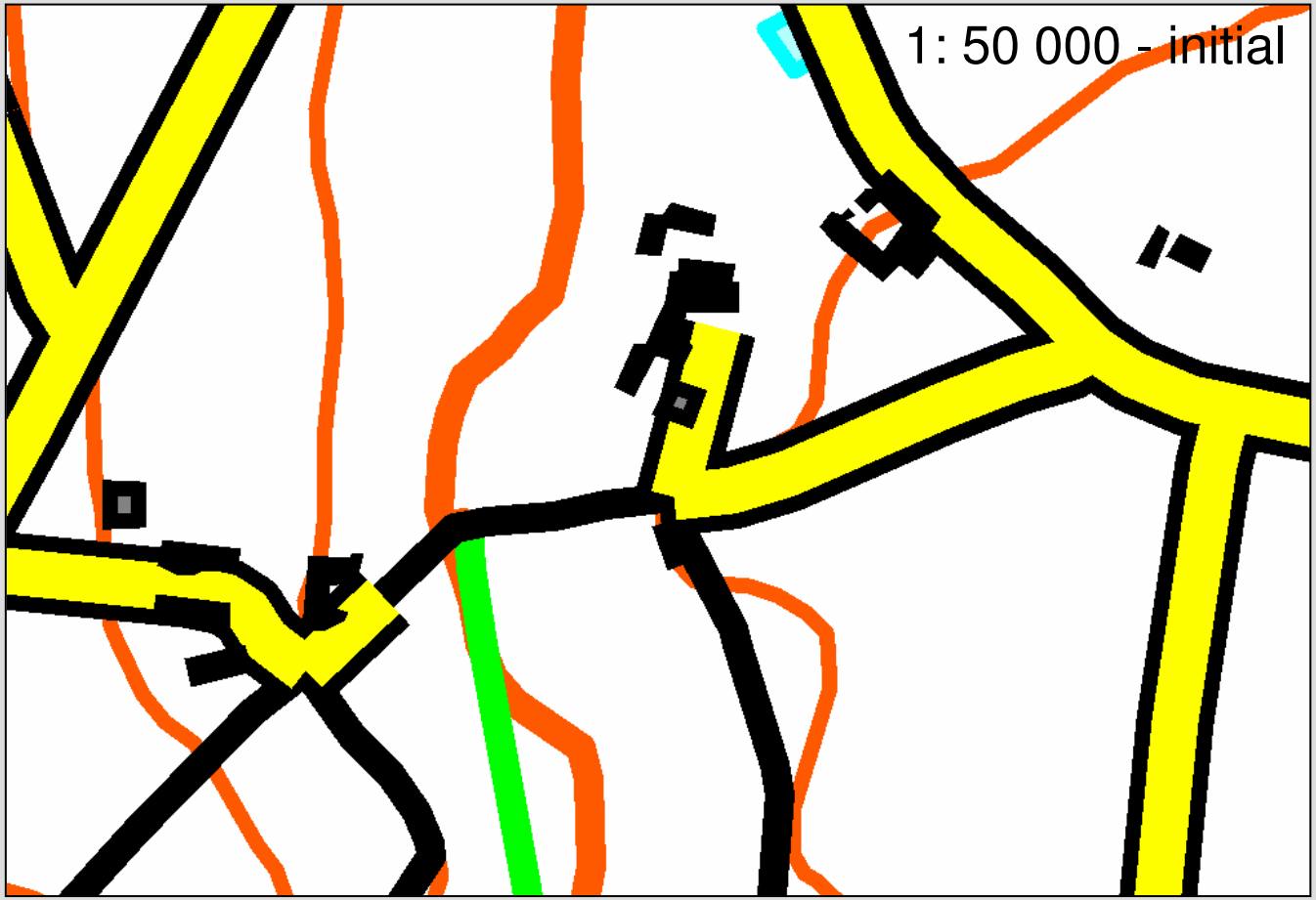

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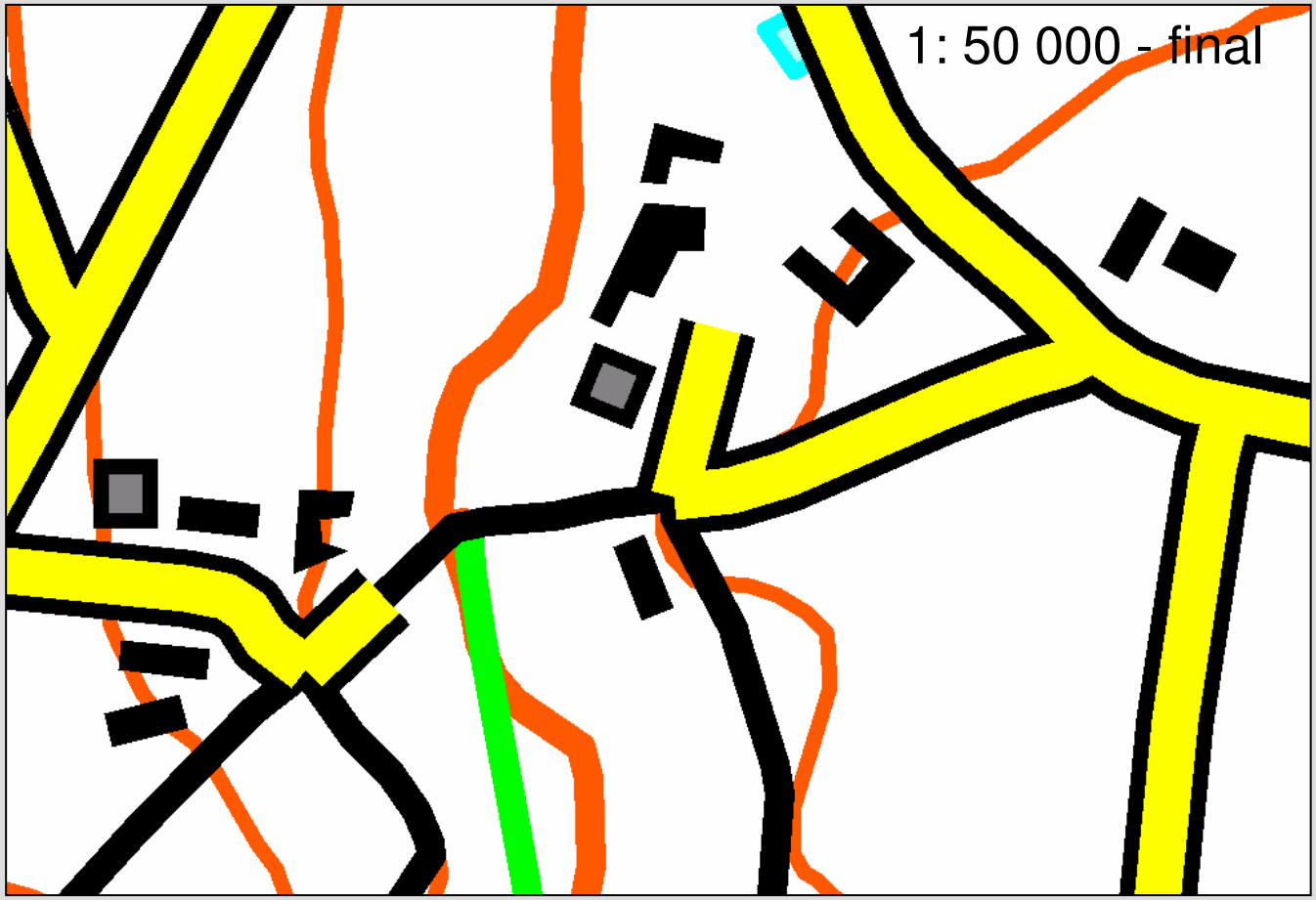
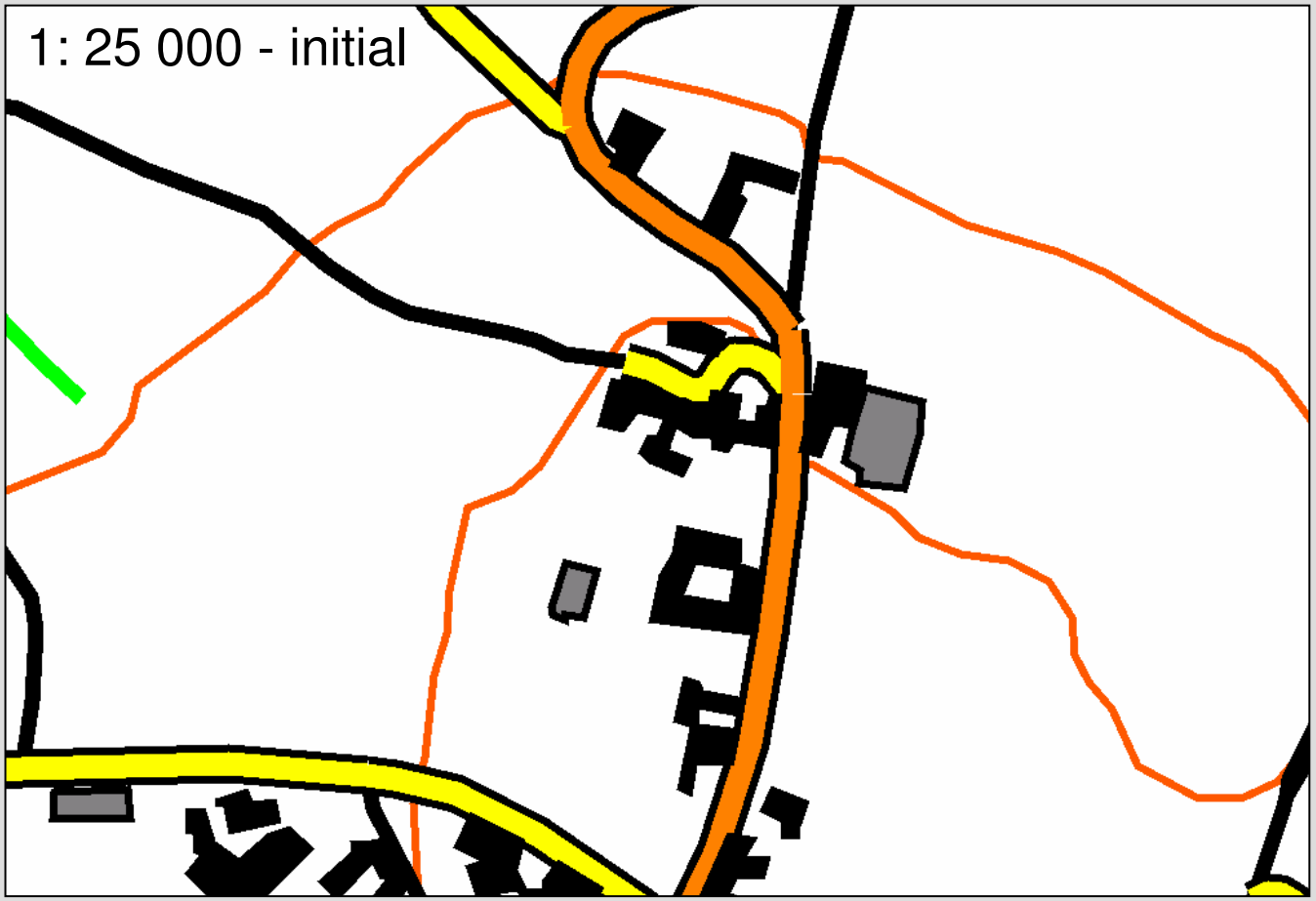


Other results

Situation of intermediate complexity



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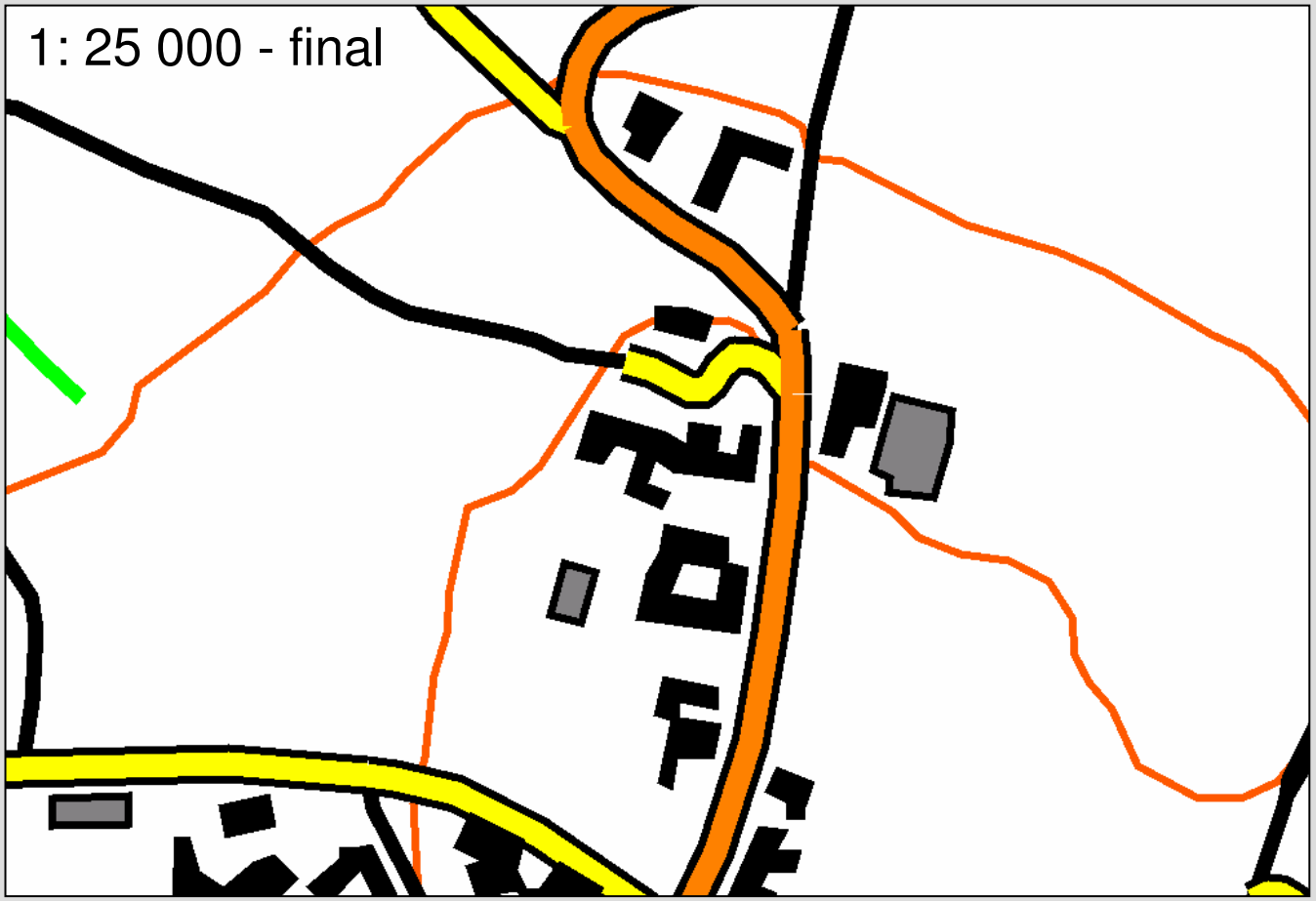
Situation of intermediate complexity



Other results

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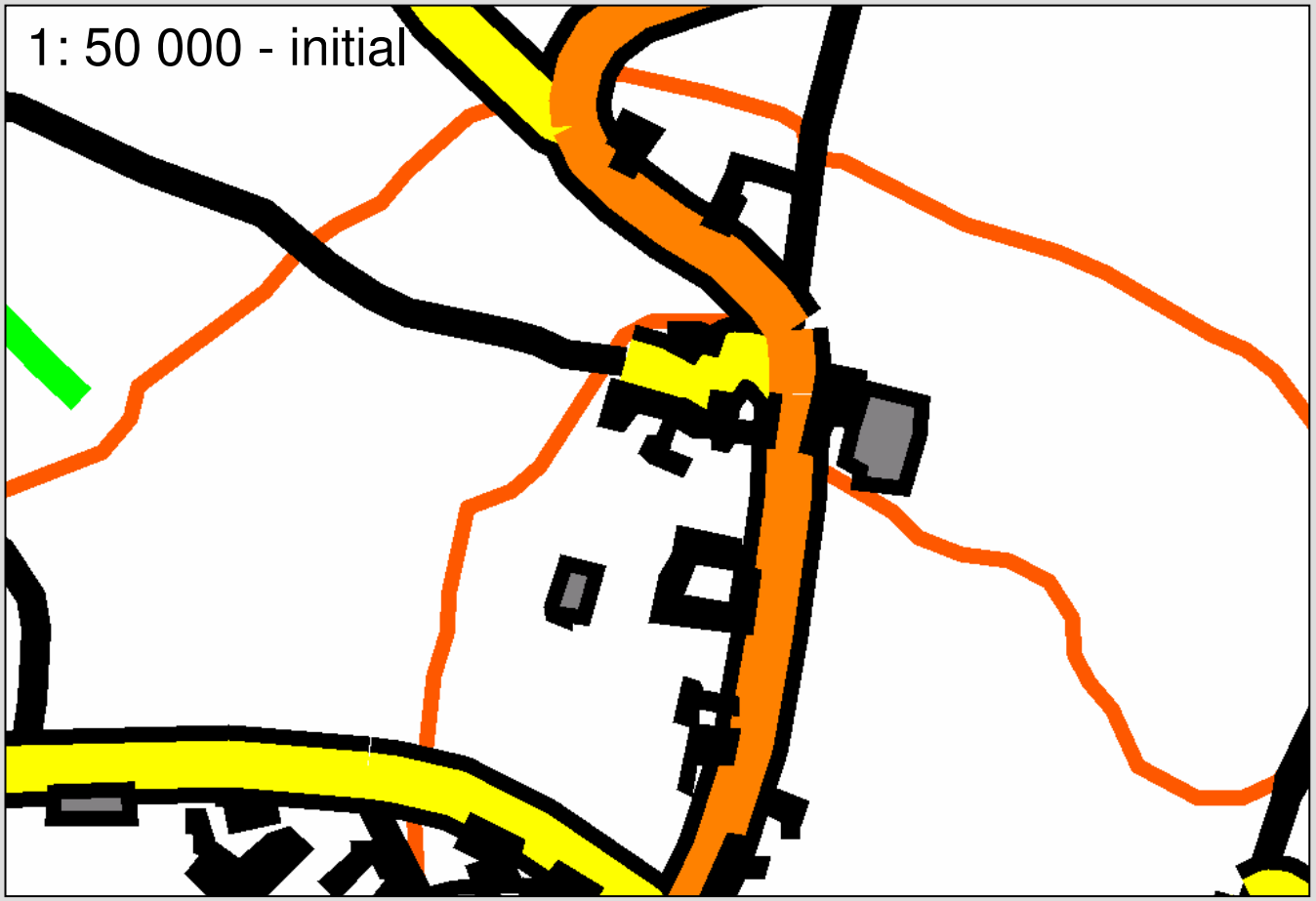

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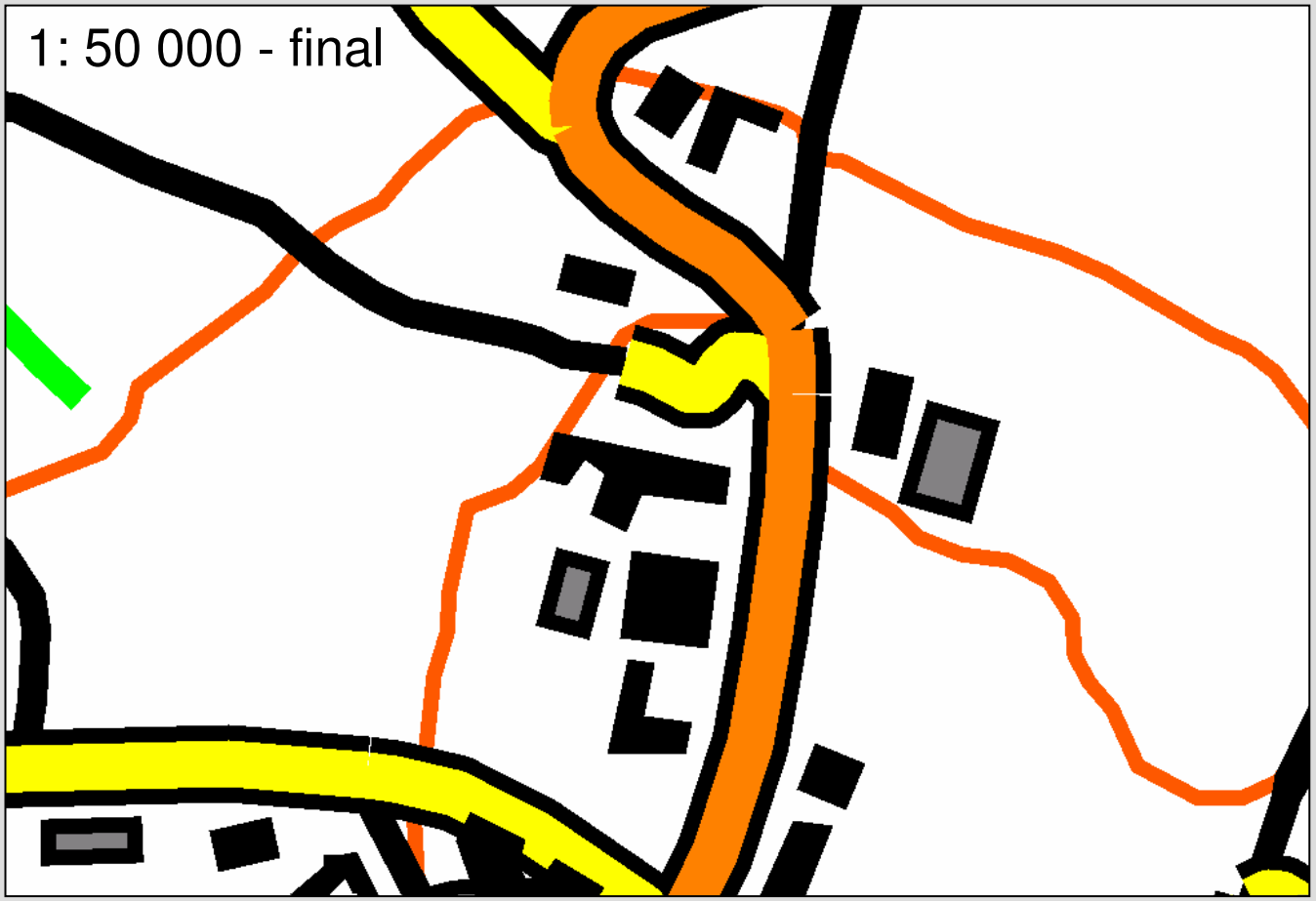

Conclusion

- Problematic: cartographic generalisation of low density areas
- Propositions:
  - Communication model
  - Model for the representation of an agent's spatial environment
  - System based on these models
- Encouraging preliminary results

On-going work

- Introduce
  - other relational constraints
  - other generalisation actions
  - other geographical themes
- Better study the dynamic of the system:
  - In which order should we activate the agents?
  - In which order should an agent perform the actions it has to perform?
- More deeply combine the system with the AGENT prototype
  - management of over-constrained situations using groups
  - interface urban/rural

THANK YOU !