

A rewriteable RFID environment for AGV navigation

Arne Bosien, Marcus Venzke, Volker Turau

Institute of Telematics
Hamburg University of Technology

International Workshop on Intelligent Transportation
Hamburg, 18th March 2008



Motivation

- in production environment
 - automated guided vehicles
 - flexible routes needed
- traditional navigation
 - optical lines or electric wires
- latest approach
 - Container Terminal Altenwerder
 - RFID tags embedded in floor
 - central communication
 - expensive, complex to install



Objectives

Goals

- navigation without expensive installation
- autonomous following
- avoid central communication
- change routes with low effort

Idea

- use RFID write capabilities

Outline

- experimental platform
- two algorithms

Approach

Inspired by nature

- ants use pheromons to mark trails
- takes place on way back from source of food
- this allows other ants to find the food

Two modes

- teaching
- following

Approach

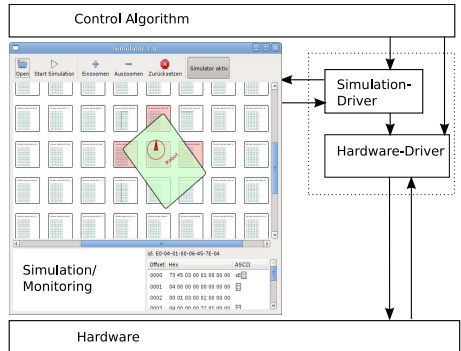
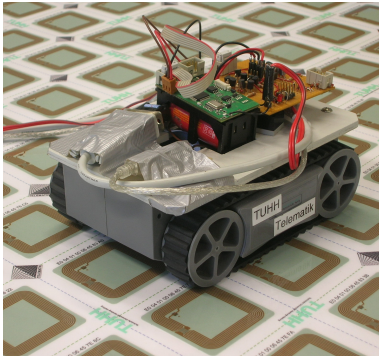
Inspired by nature

- ants use pheromons to mark trails
- takes place on way back from source of food
- this allows other ants to find the food

Two modes

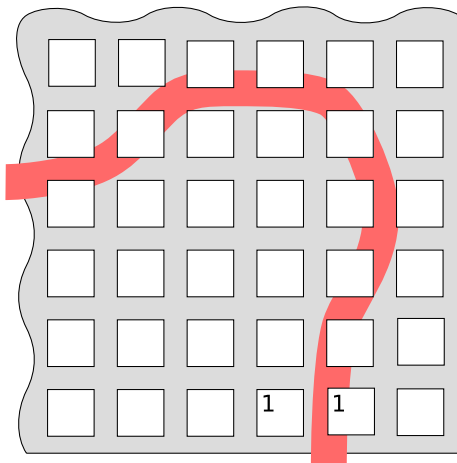
- teaching
- following

Experimental platform



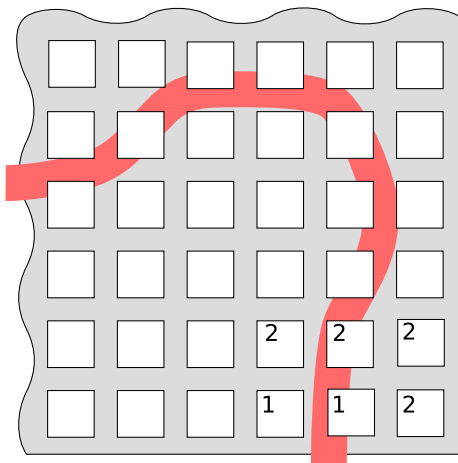
First algorithm

- mark all tags in range with sequence number
- increase number when new tags are detected



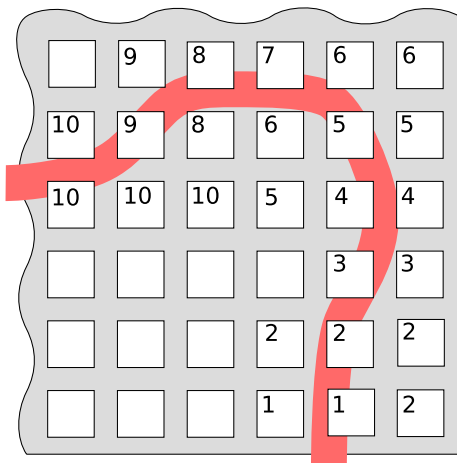
First algorithm

- mark all tags in range with sequence number
- increase number when new tags are detected



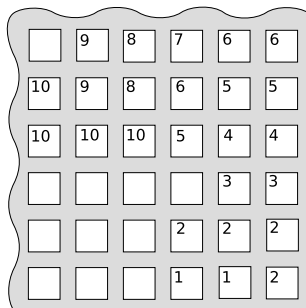
First algorithm

- mark all tags in range with sequence number
- increase number when new tags are detected



Results of first algorithm

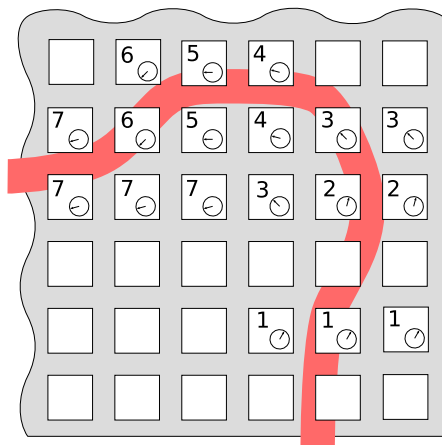
- hard to follow path, must be searched frequently
⇒ slow driving speed
- algorithm doesn't allow cross-ways nor independent paths
⇒ memory management needed, but memory is limited
- reading/writing memory lowers speed



Optimize Navigation

- Compass
 - detect current direction to reproduce rotary motions
 - write drive directions on tags
 - consumes more space
- Odometry
 - detect changes of position
 - realization is complex
- Dynamic range (change transmission power of RFID reader)
 - gain information about the distance to tags
- Additional readers
 - detect position of path with left and right reader

Second algorithm

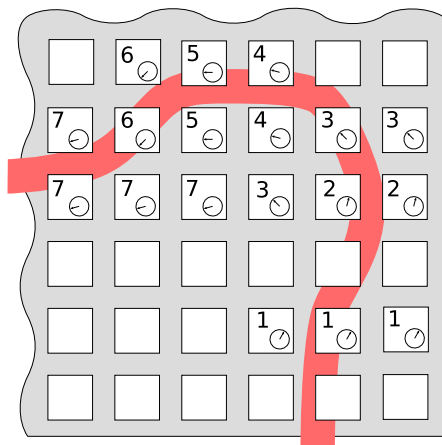


- uses compass
- only writes sequence number when direction changes
- also writes new direction
- uses path identifier, stores multiple sequence numbers

Results

- usage of fewer tags
- faster and more reliable
- still possible to lose path
- magnetic compass is unreliable

Second algorithm



- uses compass
- only writes sequence number when direction changes
- also writes new direction
- uses path identifier, stores multiple sequence numbers

Results

- usage of fewer tags
- faster and more reliable
- still possible to lose path
- magnetic compass is unreliable

Conclusion

Results

- two algorithms shown
- second algorithm working
- promising approach
 - allows autonomous following
 - communication via environment
 - new routes can be added easily

Future work

- for smooth movement more readers required
- also other techniques will be applied
- efficient management for tag memory

A rewriteable RFID environment for AGV navigation

Arne Bosien, Marcus Venzke, Volker Turau

Institute of Telematics
Hamburg University of Technology

International Workshop on Intelligent Transportation
Hamburg, 18th March 2008

