

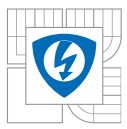
INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

Agent applications in traffic and transportation

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Tato prezentace je spolufinancována Evropským sociálním fondem a státním rozpočtem České republiky.



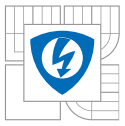
Air traffic management domain

Air traffic management domain

Air traffic simulation
systems overview
AgentFly overview
AgentFly scenarios

- Currently the management based purely on human factor (air traffic controllers)
- Predicted increase in number of flights
- Current system is not sustainable in long term
- Need to solve the planning problem and collision avoidance problem





Air traffic simulation systems overview

Air traffic management
domain

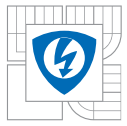
Air traffic simulation
systems overview

AgentFly overview

AgentFly scenarios

- NASPAC 2.0
 - ◆ Event based simulation
- FACET (NASA Ames)
 - ◆ Queue based techniques
- ACES (NASA Ames)
 - ◆ Multi-agent approach, one thread per flight
 - ◆ 50.000 flights on 40 airports simulated in 90 minutes
- AgentFly





AgentFly overview

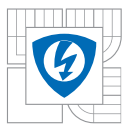
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AgentFly overview

AgentFly scenarios

- Multi-agent distributed simulation
- Path planning
 - ◆ Accelerated A* Algorithm
 - Using the adaptive sampling step
 - Using similarity checks and hashing
- Collision avoidance multilayer architecture
 - ◆ Cooperative
 - RBCA
 - IPPCA
 - MLCA
 - ◆ Non-cooperative





AgentFly scenarios

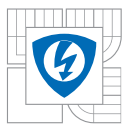
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■ Human Asset

- ◆ Free-flight concept, flight plan descriptions, special use airspaces, planning algorithm

■ Rule-based Collision Avoidance

- ◆ Inspired by visual flight rules
- ◆ Horizontal manoeuvres only



AgentFly scenarios

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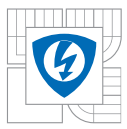
■ Iterative Peer to Peer Collision Avoidance

- ◆ Collisions solved pair-wise
- ◆ Solution for the first collision is found
- ◆ Solution of the collision can't break solution of any earlier collision

■ Multiparty Collision Avoidance

- ◆ Division of airplanes to groups based on collision participations
- ◆ Solution more "compact" than for IPPCA, but higher bandwidth requirements





AgentFly scenarios

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■ Landing

- ◆ 20 airplanes
- ◆ Can change speed only

■ Mixed Initiative

- ◆ Combination of cooperative and non-cooperative collision avoidance methods
- ◆ Scenario above Los Angeles
 - 2 flows of airplanes landing at the airport
 - 2 UAVs on their surveillance mission