

# Toward directable autonomous crowds



Clodéric Mars – R&D Software Engineer – Golaem

# Populate virtual environments



✘ Mainstream in animation/vfx

✘ Trend in video games

➤ **Crowds must be believable & directable**



## ❖ Manual authoring

❖ Long (read expensive)

❖ Difficult

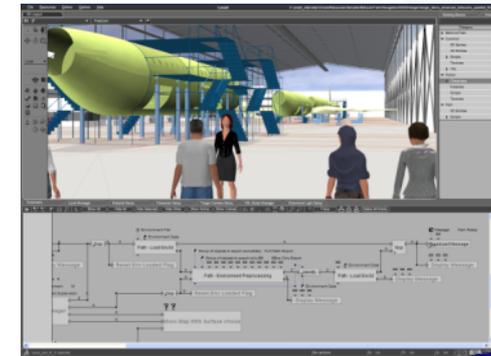
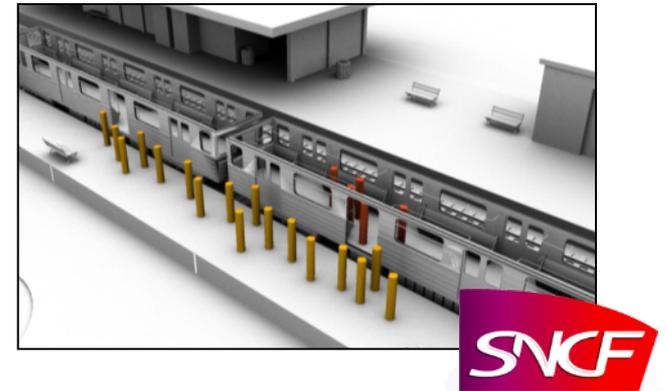
## ❖ What is autonomy ?

❖ Handle high level orders

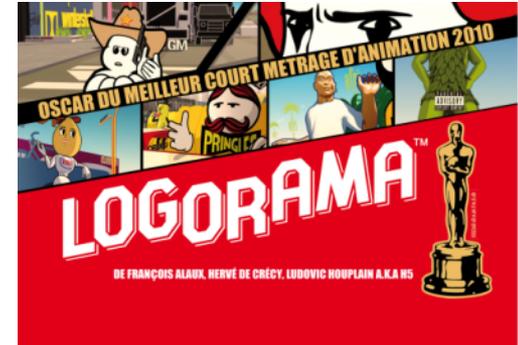
❖ React to events

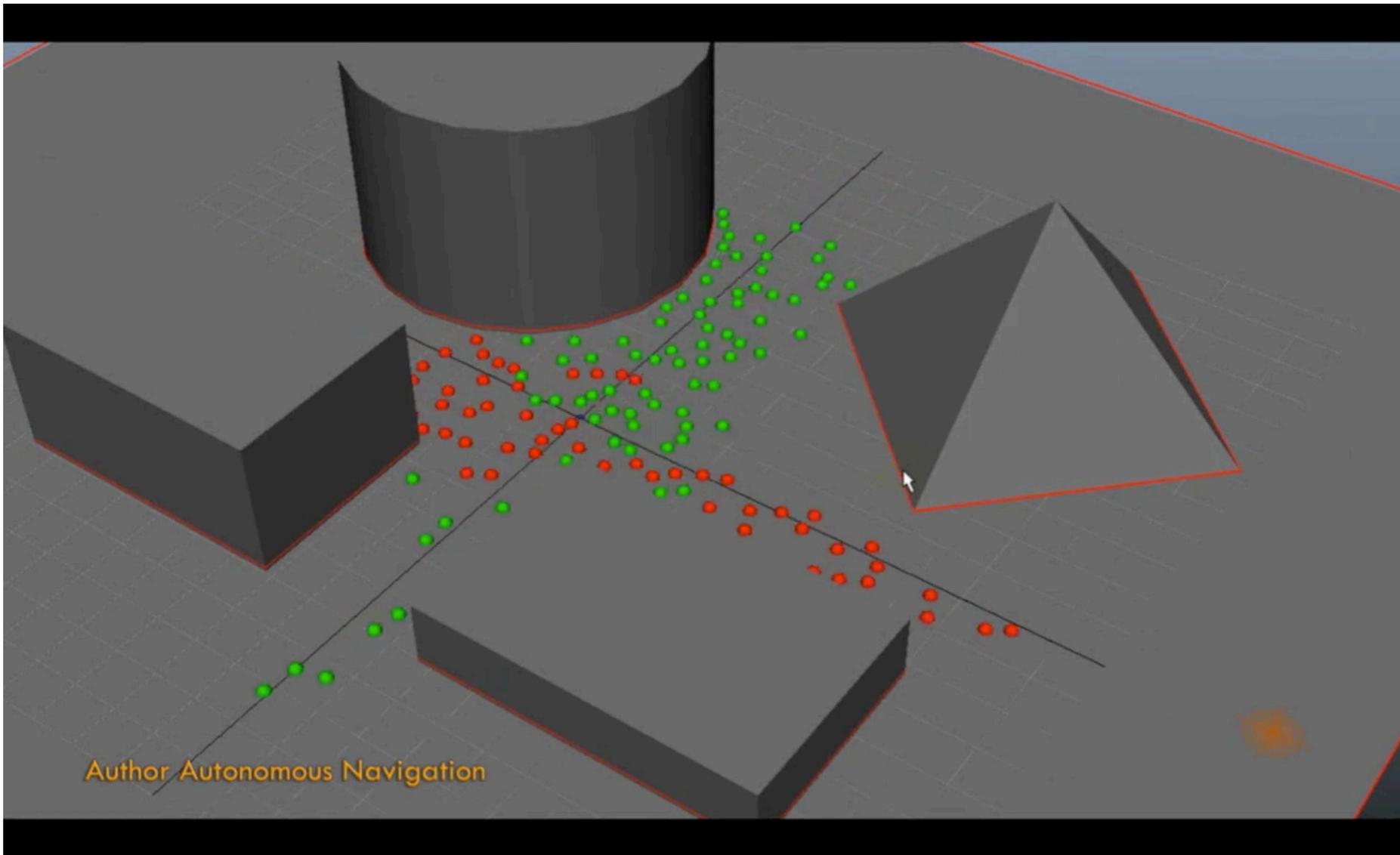
## ➤ **How tools can direct autonomous entities?**

- ❖ Software company
  - ❖ INRIA's spin-off
  - ❖ Founded in 2009
- ❖ Virtual humans in 3D worlds
  - ❖ Animation
  - ❖ Navigation
  - ❖ Behaviors

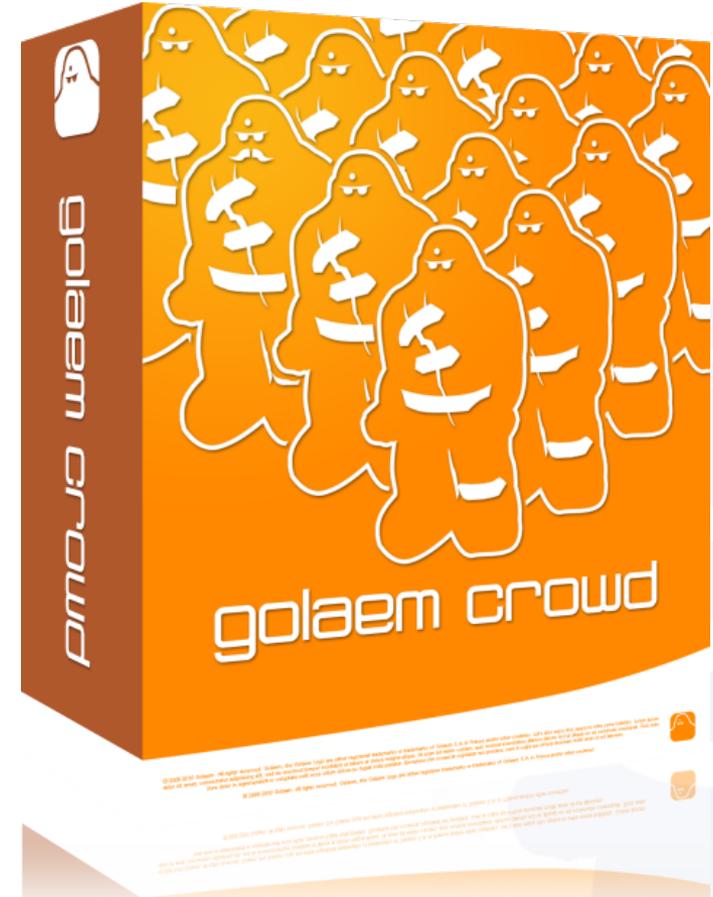


- ✘ Post-production studio
  - ✘ France, Belgium & Luxembourg
- ✘ Special effects for commercials and features films

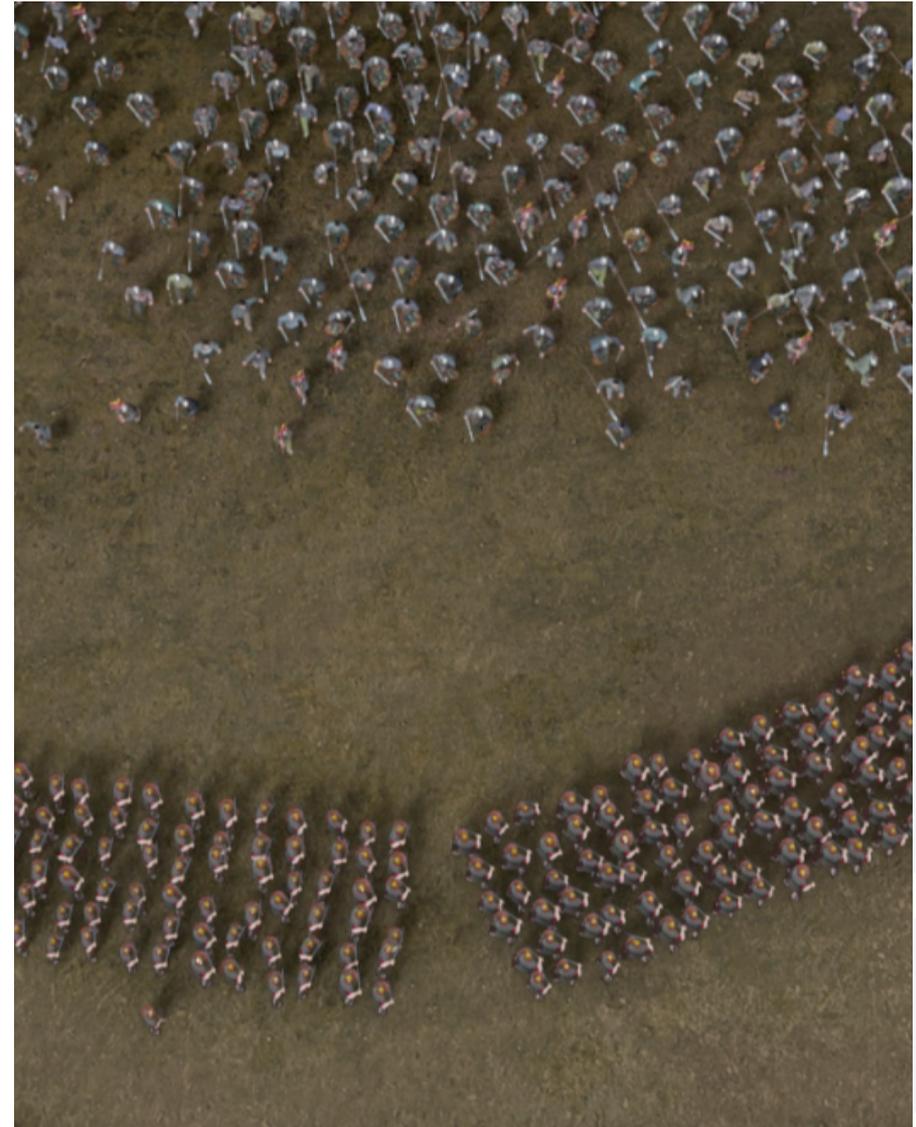




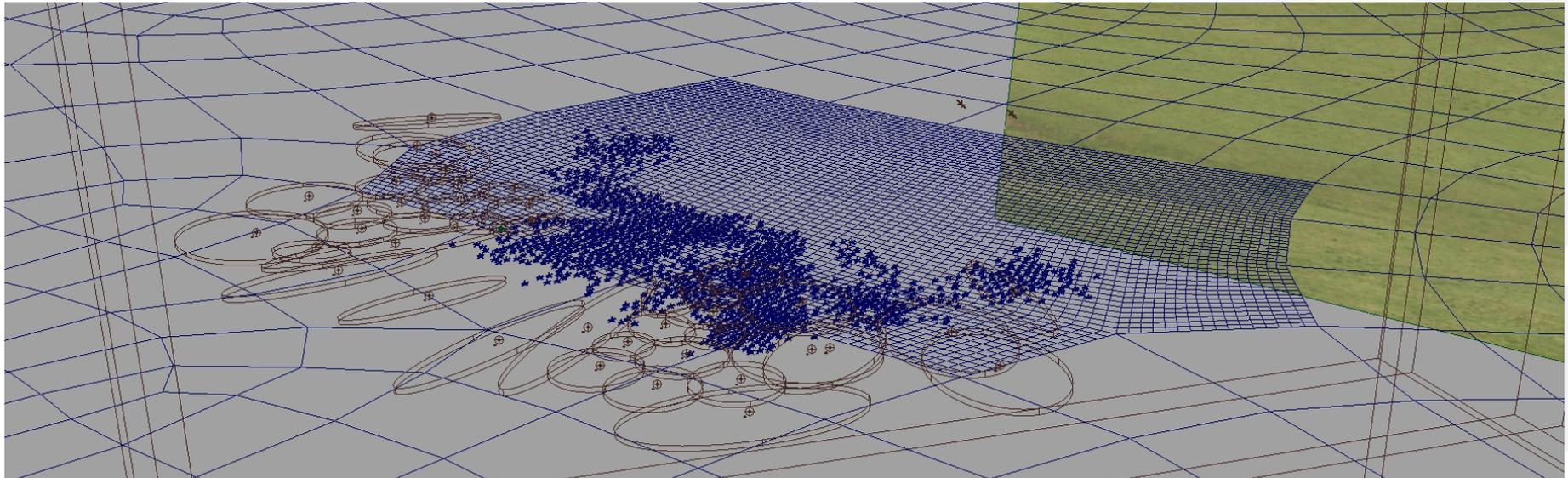
- Known host tool
  - Plugin for Autodesk Maya®
- Respect existing production workflow
  - Designed with professionals
- Rely on Golaem SDK
- Focus on users needs
  - Limit exposed features

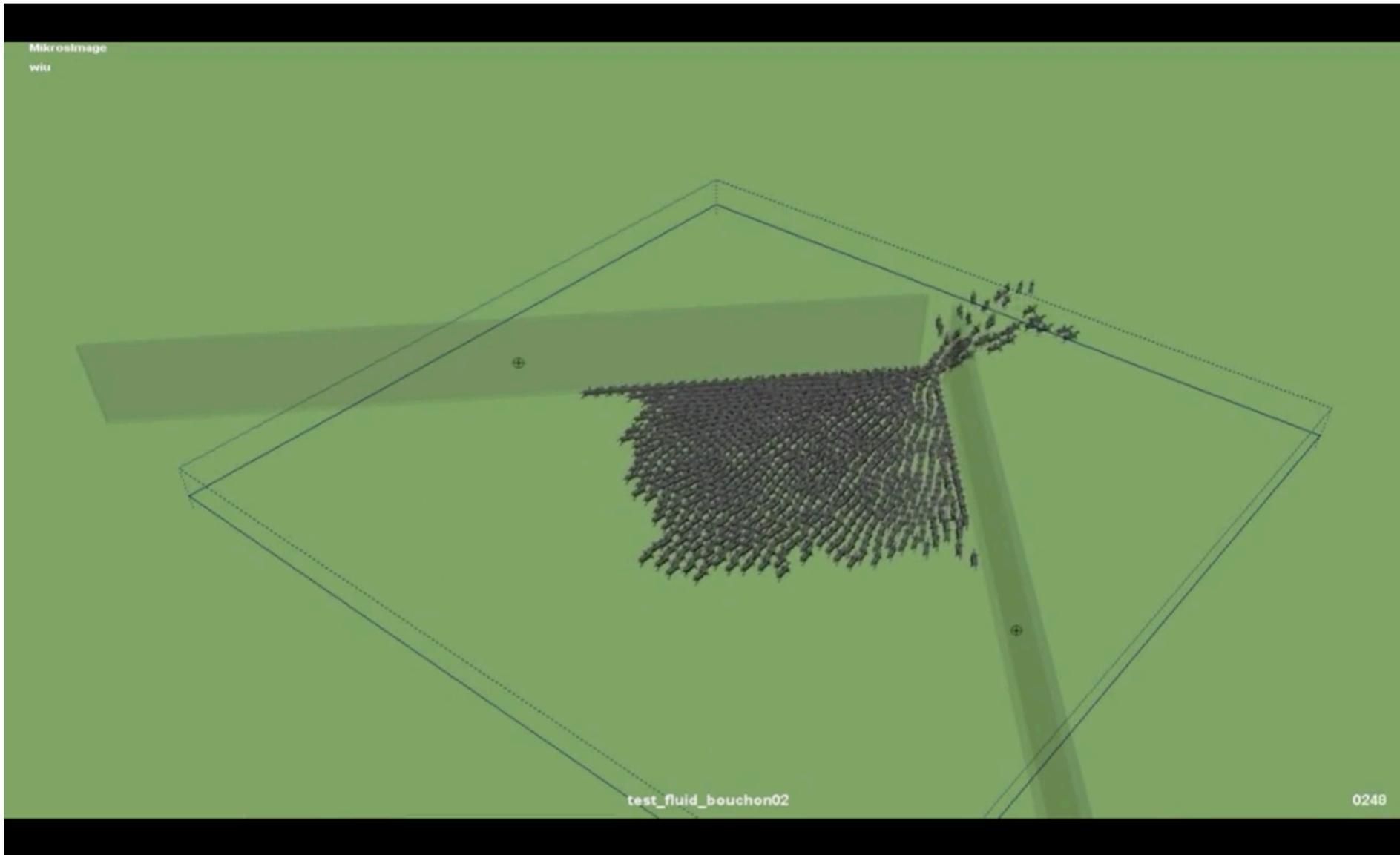


- ✘ How the entities move in the environment
  - ✘ As a whole
  - ✘ At the entity level
- ✘ Usually created using particles and fields
- **How to introduce autonomy?**

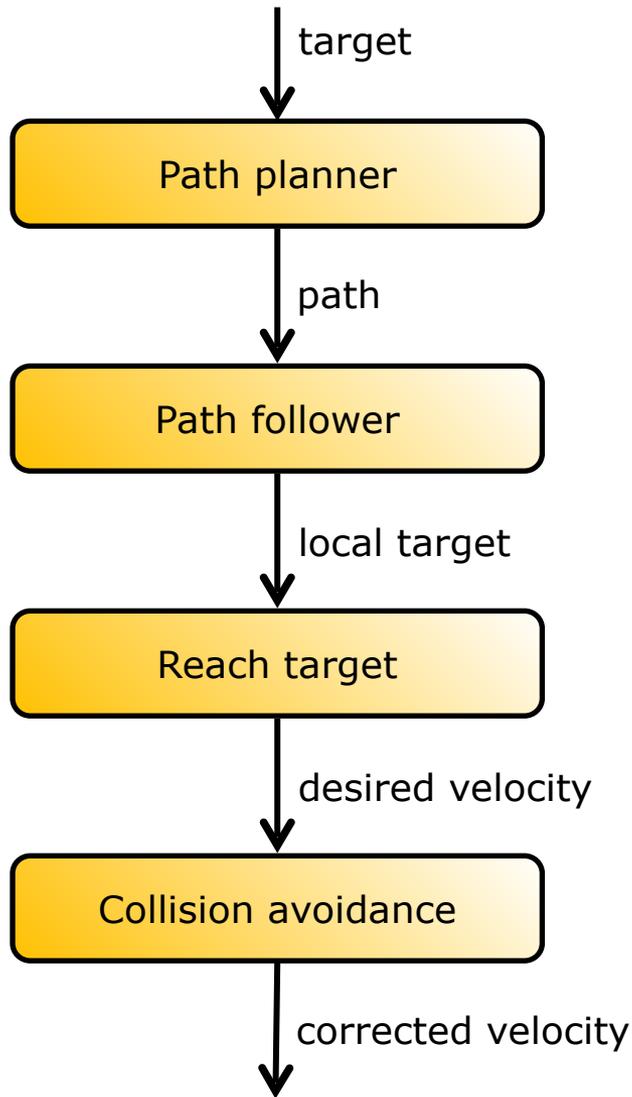


- ✘ Explicit setup
  - ✘ Localized fields
  - ✘ Keyframed forces
  - ✘ Separation forces
- ✘ Difficult to tune
- ✘ Impossible to reuse





# Autonomous navigation



🔥 Rely on Golaem SDK

🔥 Navigation mesh & roadmap

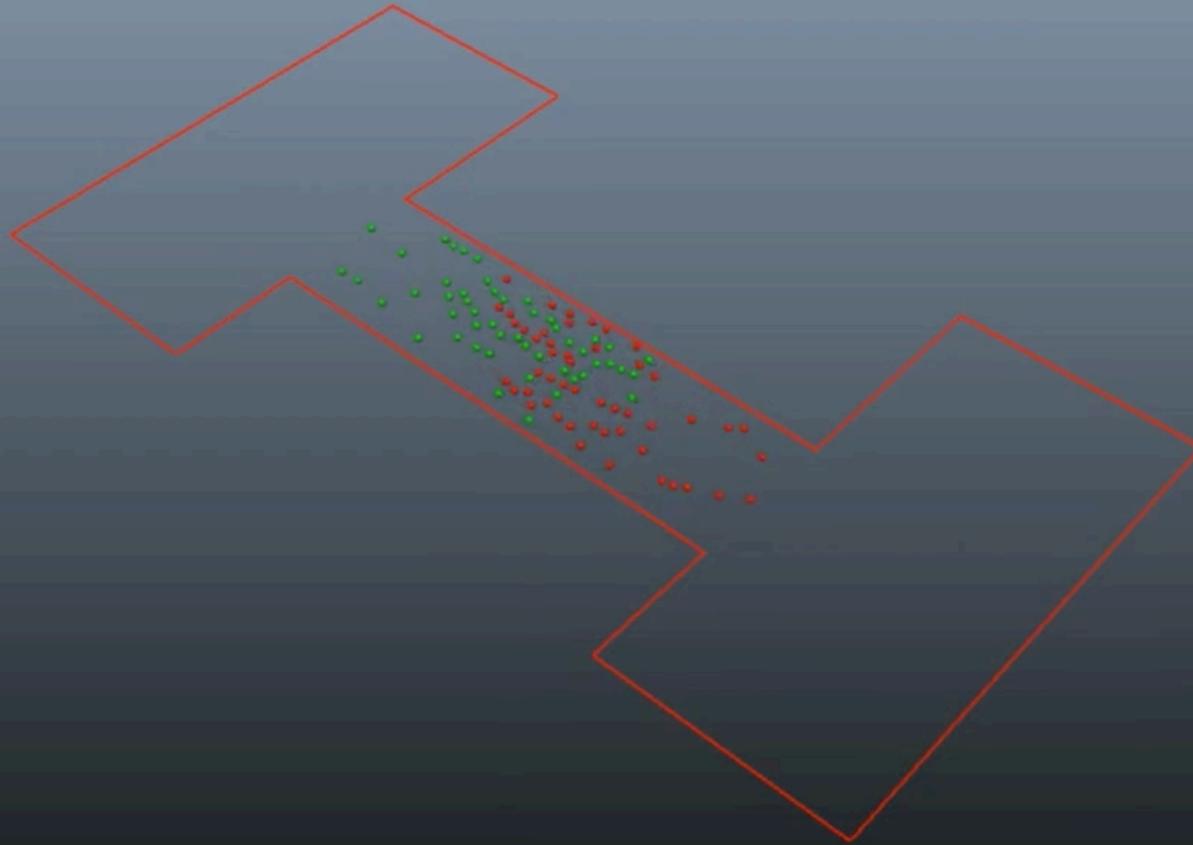
🔥 Configurable navigation

pipeline

🔥 Algorithms handle complexity

➤ **What tools to direct ?**

# Provide « goto » targets



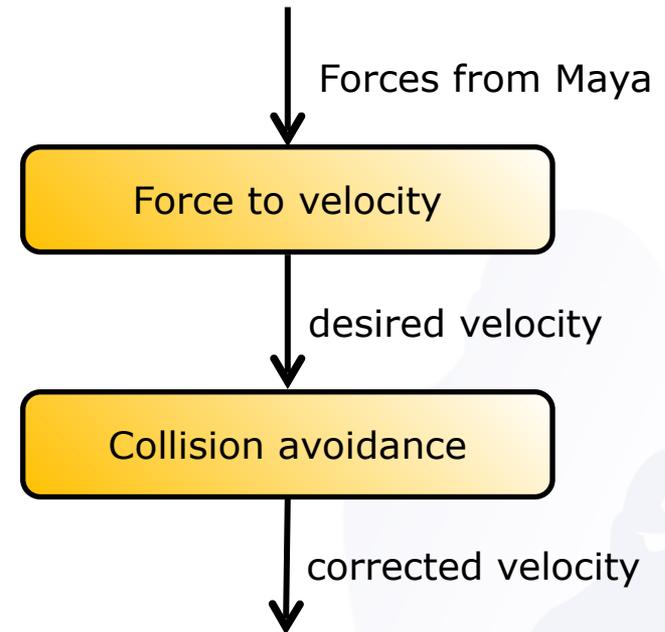
goto

✘ Force fields as input

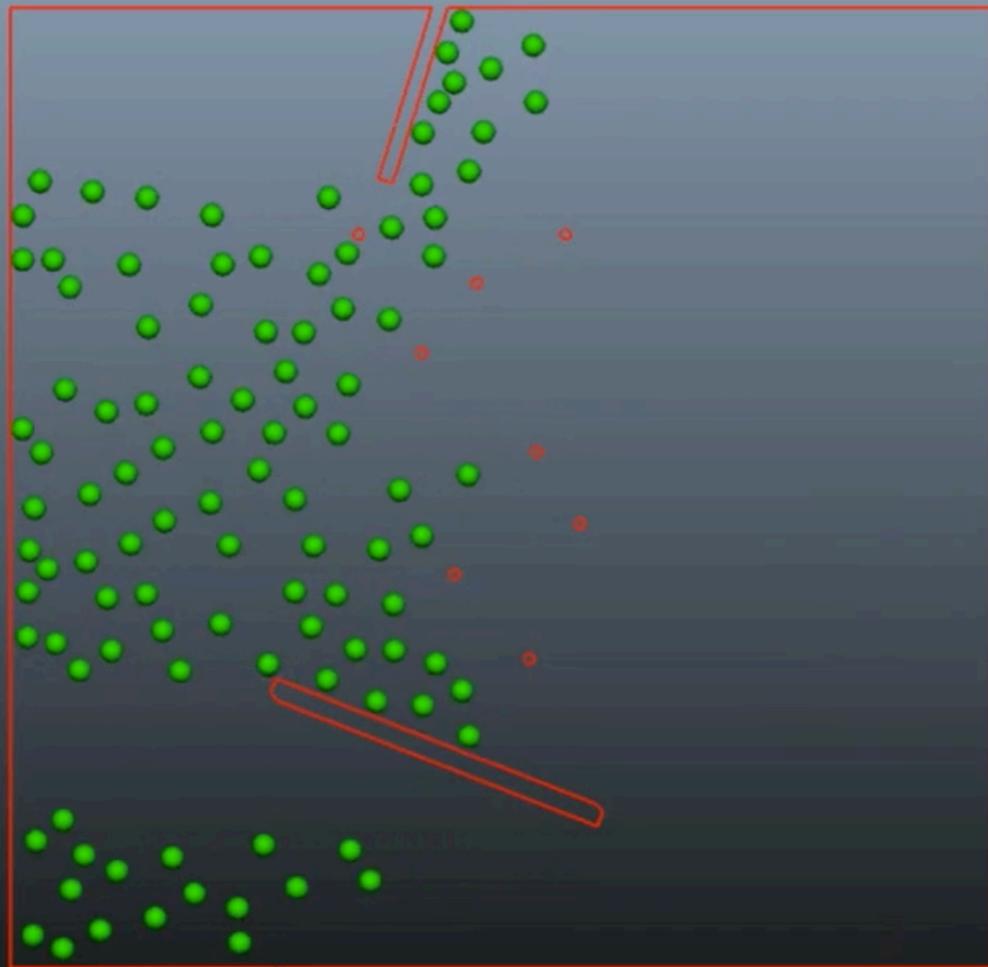
✘ Theory: best of both worlds

✘ Practice: so-so

✘ Manual control of some entities



# Mix with manual



y x

28.1 fps

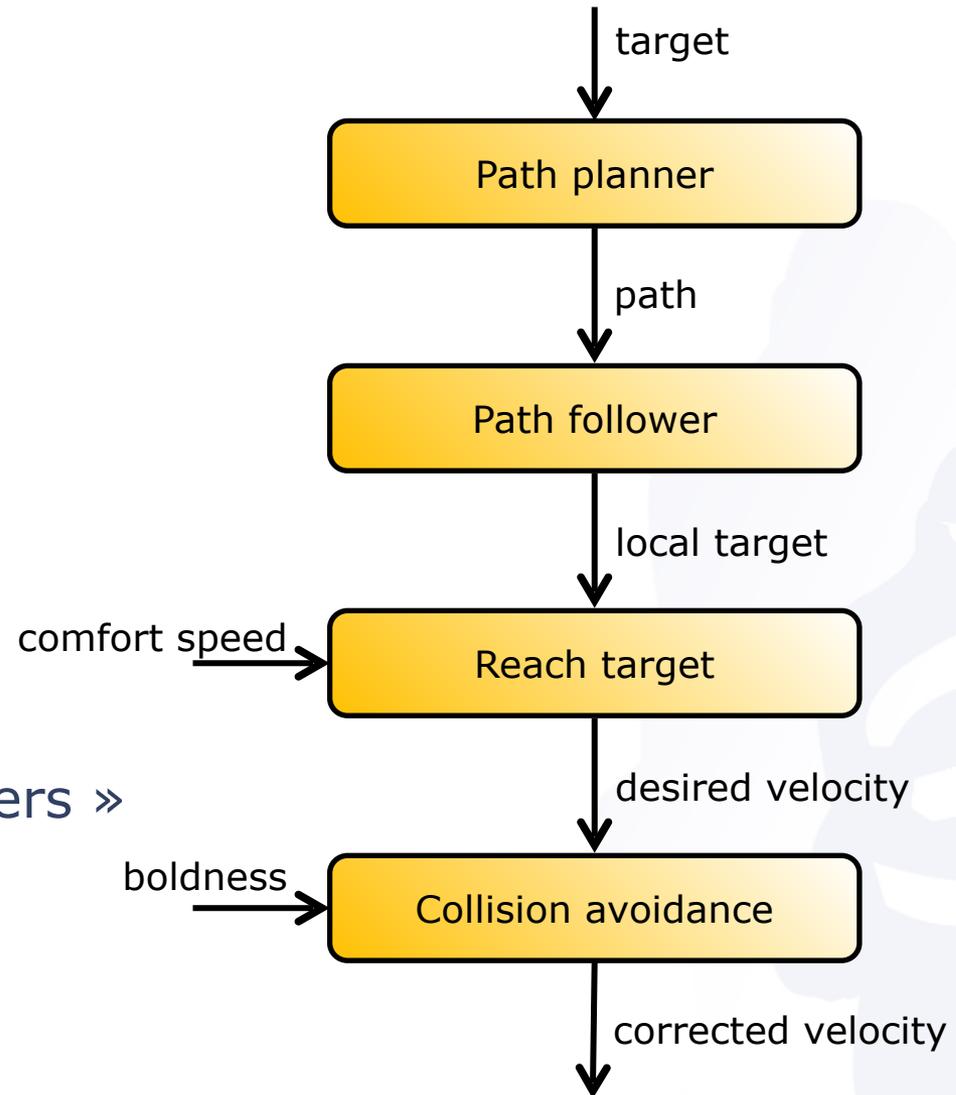
## Parameters musts

- ✘ Understandable
- ✘ Visible influence
- ✘ No « wrong » value

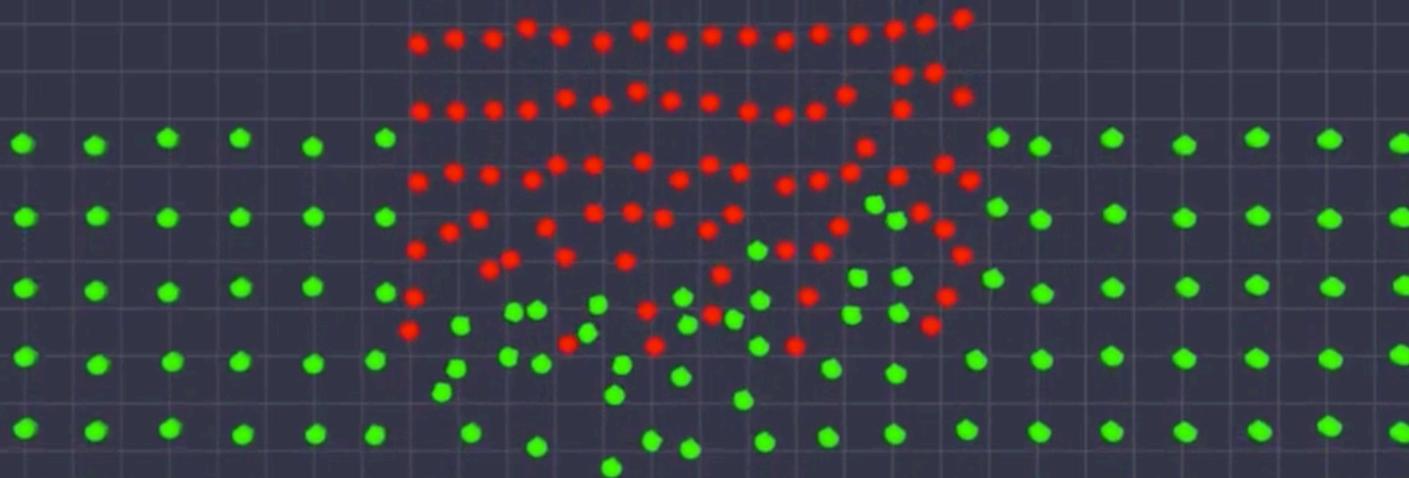
## Comfort speed

## Boldness

- ✘ « I don't care about others » factor



# Expose parameters



## ✘ Groups

✘ Cohesive flocks and formations

✘ Sketching

## ✘ Navigation fields

✘ Allow to navigate around obstacles toward a goal

✘ Easy to mix with authored fields

✘ « *Directing Crowd Simulations Using Navigation Fields* » - Sachin Patil et al.



- ✘ Innovative tool
  - ✘ Change of habit
  - ✘ New direction possibilities
- ✘ Convince animators to use it
  - ✘ Useful and simple
  - ✘ Lack of real production feedbacks
- ✘ Applicable for game designer tools ?

# It's question time !



[www.golaem.com](http://www.golaem.com)

mail: [cloderic.mars@golaem.com](mailto:cloderic.mars@golaem.com)

twitter: @clodericmars

Rendered pictures extracted from:

« Alesia, le rêve d'un roi nu »

Production : Agat Films et Cie

Scenari0 & direction : Christian et Gilles BOUSTANI