IPAL – LIAMA PEPS Project

Multiscale crowds

Workshop AUR@, Singapore, Sept 2012

History

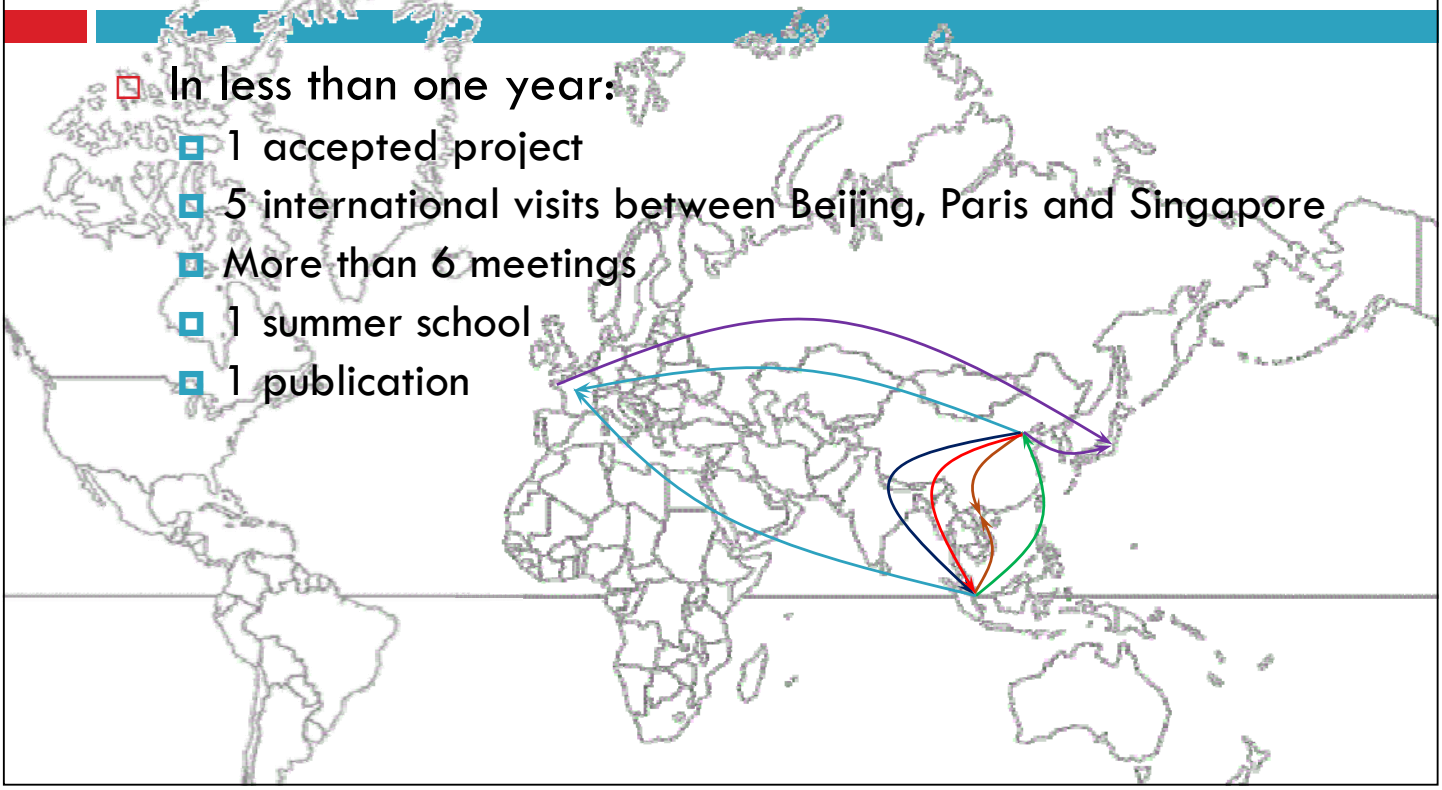
- November 2011
  - T. Corpetti and D. Racoceanu's first meeting at AUR@ workshop, Hanoi
- December 2011
  - Visit of T. Corpetti at IPAL (supported by LIAMA and IPAL)
- February 2012
  - 6 months visit of N. Courty (IRISA, France) at LIAMA
  - Submission of the "Multiscale crowds" project
- April 2012
  - Project acceptance
- May 2012
  - Visit of N. Courty at IPAL
- June 2012
  - Visit of A. Fagette at LIAMA

History

- June – July 2012
  - Training of C. Monin in the context of the project
- June 2012 – June 2013
  - Training of T. Kensicher in the context of the project
- August 2012
  - Acceptance of the article *AGORASET : a dataset for crowd video analysis* to ICPR workshop on Pattern Recognition and Crowd Analysis
- September – December 2012
  - Training of S. Garnier in the context of the project
- October 2012
  - Attendance of A. Fagette at the Human Activity and Vision Summer School
  - Meeting in France of all investigated people

History

- In less than one year:
  - 1 accepted project
  - 5 international visits between Beijing, Paris and Singapore
  - More than 6 meetings
  - 1 summer school
  - 1 publication



Goals of the project

- Multiscale analysis and interpretation of crowd phenomena
- Rely on fluid mechanics for the representation of such crowds

People involved

LIAMA

- Nicolas Courty (head)
- Thomas Corpetti
- Pascal Zille (PhD)

IPAL

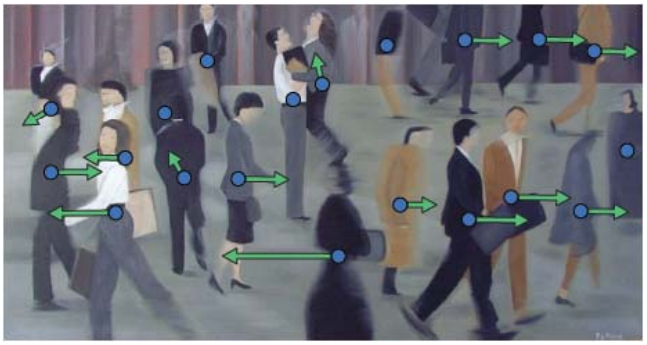
- Daniel Racoceanu
- Antoine Fagette (PhD)

Project into details

- Crowd analysis has many interesting applications:
  - security (crowd monitoring, abnormal event detection, etc.)
  - environment management
  - entertainment (cinema, video games, etc.)
  - social sciences
  - etc.
- Two main approaches:
  - Agent based: a set of pedestrians with individuals rules
  - Continuum-based: the crowd is driven by a continuous flow

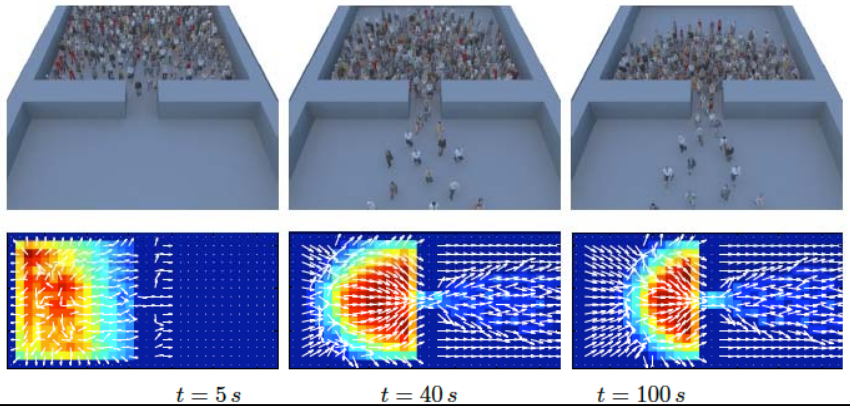
Agent-based approaches

- Each **pedestrian** has its **own characteristic** related to its objective, speed, influence and social behavior.
- The crowd is simulated by putting together a large number of agents.
  - Advantages : simple to implement, easy to add new rules, etc.
  - Drawbacks : sometimes lack of realism, time computation



Continuum-based approaches

- **The crowd is seen as a whole** and is driven by a continuous flow
- It is simulated using fluid mechanics laws (transport equation, etc.)
  - Advantages : time computation does not depend on the density, can simulate a large variety of flows
  - Drawbacks : no individual reasoning



Our project

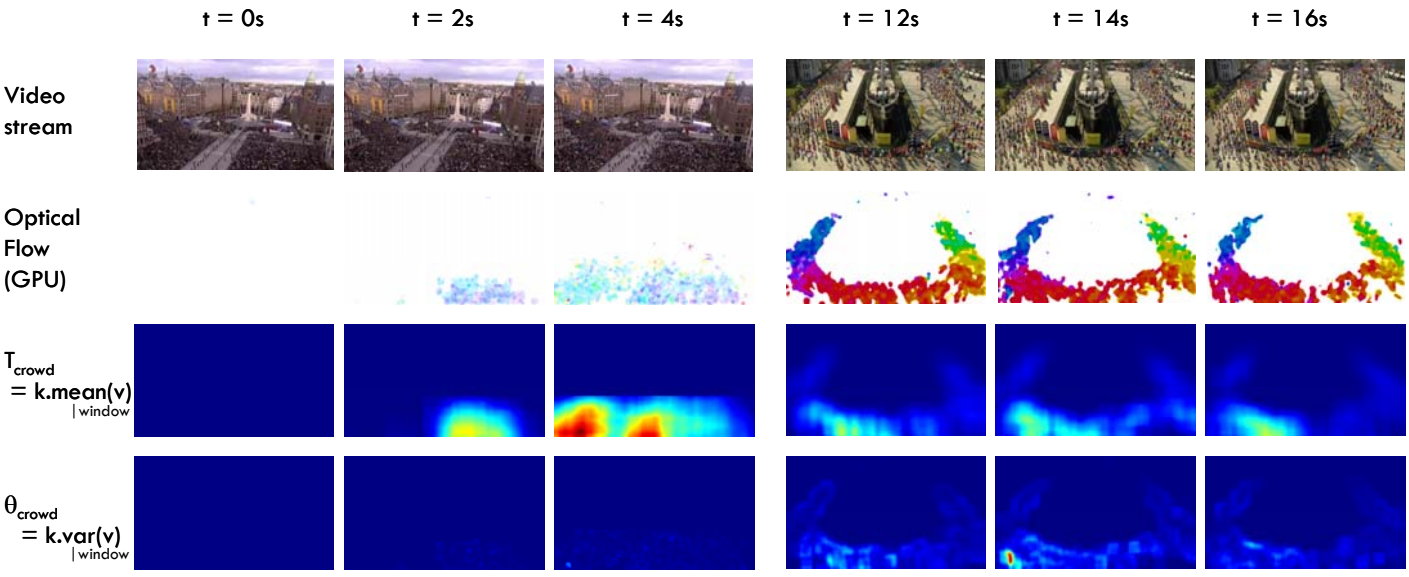
- Mix continuous and agent representations to take advantage of both techniques
- Main topics:
  - 1 – Extract **physical parameters** related to the crowd (velocity and temperature in particular) using techniques taken from fluid flow analysis in images
  - 2 – Work on the **multi-scale** aspect (the notion of pedestrian/flow is closely related to the notion of scale) using diffusion maps techniques
- Technical constraint: use of both **CPU** and **GPU** technologies

Complementary skills

- LIAMA, TIPE group
  - Fluid flow analysis from image sequences
  - Crowd representation and analysis using fluid mechanics
- IPAL
  - Image analysis and understanding

First results

- Extraction of physical parameters related to the crowd:

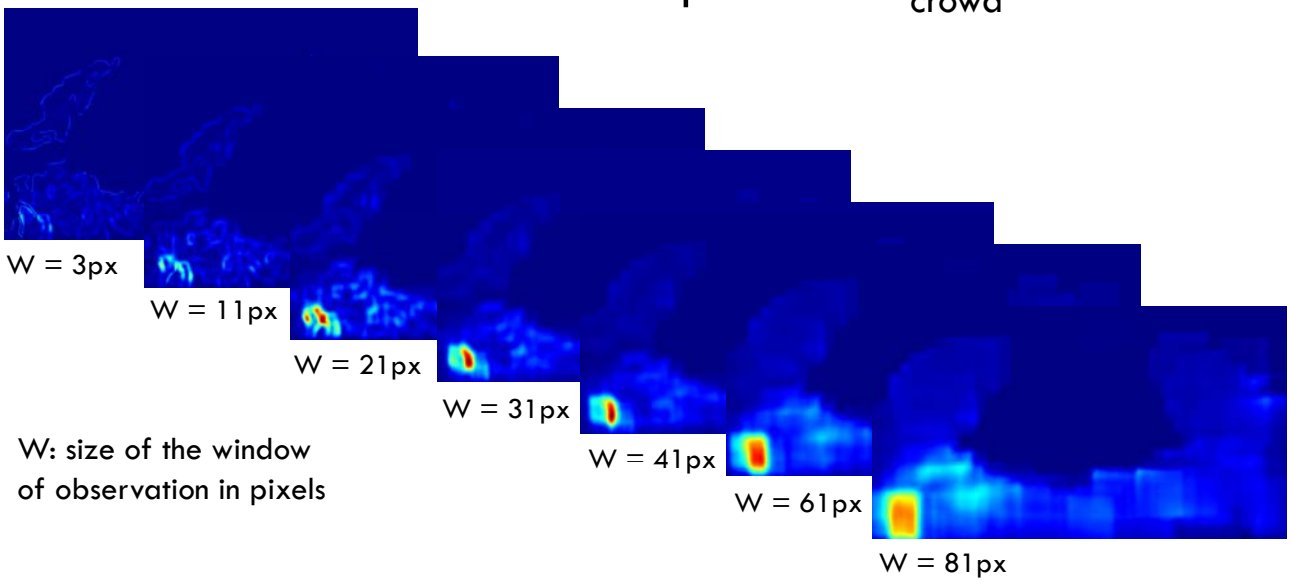


Use case 1: a crowd scattering with panic

Use case 2: a pedestrian having an inconsistent behavior

First results

- Highlighting of the multiscale approach problem related to the evaluation of the crowd temperature θ_{crowd}



First results

- AGORASET: Generation of a synthetic dataset that will be used as ground truth to validate the results of the project.

Shibuya (Tokyo), one of the most famous crowd scene studied in crowd analysis.
A simulation (left) and a real view (right).

Thank you