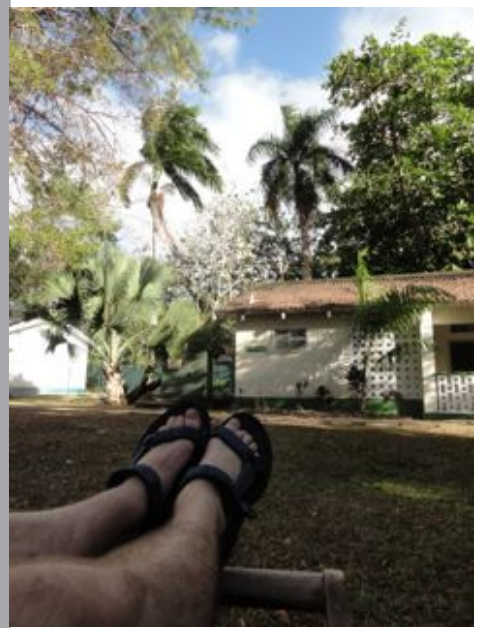
Faculté des Sciences

UMONS Université de Mons

Software Engineering Lab

Institut d'Informatique
Faculté des Sciences, UMONS

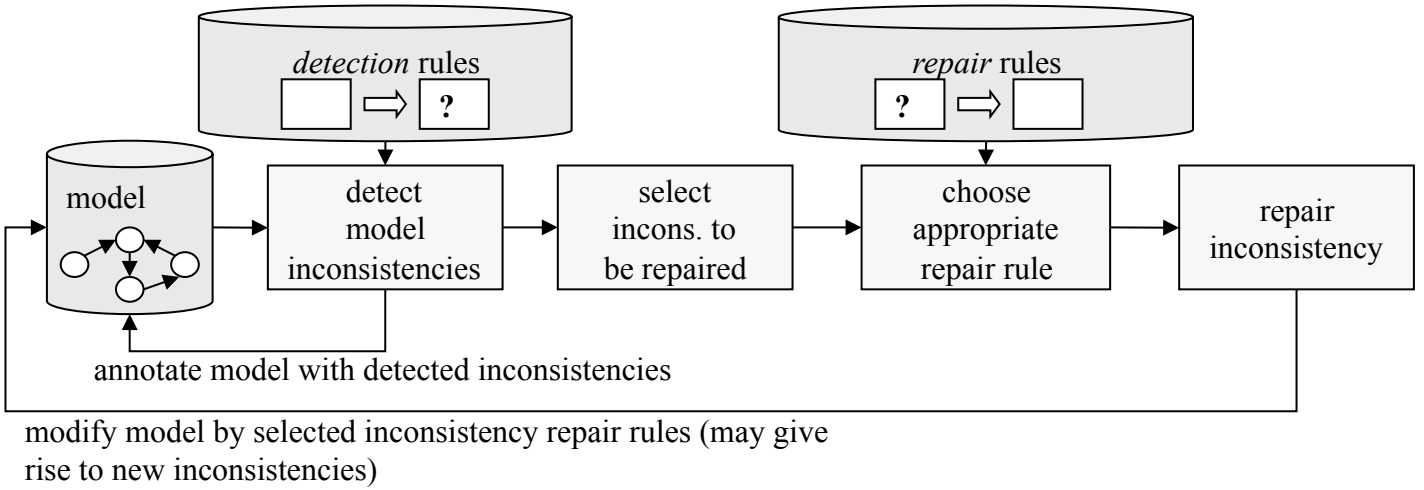


<< Tom **Mens**

Romuald **Deshayes** >>

MPM Related Research

- Model inconsistency management - Detection and resolution of inconsistencies in software models
  - Using graph transformation (R. Van Der Straeten)
    - WADT 2007
  - Using automated planning (with J. Pinna Puissant)
    - ECMFA 2012
  - Using description logics and model checking (with R. Van Der Straeten)
    - ECMFA 2011
  - Using logic programming (with X. Blanc)
    - CAiSE 2009, ICSE 2008

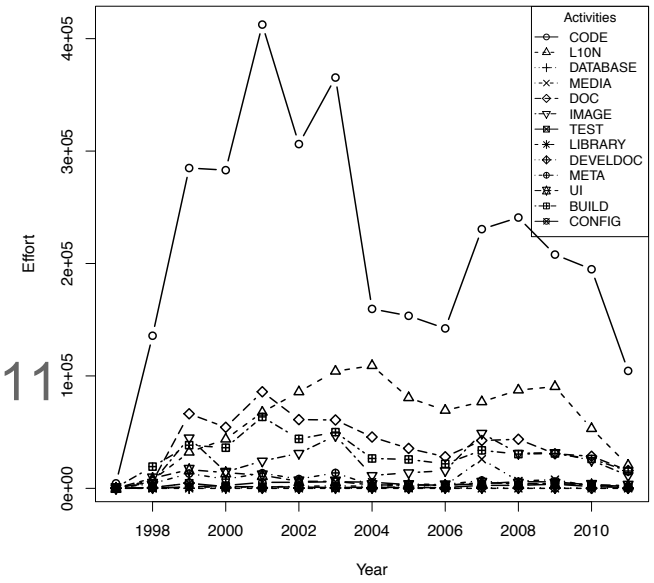


MPM Related Research

- Model transformation (using graph transformation)
  - Model and program refactoring (with G. Taentzer)
    - STTT 2010
    - AGTIVE 2007, SOSYM 2007, GTTSE 2005
  - Architectural restructuring (with D. Tamzalit)
    - ECBS 2010; IEEE Computer 2010

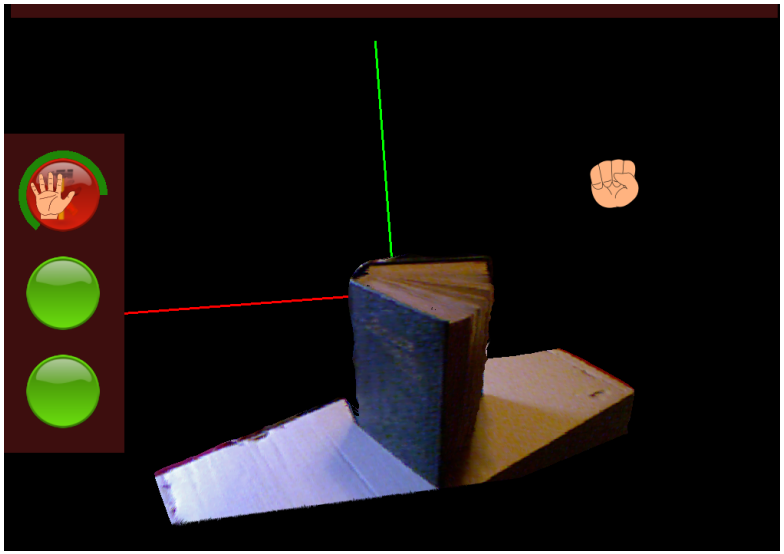
Non MPM research

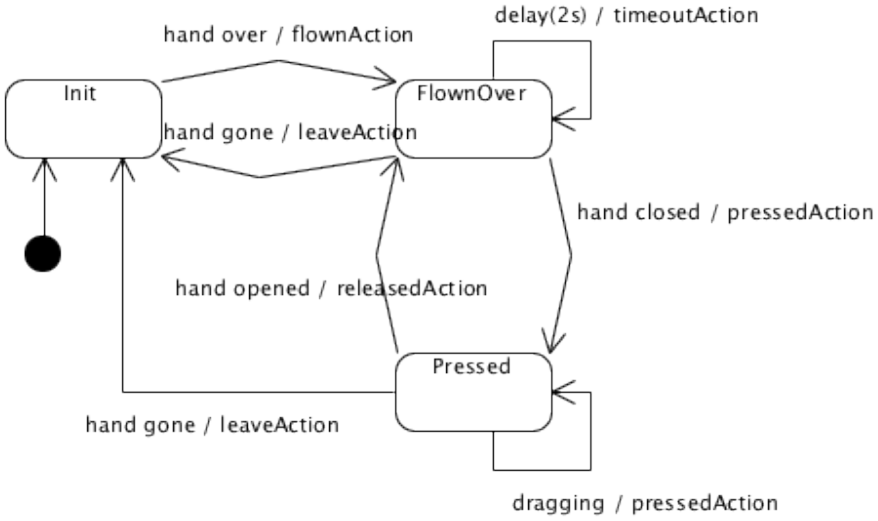
- Empirical analysis of open source software ecosystems (with M. Goeminne, A. Serebrenik)
  - Technical aspects: Study software *quality* (code or design models) and *complexity*
  - Social aspects: study software *community* and their interaction, communication and collaboration
  - Study how software *evolves* over time
    - Increase or decrease in complexity, quality, size, productivity, popularity, …
- Papers
  - IWSECO 2011, SQM 2011, CSMR 2011
  - ICSM 2008, OSS 2009, IWST 2009



Non MPM research

- Modeling of HMI applications
  - See presentation by Romuald Deshayes
  - Discrete modeling of user interaction + continuous modeling of physical interaction





Current research projects

ARC Project « Ecological Studies of Open Source Software Ecosystem »

- 2012-2016
- Applying theories of biological evolution and ecosystems to software evolution and ecosystems

ARC Project « Model-Driven Software Evolution »

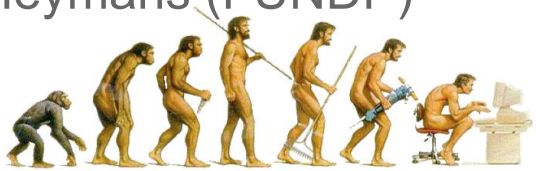
- 2008-2012
- Focus on model quality improvement, model inconsistency management and model refactoring

FEDER Project « Centre d'Expertise en Ingénierie et Qualité des Systèmes »

- 2008-2013
- CETIC, CENA, FUNDP, Multitel, UCL, ULB, Umons

FRFC Project « Centre de Recherche en Adaptabilité Logicielle »

- 2009-2012
- In collaboration with K. Mens (UCL) and P. Heymans (FUNDP)



UI Modelling and Recognition of 3D virtual scenes and objects

Romuald Deshayes

Software Engineering Lab

Computer Science Institute

2011-2012

Table of Contents

About Me?

- Romuald Deshayes
- 23 Years old ⇜⇝ 1st Year PhD
- Belgium : University of Mons, Software Engineering Lab.

About Me ? - continued

Interrests

- Work in UI Modelling
- More specifically in Gestural interactions
- Modelling the interactions with virtual objects
  - Physical (continuous) interactions
  - Command/Action-type (discrete) interactions triggered by gestures

Introduction

- Different objects with different ways of interacting with them

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- Enhance computer with better insight in

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- Different objects with different ways of interacting with them

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  - objects recognition

Introduction

- Different objects with different ways of interacting with them

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  - user interactions with virtual objects
  - objects recognition

[Target Domain] Virtual and Augmented Reality applications such as simulation, home automation and gaming

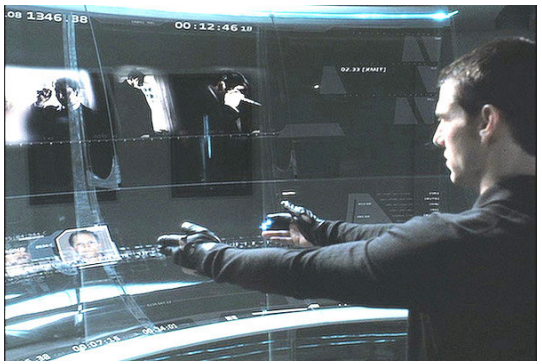
Goal of the project

Two main scientific contributions :

Goal of the project

Two main scientific contributions :

1) Generic solution to specify and execute interactions with virtual objects in an immersive way (Modelling !)



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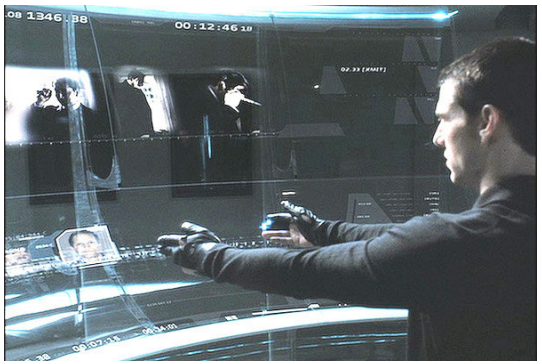
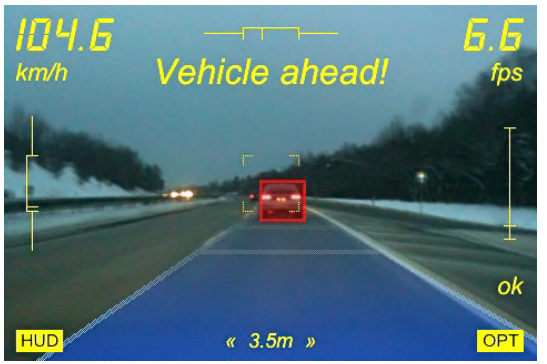
1) Generic solution to specify and execute interactions with virtual objects in an immersive way (Modelling !)



2) Improve the robustness of 3D recognition algorithms, using 3D sensors



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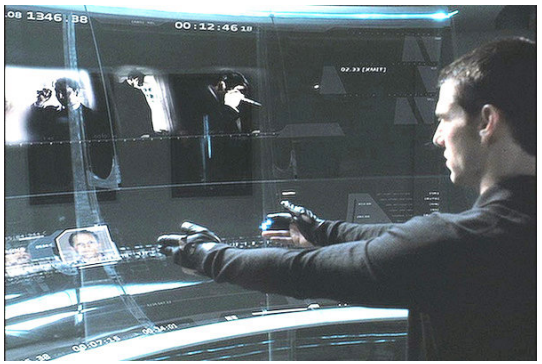

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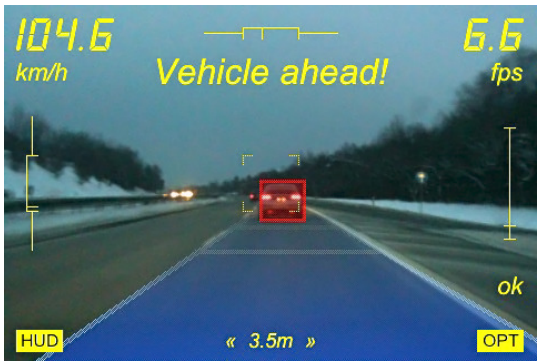

Combining those two ideas would allow various applications in many domains such as virtual reality, video games or home automation (domotics)

Gestural interaction

Gestural interaction

Gestural interaction

Interacting with virtual objects in an immersive way ?

- Gestural interaction

Gestural interaction

Interacting with virtual objects in an immersive way ?

- Gestural interaction
- VR glasses

Gestural interaction

Interacting with virtual objects in an immersive way ?

- Gestural interaction
- VR glasses
- Tactile interaction

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Interacting with virtual objects in an immersive way ?

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- ...

Gestural interaction

Interacting with virtual objects in an immersive way ?

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Gestural Interaction : using the body to communicate with the computer

Kinect

New generation of 3D sensors, equipped with :

- Normal color Camera
- Infrared Camera
- Infrared projector

→ RGB-D terminology is used, because this device is able to generate a 3D map of the observed scene (in real time)

Kinect

Kinect allows to

- segment a scene

Kinect

Kinect allows to

- segment a scene
- detect a user and track him in real time (30hz)

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Kinect allows to

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- basis for interaction with virtual objects

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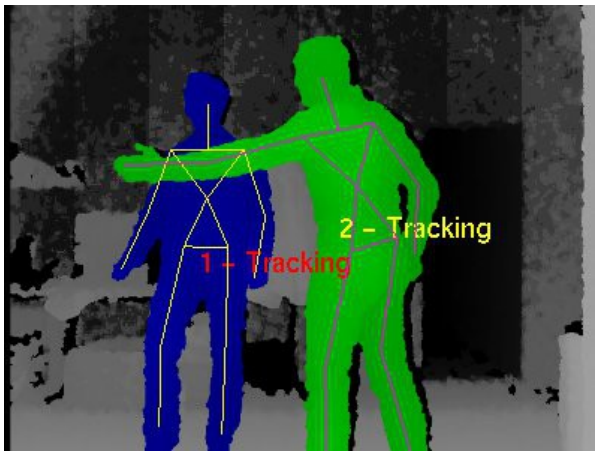

→ Better than 2D tracking

3rd dimension can be exploited to ease the segmentation and therefore the tracking.

Modeling interactive behaviour

Modeling interactive behaviour

Modeling interactive behaviour

Context

- Highly reactive systems (instantly react to user's stimuli)

Modeling interactive behaviour

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- Highly reactive systems (instantly react to user's stimuli)
- Gesture-based interaction

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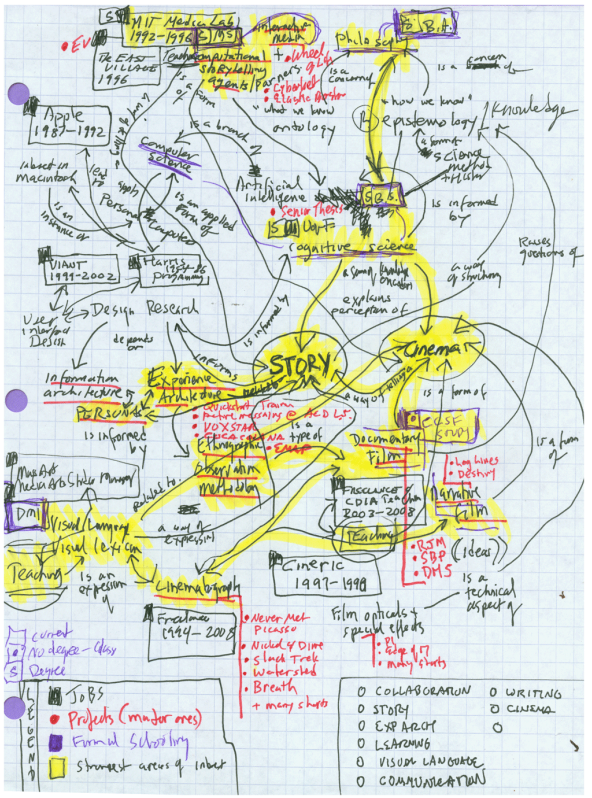
Visual language

- Higher level than code



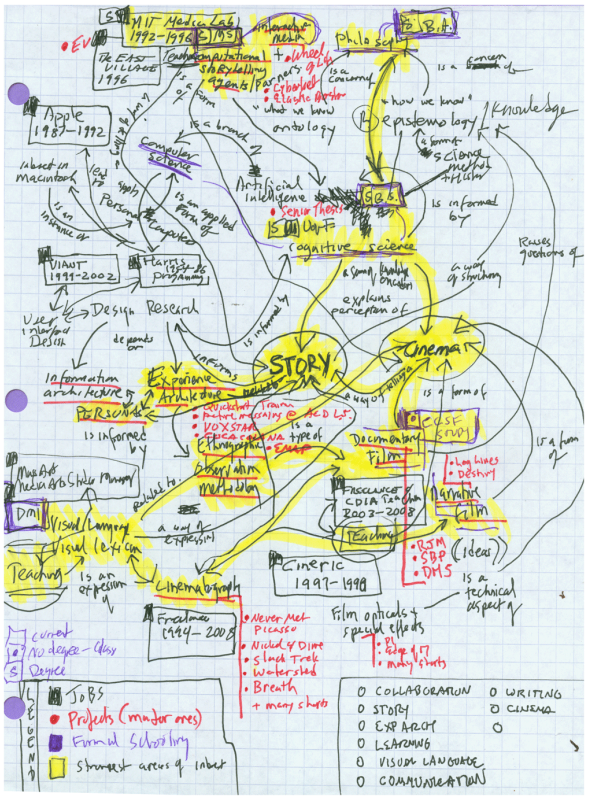
Modeling interactive behaviour

Context

- Highly reactive systems (instantly react to user's stimuli)
- Gesture-based interaction

Visual language

- Higher level than code
- Simple for non developpers



Modeling interactive behaviour

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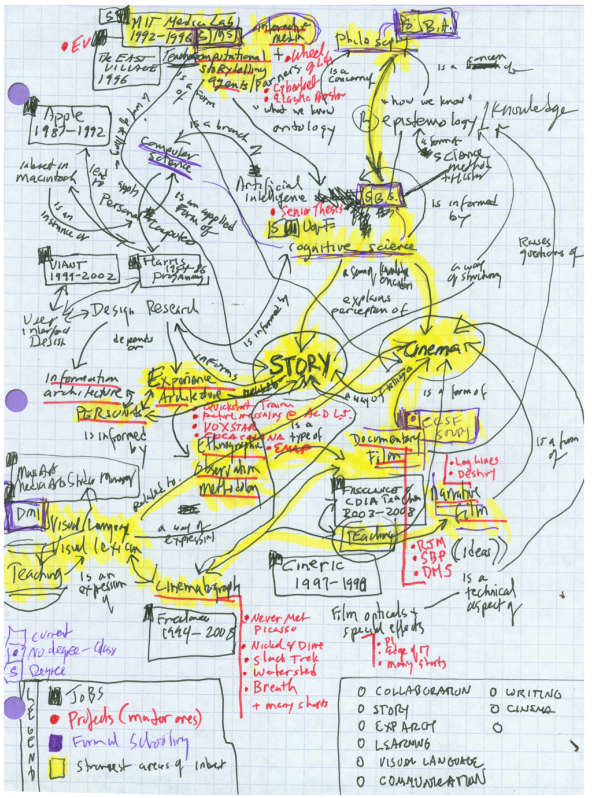
Visual language

- Higher level than code
- Simple for non developpers
- Easier to evolve



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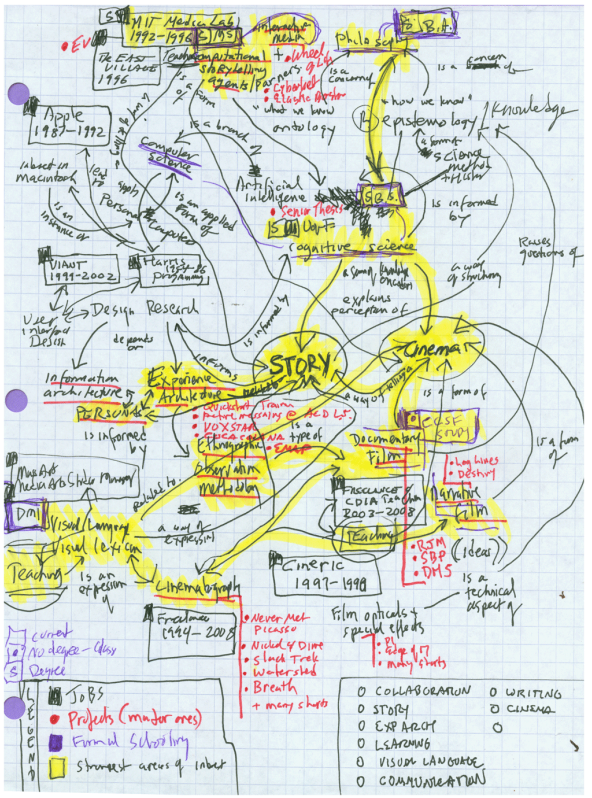
- Simple for non developpers
- Easier to evolve
- Reduced complexity



Modeling interactive behaviour

Context

- Highly reactive systems (instantly react to user's stimuli)
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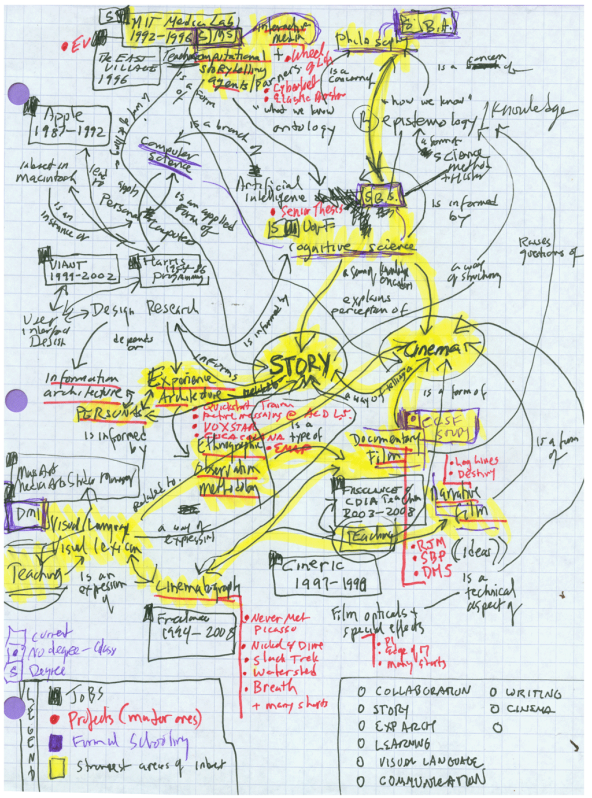
Visual language

- Higher level than code
- Simple for non developpers
- Easier to evolve
- Reduced complexity
- Amenable to formal analysis



Proof-of-concept application

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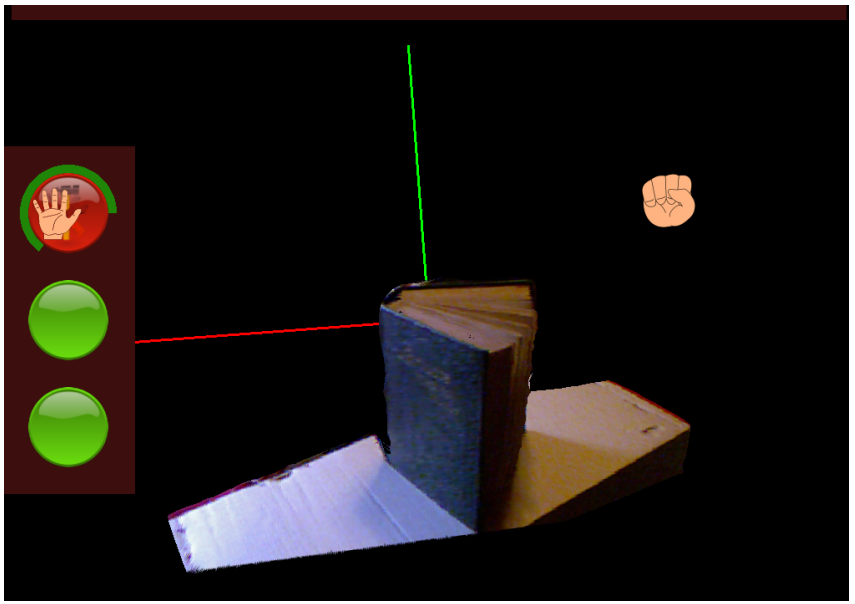
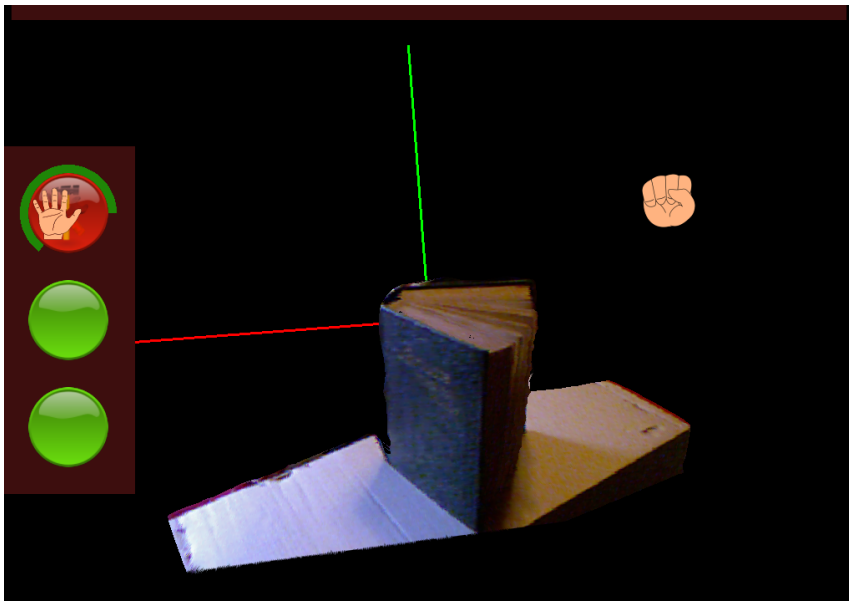
- 3D visual drawing tool



Proof-of-concept application

- 3D visual drawing tool
- Uses gestures to create and manipulate 3D objects



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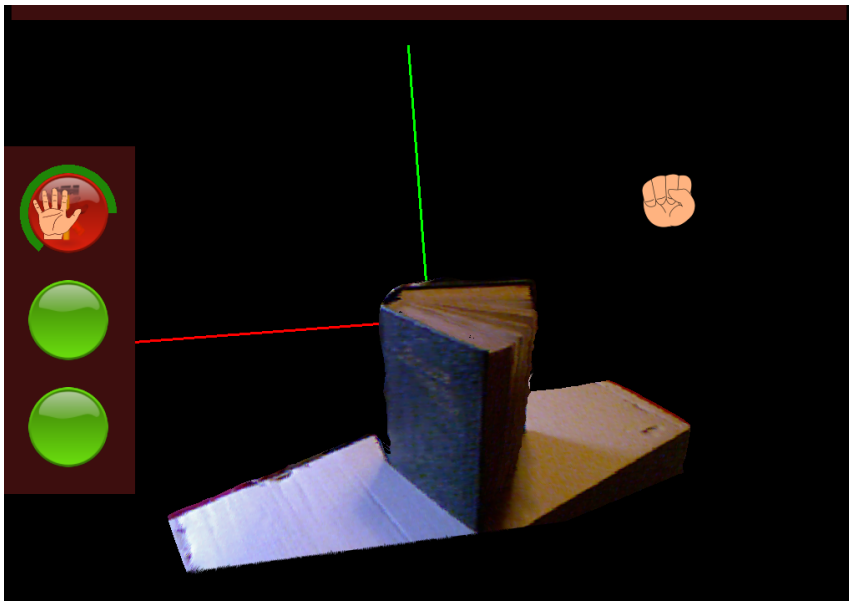
- Uses Kinect



Proof-of-concept application

- 3D visual drawing tool
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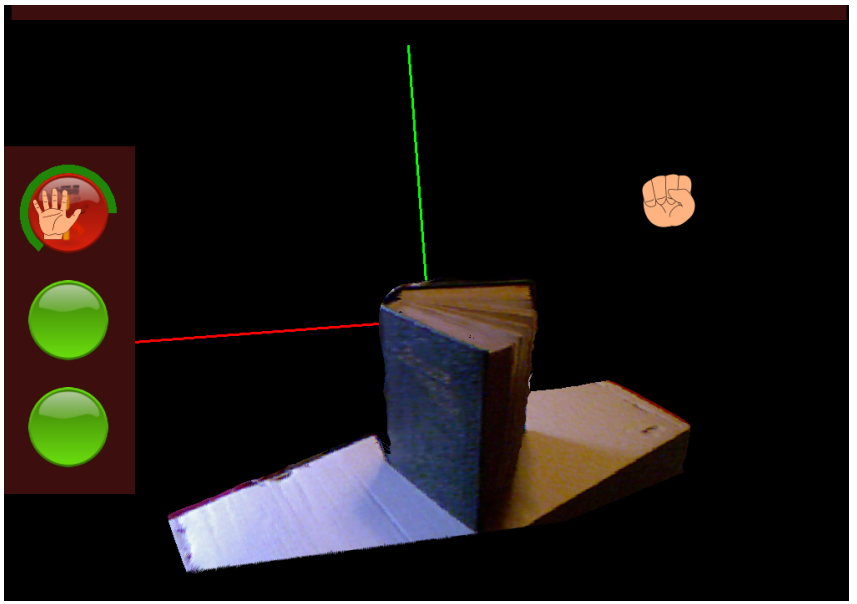
- (Part of Master thesis)

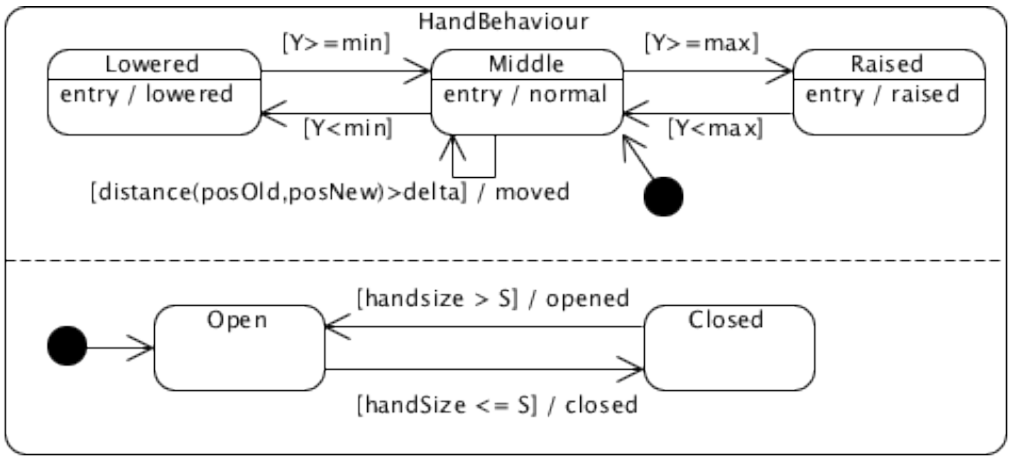


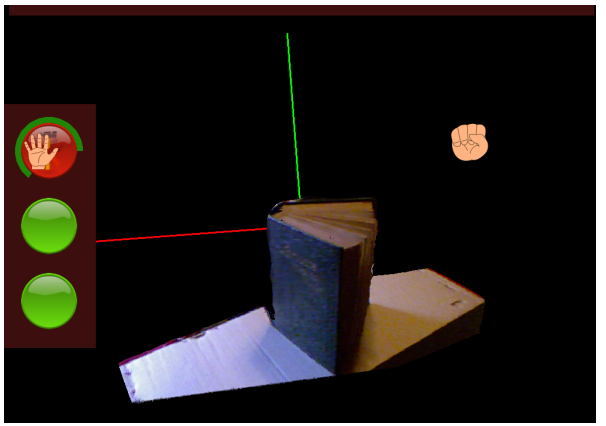
Statecharts

Statecharts

Statechart models - Hand

Example of statechart for modelling the behaviour of the hand in a gestural application





Work in progress

Work in progress

Work in progress

Actual work : Virtual library

- Book shelve filled with books

Work in progress

Actual work : Virtual library

- Book shelve filled with books
- Choose a book with hands

Work in progress

Actual work : Virtual library

- Book shelve filled with books
- Choose a book with hands
- Read it with realistic gestures

Conclusion

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- Work on 3D objects

Conclusion

- Work on 3D objects
  - Behaviour

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  - Recognition

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Thank you

Thank you for your attention !

Questions ?