

Manipulation of tangible and/or virtual objects in relation with the TangiSense RFID interactive table

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Introduction

Subject

- Description of a new type of tabletop
- Tabletop based on RFID (Radio Frequency IDentification)
- Technology which enables the user to manipulate tangible objects
- Tangible objects with RFID tags
- RFID Tags which offers the possibility to store data

Presentation

This presentation details the TangiSense interactive table, the software architecture as well as some applications using TangiSense.

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Related Works

Some Related Works in chronologic order

- First researches on interactive table/desk [Wellner, 1991]
- Design of an interactive table : DiamondTouch (Dietz and Leigh) [Dietz, 2001]
- SenseTable tracks some tangible objects electromagnetically [Patten *et. al*, 2001]
- Audiopad : A RF Tag-based Interface for Musical Performance [Patten *et. al*, 2003]
- ReacTable : A new electronic musical instrument by manipulating tangible objects [Jordà *et. al*, 2005]
- Intelligent Table : An interactive table using a Multi-Agent System [Panasonic, 2006]
- Presentation of Surface, the interactive table by Microsoft [Microsoft, 2008]
- mixiTUI : A Tangible Sequencer for Electronic Live Performances (Pedersen and Hornaek) [Pedersen, 2009]

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TTT : interactive Table with Tangible and Traceable objects

Subject

Proposition of an alternative vision of the way of using tangible objects on conjunction with an interactive tabletop. Tabletop using RFID technology.

Hardware

- Table composed of 25 tiles (5x5) for 1x1m of surface
- Each tile contains 64 RFID antennas
- Each tile has a DSP processor
- Ethernet link

TTT Project partners

Partners

- MultiCom LIG (Laboratoire d'Informatique de Grenoble)
 - Capture and Interface Layer
 - Traceability Layer
- LAMIH (Laboratoire d'Automatique, de Mécanique, et d'Informatique industrielles et Humaines)
 - Multi-Agent System part
 - Human-Computer Interaction part
- CEA (Commissariat à l'Energie Atomique)
 - Development of an industrial demonstrator
- RFIdées
 - RFID developer and integrator
 - Design of the table

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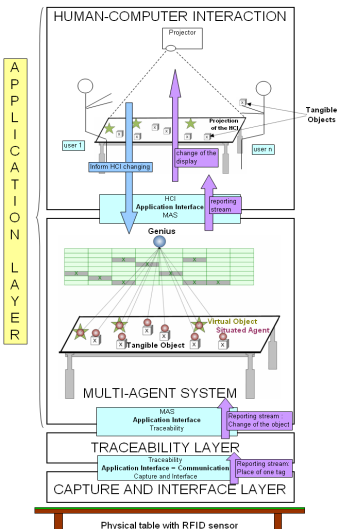
Structure and communication

Architecture in 3 layers

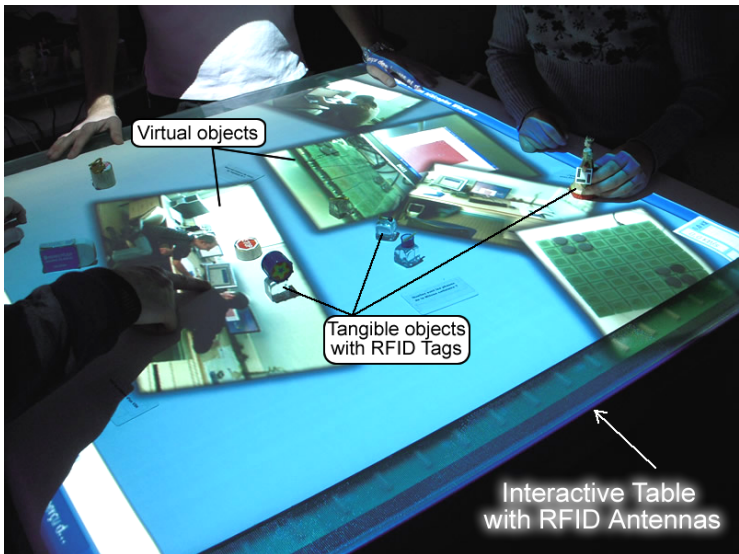
- The *Capture and Interface* layer : handles tangible objects provided with one or more RFID Tags
- The *Traceability* layer : handles events associated to the objects and communicates the modifications of objects positions to the applicative layer
- The *Application* layer manages the specificities of the application associated to the table

Application layer in 2 parts

- Multi-Agent System
 - Establishment and verification of correspondence between agents' roles and behavior
 - One agent is responsible of one virtual or tangible object
- Human-Computer Interaction
 - Direct interaction between users and future tabletop applications
 - Innovation in terms of Human-Computer Interaction in the use of an interactive table



TTT Table - Prototype v1



Applications

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Teaching

Colors learning

Allow a child learning colors according to scenarios proposed by a nursery school teacher

Presentation

- Child in nursery school
- Child of 2-6 years old
- Colors : green, blue, yellow, red + orange, purple
- 8 objects of each colors
- The objects have "lost" theirs colors

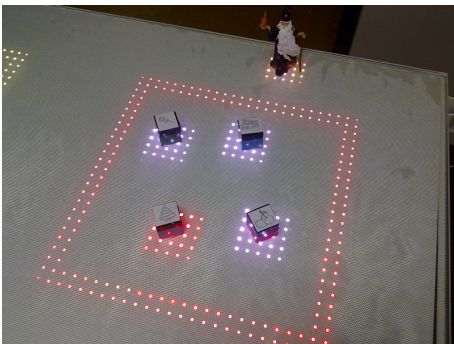
Teaching

Children should :

- Recognize the objects
- Place each objects in the colored appropriated zone
- Be sure of their choices
- Validate with the "magician"
- Correct their errors

Objectives

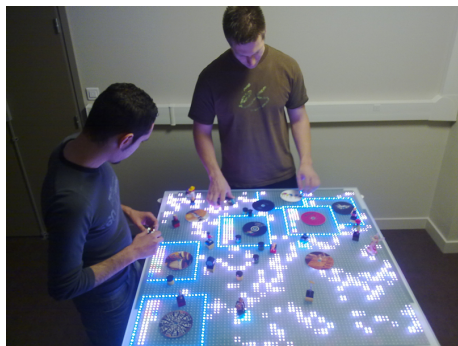
- Alternative of sticky labels
- Collaborative work
- Comprehension of mistakes
- Results for the teacher



Music

Creation of a musical universe with tangible objects

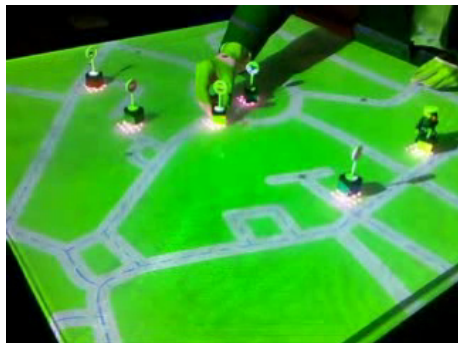
- Game of life based
- Some tangible objects are placed
- Objects with or without defined role
- A song is played if a cell is displayed under the object
- Random situation but dependent on the objects position



Interactive traffic simulator

Management of the traffic

- A map is videoprojected
- Map from cartography datas
- Each vehicule = one autonomous agent
- The experts place some objects (roadsign, traffic light, etc.)
- The agent adapts their behaviors contingent of the objects



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Conclusion

Conclusion

- Tabletop with original characteristics
- Interaction with virtual and tangible objects
- Innovations and new way of research in HCI as well as in MAS
- Development of some applications

Acknowledgements

- Agence Nationale de la Recherche (ANR)
- CITC - EuraRFID
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- MultiCom LIG (Laboratoire d'Informatique de Grenoble)
- RFIdees

The End

Thank you for your attention

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