VDesktop:

Event Management and Physically Based Behaviour in Tabletop Displays

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Content

- Introduction and motivation
- Event Management
- Implementation
  - 3D Widgets
  - VDesktop application
- Conclusions
- Future Work

Introduction

- TableTop displays
  - Novel user paradigms
  - More usable and intuitive interaction
- Alternative to the standard keyboard / mouse

- Input methods
  - Multi / single user
  - Gesture recognition
  - Touch screens
  - Combination
- Typical demo application:
  - Multimedia view and management (images, video,…)
  - Maps interactive visualization (zoom, pan, …)

State of the Art

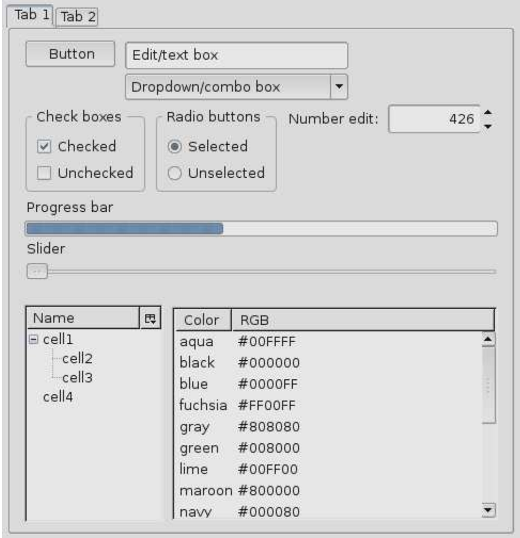
- HW/ SW combination
  - Diamond Spin
  - Sensetable
  - PerspectivePixel Wall
  - MS Surface ®
  - BumpTop Desktop

- Basics
  - Event management

DiamondSpin [Shen04], SenseTable [Patt01], PerceptivePixel wall [Han06], BumpTop Desktop [Agar06]

Motivation

- TableTop displays
  - 2D traditional GUI extension
  - Extension to 3D
- Event Handling Problem
  - Lot of elements in the system
  - All generating events at the same time
  - Different event sources
  - Different reactions is needed
- How mix succesfully a ...
  - ... VR system,
  - ... Physically based simulation,
  - ... (multi) user interactions,
  - .. in real time.



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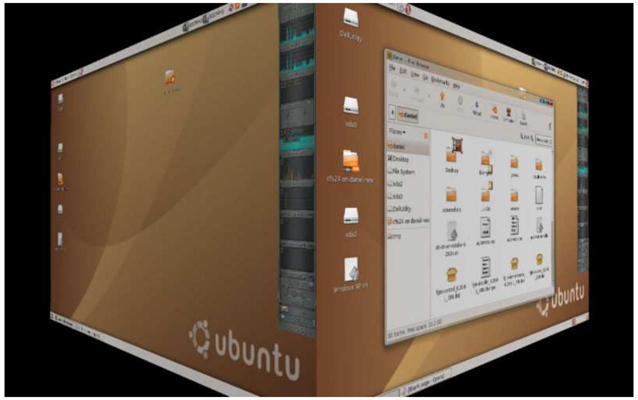
2D GUI controls



Compiz 3D

Event Management

- Input Events (classical mouse events)
  - *MoveEvent, PressedEvent, DragEvent, ReleaseEvent*

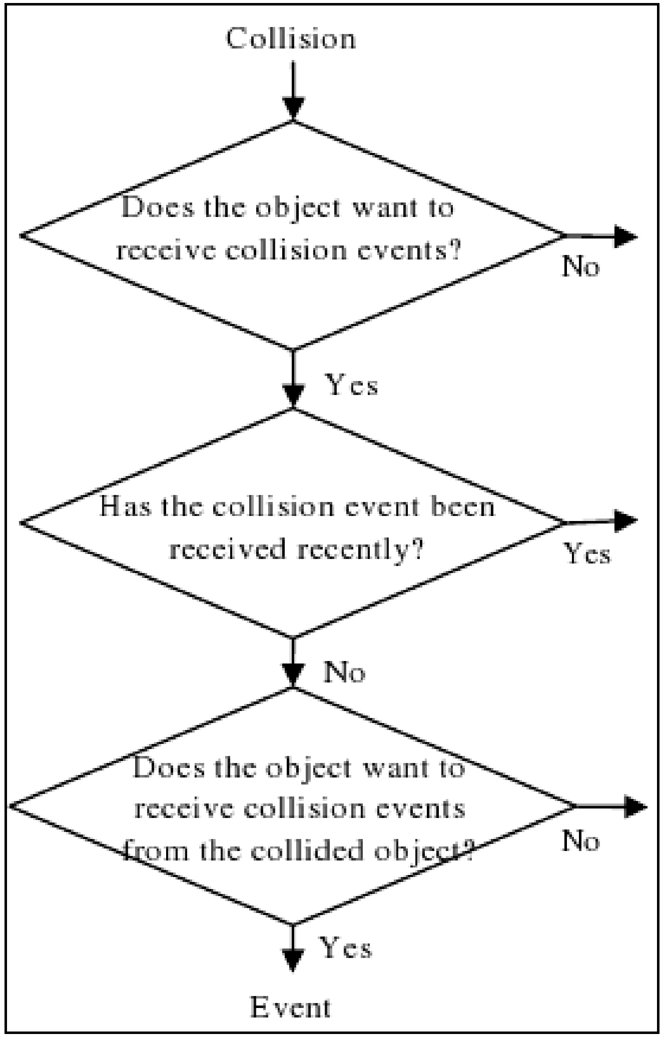
- Collision Events
  - When the physics engine detects a collision, a collision event is triggered

- System Events
  - *ConstantStepEvent*
    - The physics engine *doPhysics()* function is called at a fixed periodicity
  - *VariableStepEvent*
    - Triggered by the graphics rendering engine when it begins or ends a frame.
  - *ActionEvent*
    - Notifies the objects registered in a given action. *Observer pattern.*

Collision Event Management

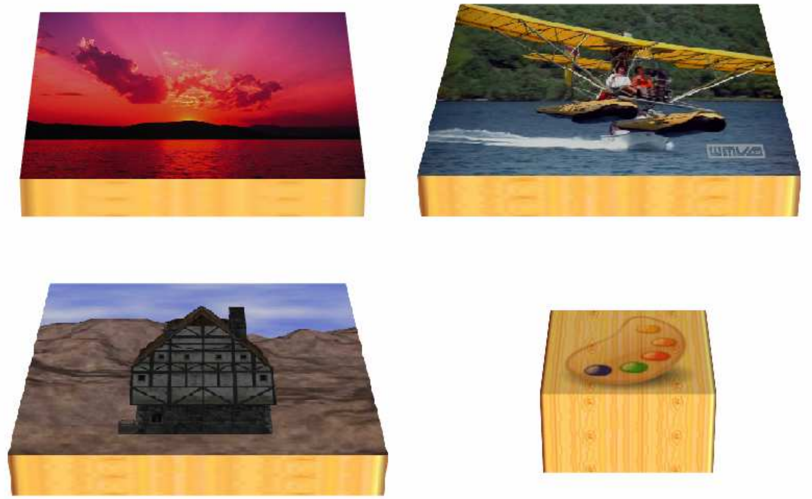
- Performance problems
  - Scalability.
  - Performance degradation
  - Usability issues. Bumpy objects

- Drop unnecessary collision
  - Objects must explicit declare that they want to receive collisions.
  - Filter continuous collisions.
  - Objects must explicit declare that they want to be collided.


Collision
Does the object want to receive collision events?
No
Yes
Has the collision event been received recently?
Yes
No
Does the object want to receive collision events from the collided object?
No
Yes
Event

Implementation (I). **Low Levels Widgets**

- GraphicNode (basic node)
  - A renderable widget.
- ImageNode
  - It shows a single image.
- VideoNode
  - It plays a video.
- RenderNode
  - It renders a 3D scene.
- ButtonNode
  - A simple user interaction element.

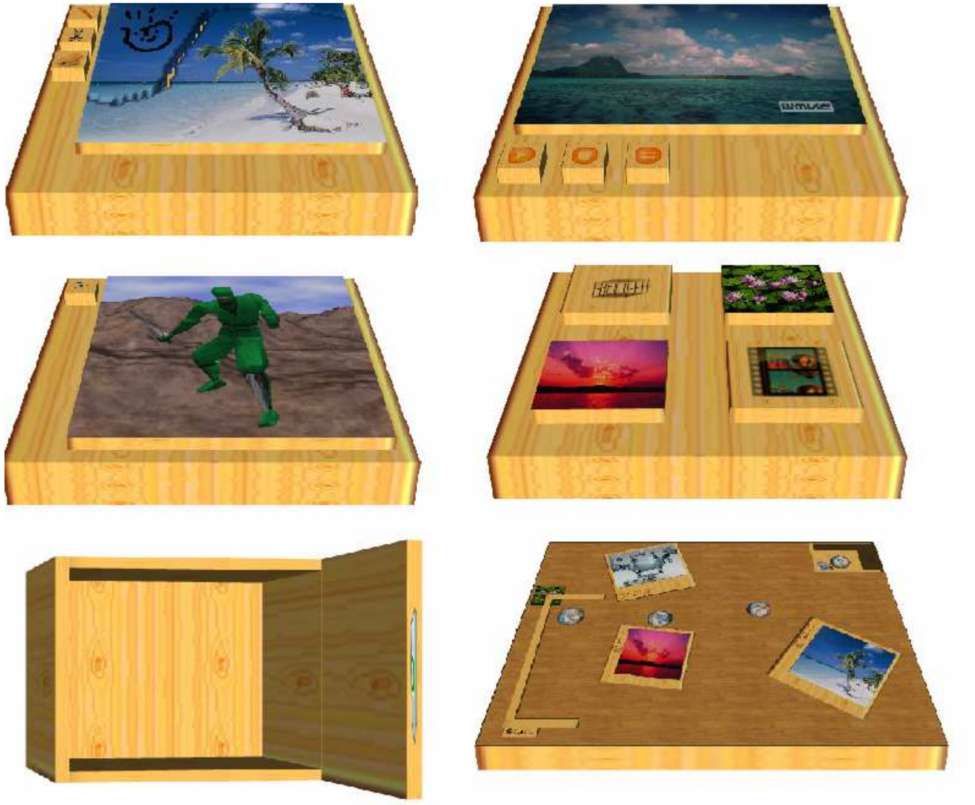


ImageNode / VideoNode

RenderNode / ButtonNode

Implementation (II). **High Level Widgets**

- ImageDocument
- VideoDocument
- MeshViewer
- FolderContainer
- RecycleBin
- VDesktop
  - Main container ….



ImageDocument / VideoDocument

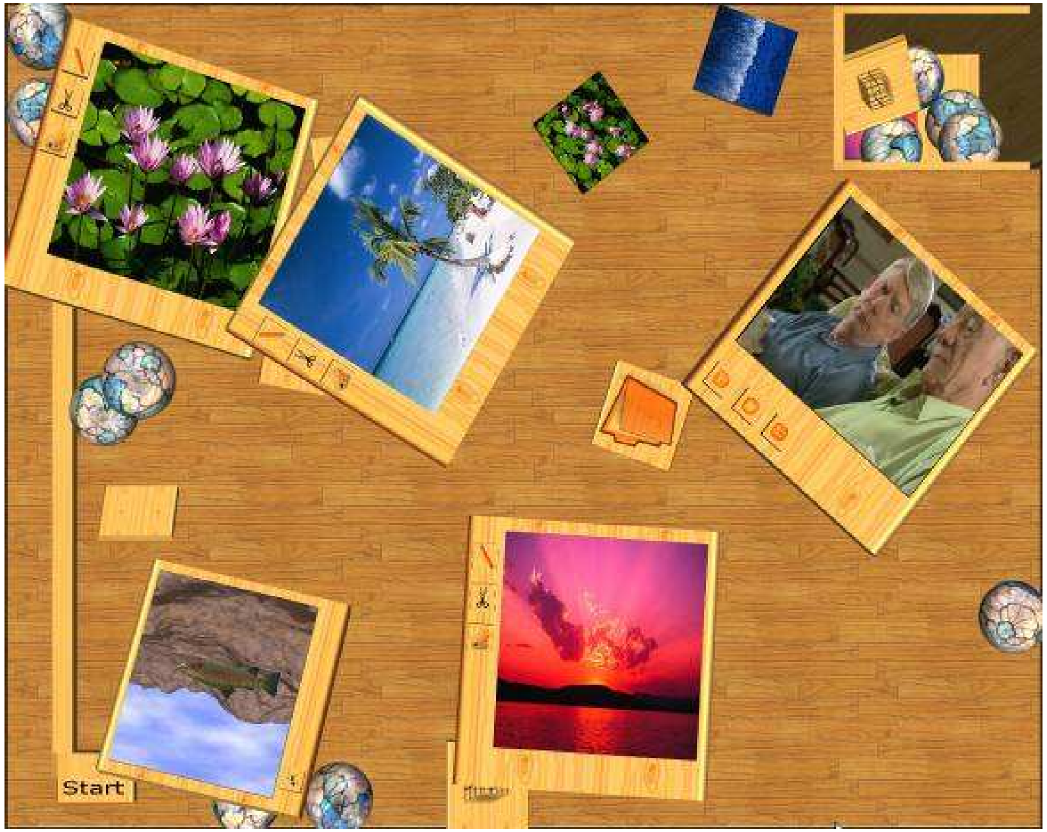
MeshViewer / FolderContainer

RecycleBin / VDesktop

Implementation (III). **VDesktop**

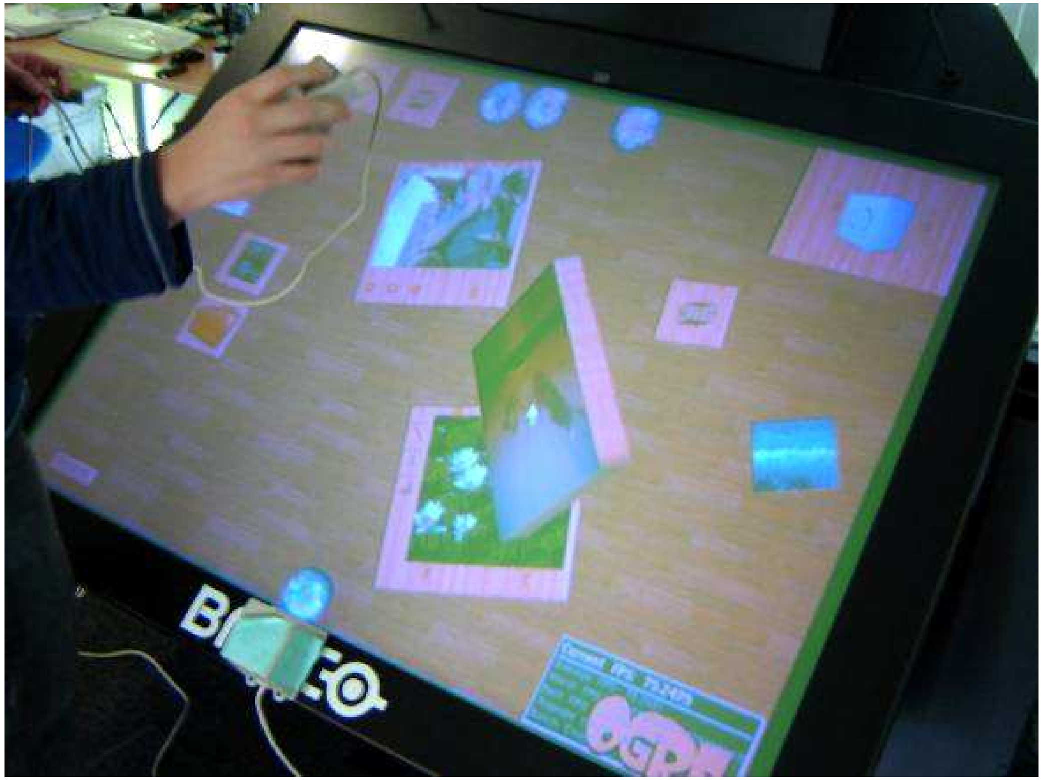
VDesktop

- Widget Container
  - Main root element
- Physics world
- User Interaction
- System HW
  - AMD Athlon XP 4200 (D-Core)
  - NVidia GeForce 7900 GS
  - 1 Gb RAM
- Sofware:
  - Ogre3D (Graphics)
  - ODE (Physics engine)



Conclusions

- Methodology to handle input events in digital table tops.
- 3D VR + Physics World
- Optimised
  - Physical Collisions
- Prototype
  - 3D Widgets
  - User interaction
  - Multimedia management
  - Virtual and physical desktop
- Integration with BARCO system with 3D spatial mouse



Future Work

- Add multi input support
  - In progress
- Add gesture recognition module
  - Planned
- Test with different hardware:
  - Input
  - Output
- Development of a 3D widgets library > 3D GUI Toolkit

Thanks

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