An Efficient Object-oriented Authoring and Presentation System for Virtual Environments

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Outline

- Motivation and requirements
- System architecture
- System concepts
- System implementation
- Applications
- Conclusion

Virtual Environments

- New Opportunities
  - WWW-based: VRML, Java 3D
  - Distributed multi-user environments
  - Increasing performance
- Old Problems
  - High efforts in time and cost for authoring
  - Presumption of certain skills

Requirements

- Multi-purpose systems
  - Interactive virtual environments
  - Semi-interactive visualizations
  - Presentations
  - Non-interactive photo-realistic animations
- Different user groups
  - Professional users
  - Users without VR-specific knowledge

Innovative Authoring Concepts

- Authoring process itself has to be improved
- In graphics authoring *Clipart* is a common concept

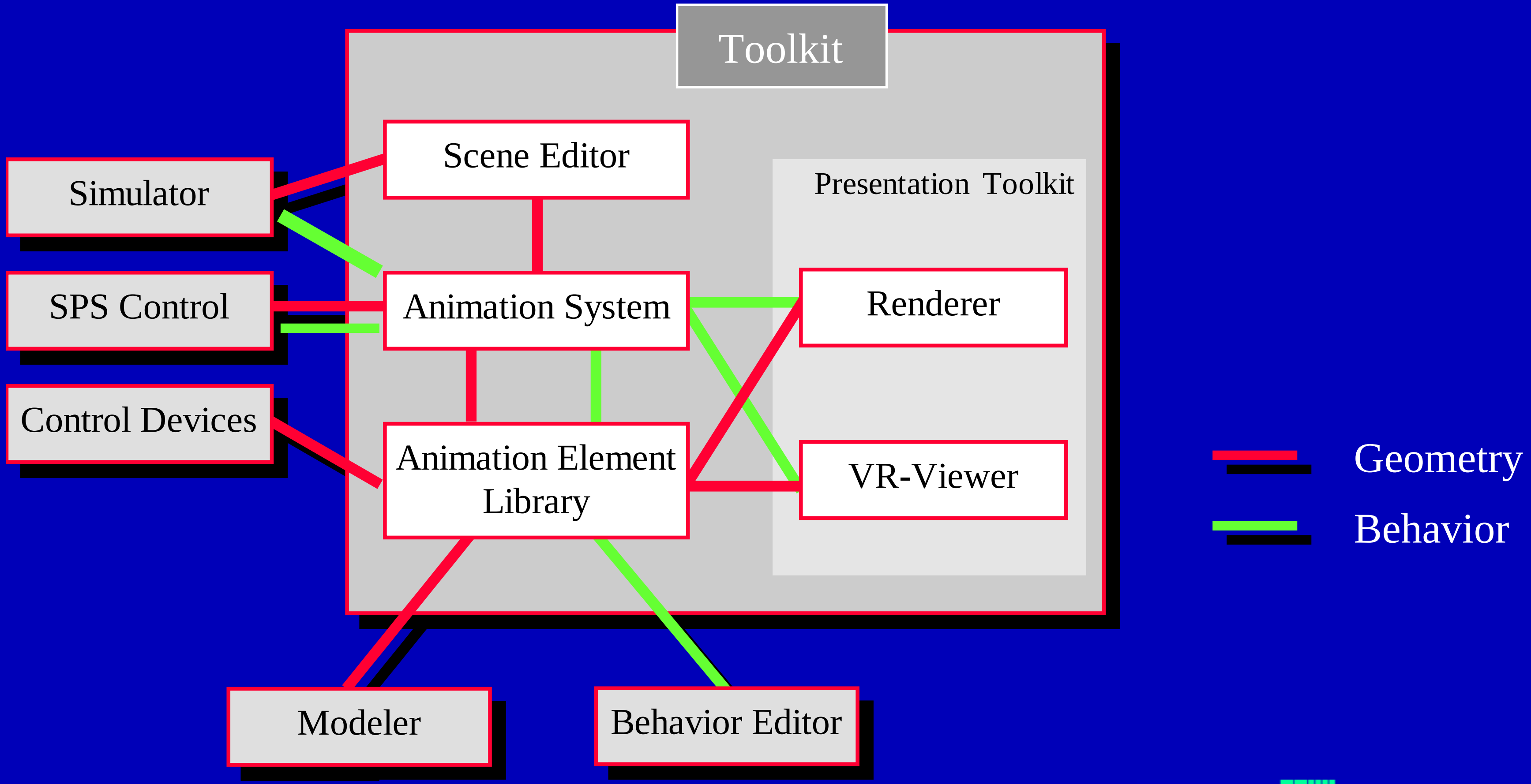
⇒ How do reusable components for animation authoring look like?

⇒ Is it possible to have Clipart in 3D animation?

Object-Orientation

- Applied to the system (e.g. abstract rendering class)
- Applied to the authoring (e.g. entities in the virtual environment are modelled as instances of classes)

Architecture Overview

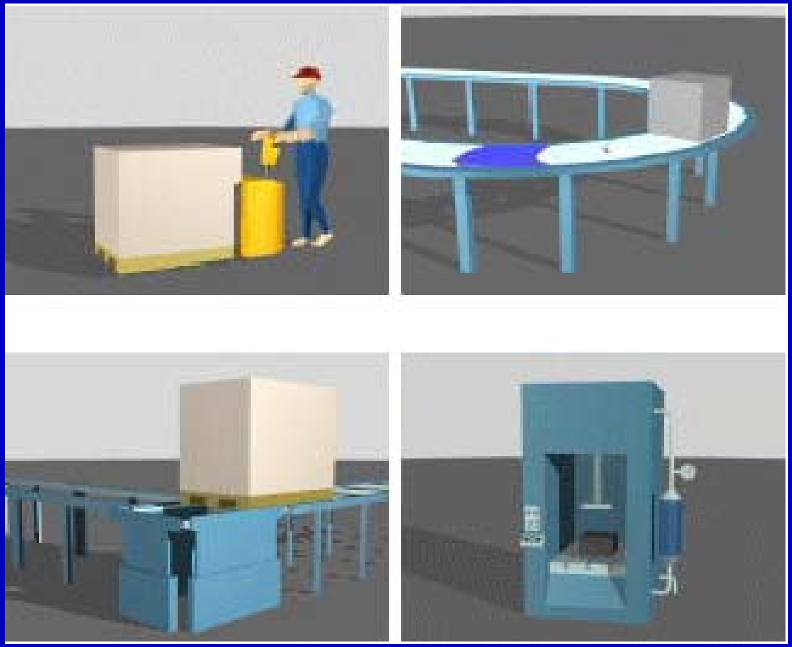


Architecture

- Several independent and coordinated tools
- Geometry and behavior
- Flexible concept already used by animation systems (e.g. Clockworks) or visualization systems (e.g. Khoros) applied to support interactive and behavioral entities

Definition: Animation Element (I)

- Analogous to Clipart
- Animation Element: Not Geometry only

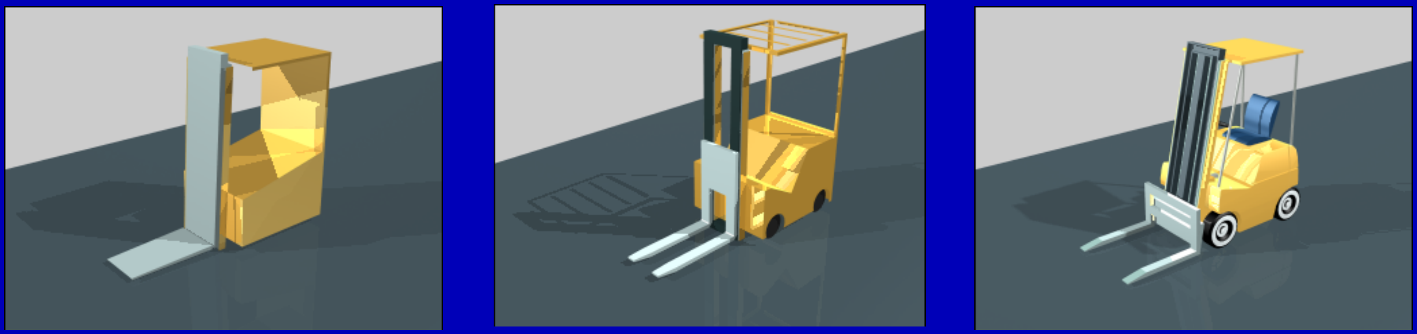


Definition: Animation Element (II)

- is an independent entity
- represents an object of the user’s “world”
- comprises a description of
  - visual appearence
  - specific behavior (animation definition, application logic, interaction facilities)

Visual Design

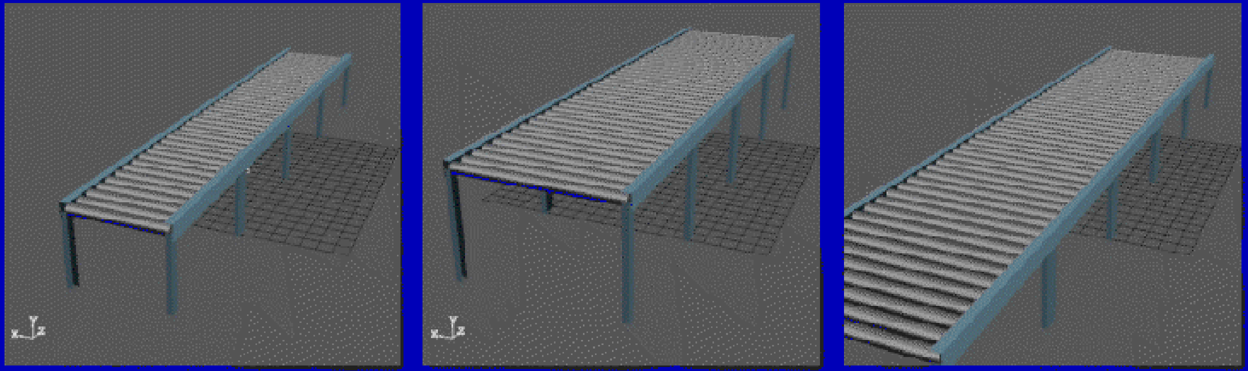
- Identifying animation elements
- Design not for one specific application
- Representation forms



- Level of detail

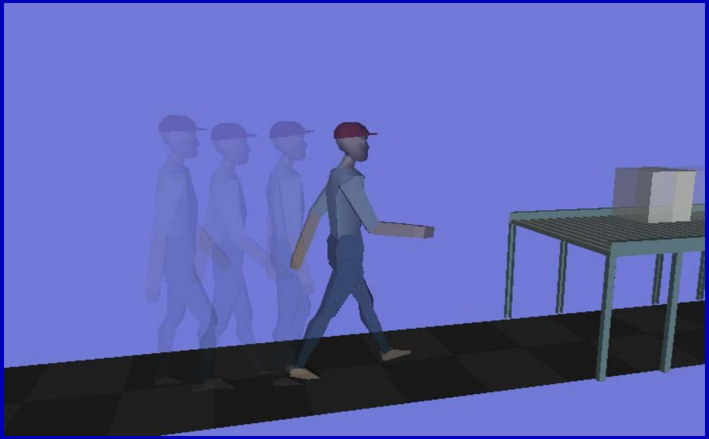
Behavior

- Providing of functionality
- Basic functionality vs. element-specific functionality
- Example: *scale*

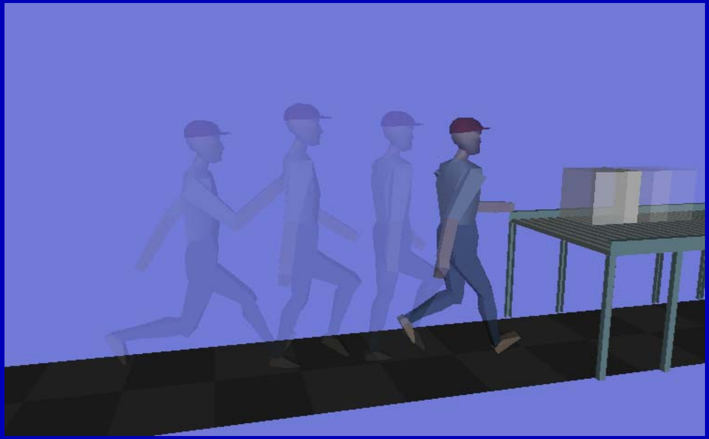


Functionality with Parameters

- Object-specific “intelligence”
- Example: *walk* (parameter: speed)

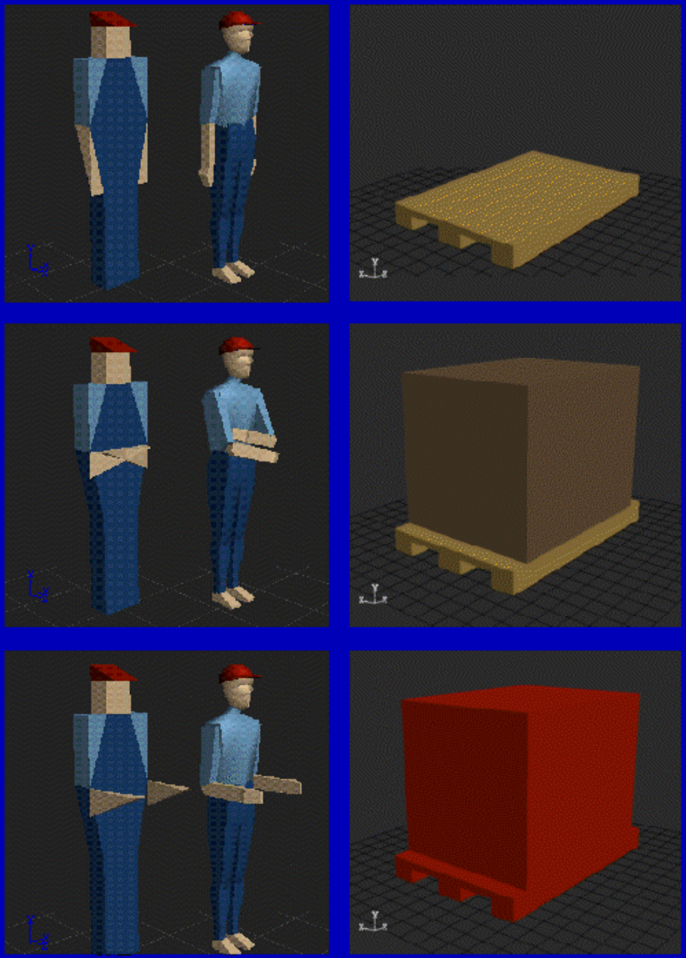


slow



fast

Object-specific State



Scripting Interface - Example

```
peter = new Person( );
peter.scaleLength( 1.82 );
peter.setExpression( Expression::ANGRY);
pos1 = new Position( 3, 0, 5 );
pos2 = new Position( 1, 0, 1 );
time  = new Time( 0.0 )
peter.walk( time, time+5, pos1, pos 2 );
```

Scripting Interface

- Scripting interface should be transparent for the user
- Example: Script generated automatically by mapping scene editor information and simulation events
- Compilation of the script leads to internal representation that is used to support different output formats

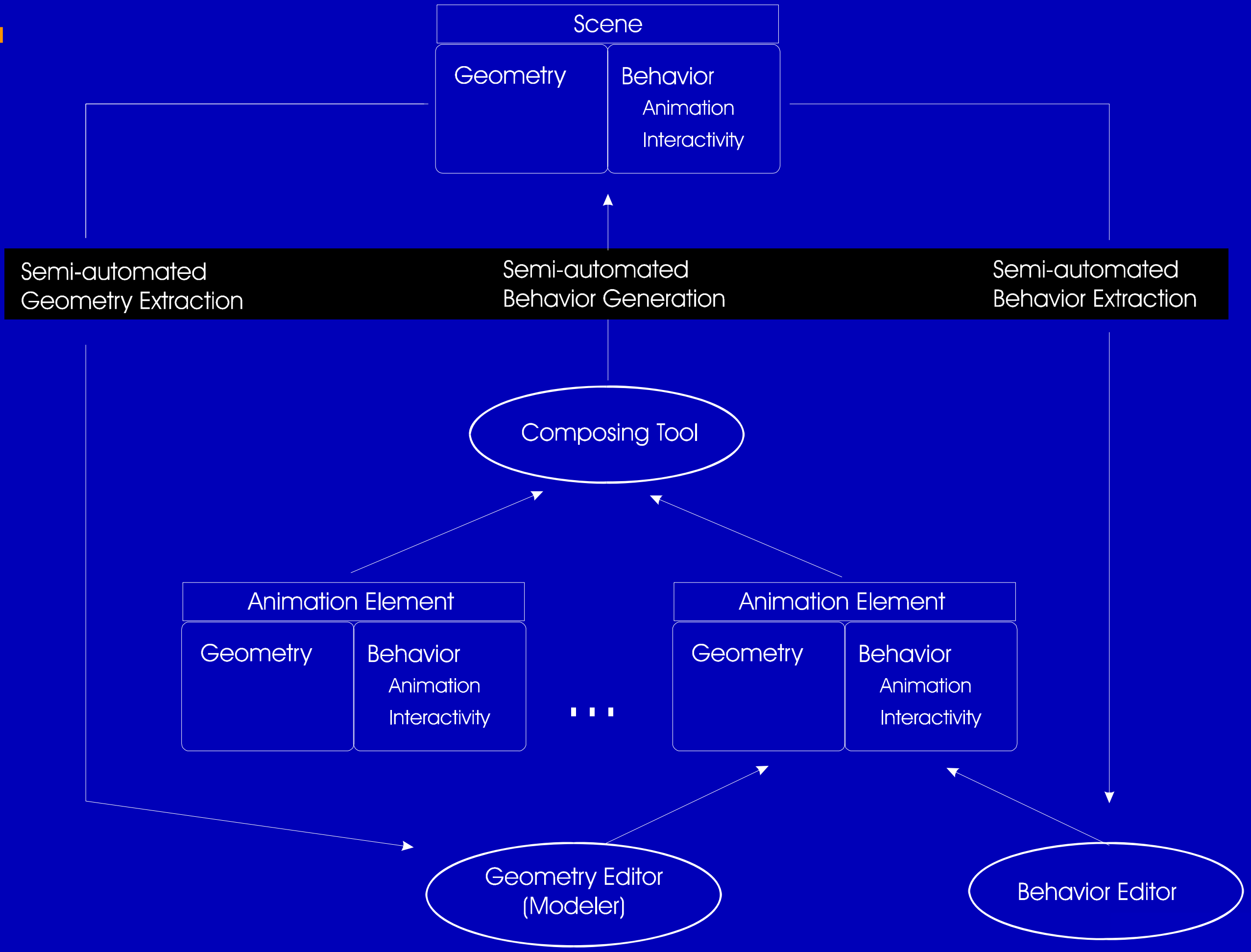
The CASUS System

- CASUS
  - Computer Animation of Simulation Traces
- A tool for automatic generation of 3D animation from event oriented simulator data
- Developed as part of the Demonstration Centre Simulation in Production and Logistics

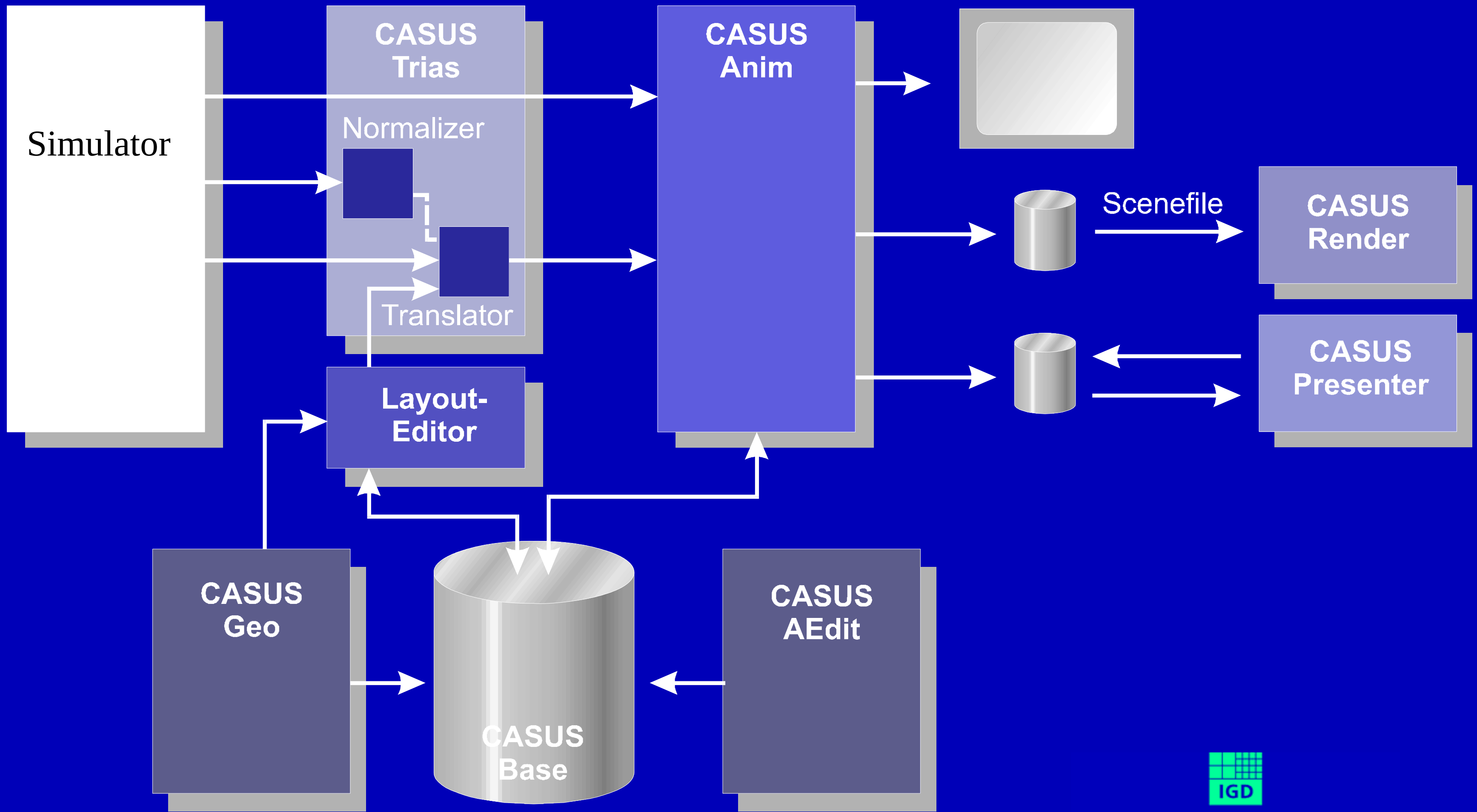
Authoring

- System programers implement different linkage modules and output drivers
- Element programmers model and implement animation elements
- Authors create and edit scenes
- Users view and/or interact with the scene

Authoring Concept



Systemarchitecture of CASUS System



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Moscow, Russia, http://www.graphicon.ru/

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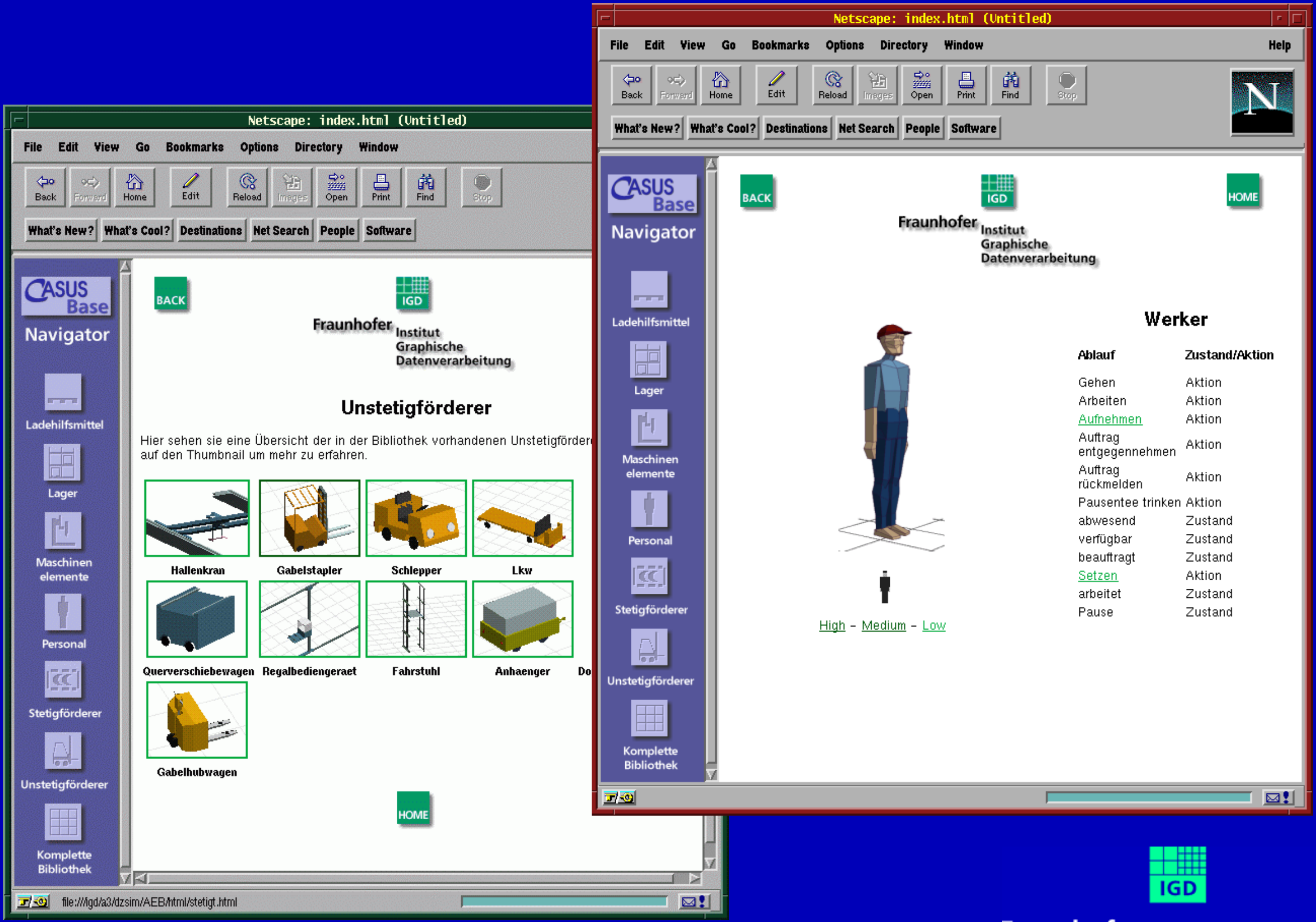
CASUS Base: A Library


Netscape: index.html (Untitled)
File Edit View Go Bookmarks Options Directory Window Help
Back Forward Home Edit Reload Images Open Print Find Stop
What's New? What's Cool? Destinations Net Search People Software
CASUS Base Navigator
Ladehilfsmittel
Lager
Maschinen elemente
Personal
Stetigförderer
Unstetigförderer
Komplette Bibliothek
BACK
IGD
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HOME
file://igd/a3/dzsim/AEB/html/stetigt.html

Unstetigförderer

Hier sehen sie eine Übersicht der in der Bibliothek vorhandenen Unstetigförderer auf den Thumbnail um mehr zu erfahren.

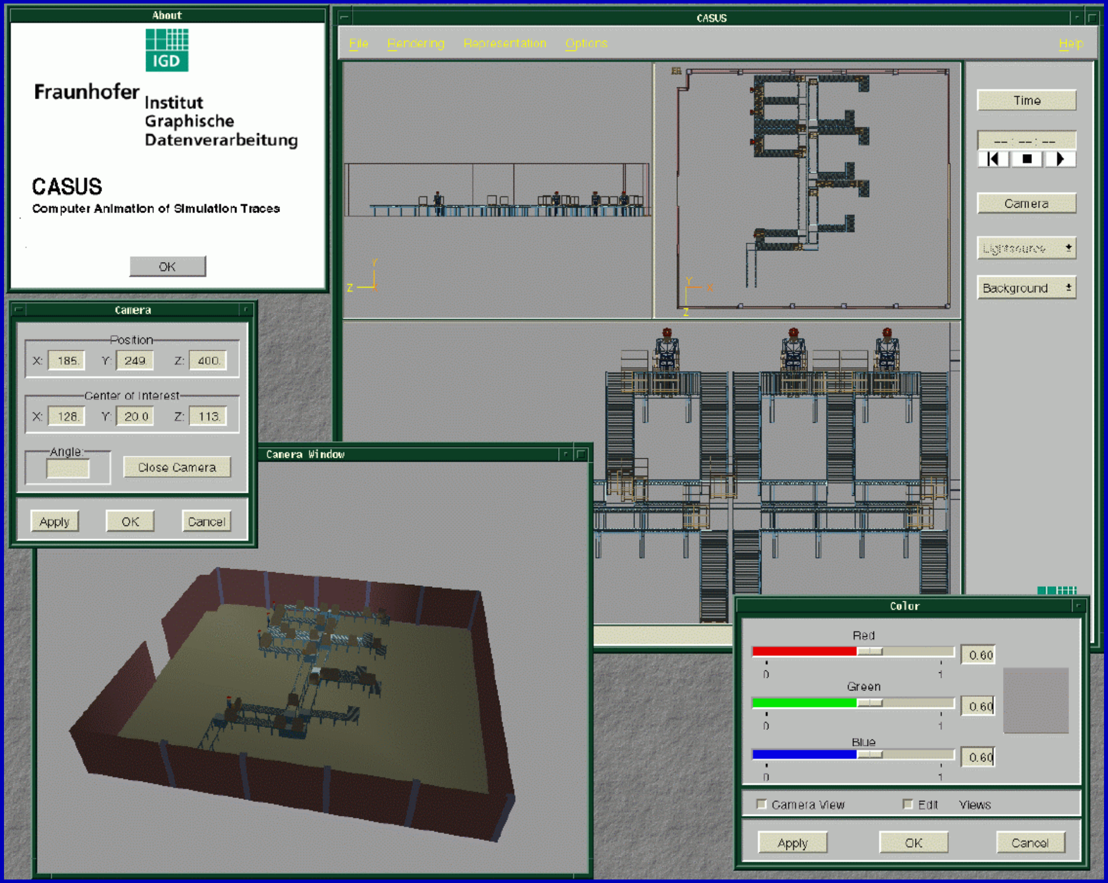
Hallenkran, Gabelstapler, Schlepper, Lkw, Querverschiebewagen, Regalbediengeraet, Fahrstuhl, Anhaenger, Do, Gabelhubwagen

Werker

Ablauf	Zustand/Aktion
Gehen	Aktion
Arbeiten	Aktion
Aufnehmen	Aktion
Auftrag entgegennehmen	Aktion
Auftrag rückmelden	Aktion
Pausentee trinken	Aktion
abwesend	Zustand
verfügbar	Zustand
beauftragt	Zustand
Setzen	Aktion
arbeitet	Zustand
Pause	Zustand

High - Medium - Low

CASUS Anim: An Animation System



About

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CASUS

Computer Animation of Simulation Traces

Camera

Position

X: 185. Y: 249 Z: 400.

Center of Interest

X: 128. Y: 20.0 Z: 113.

Angle:

Color

Red 0.60

Green 0.60

Blue 0.60

☐ Camera View ☐ Edit Views

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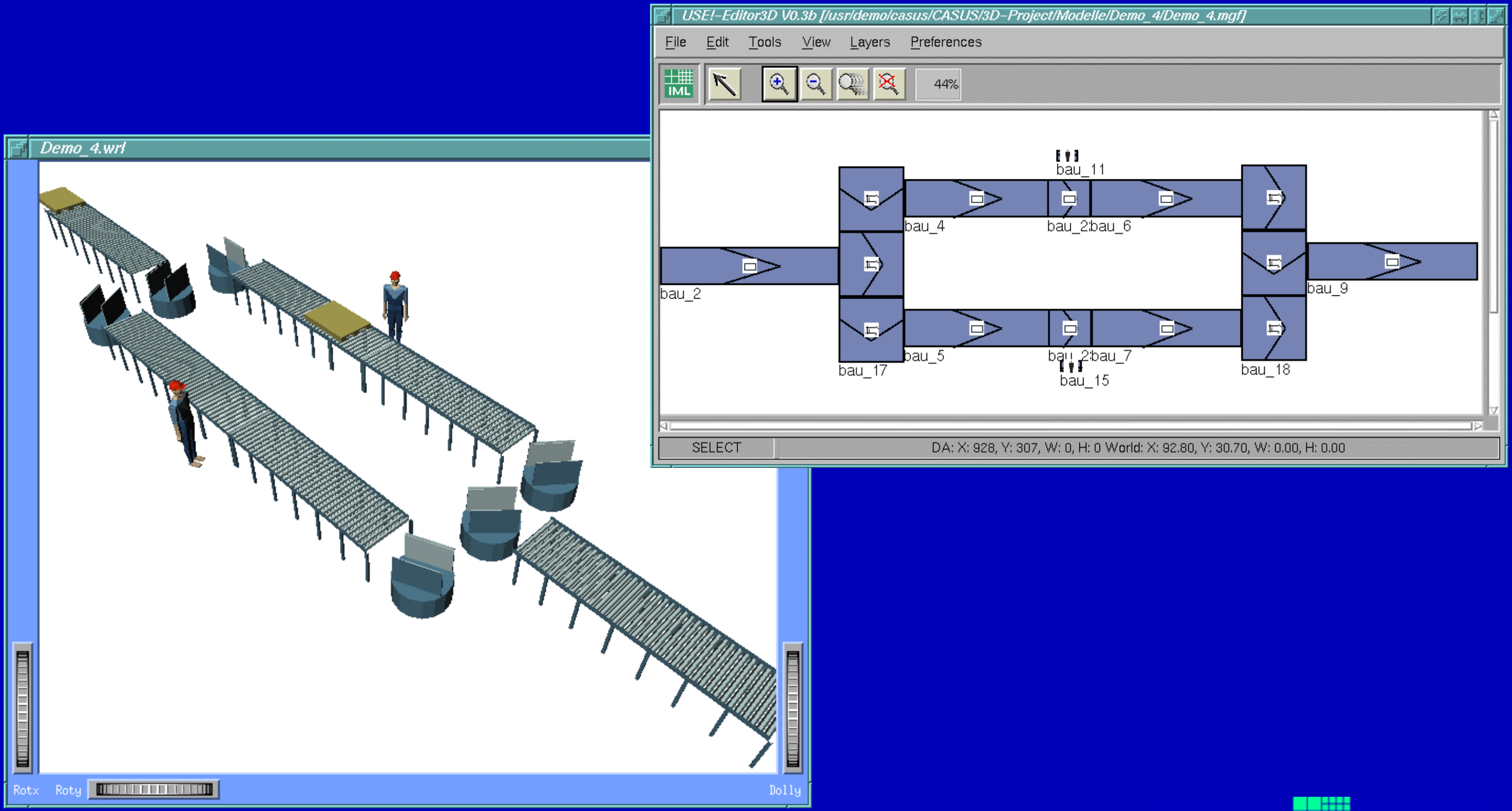
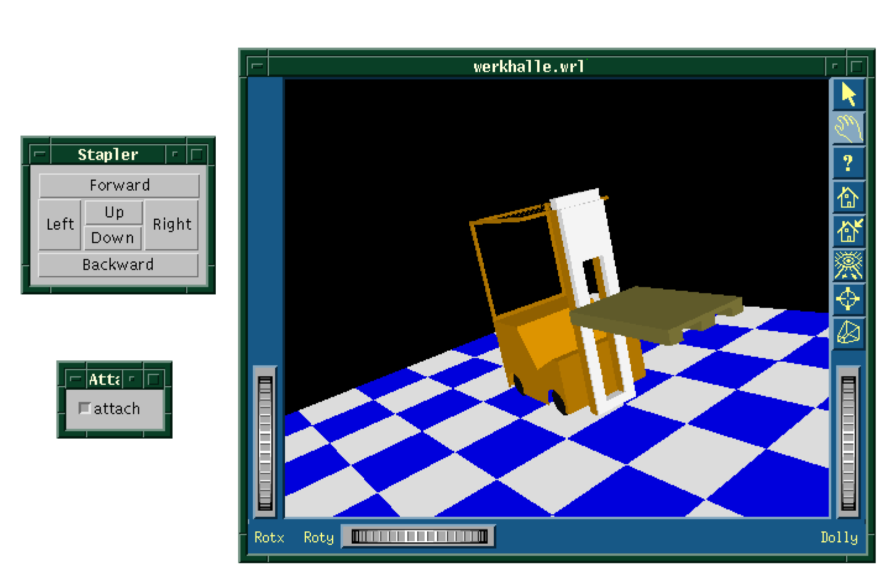
Authoring with Simulator Linkage

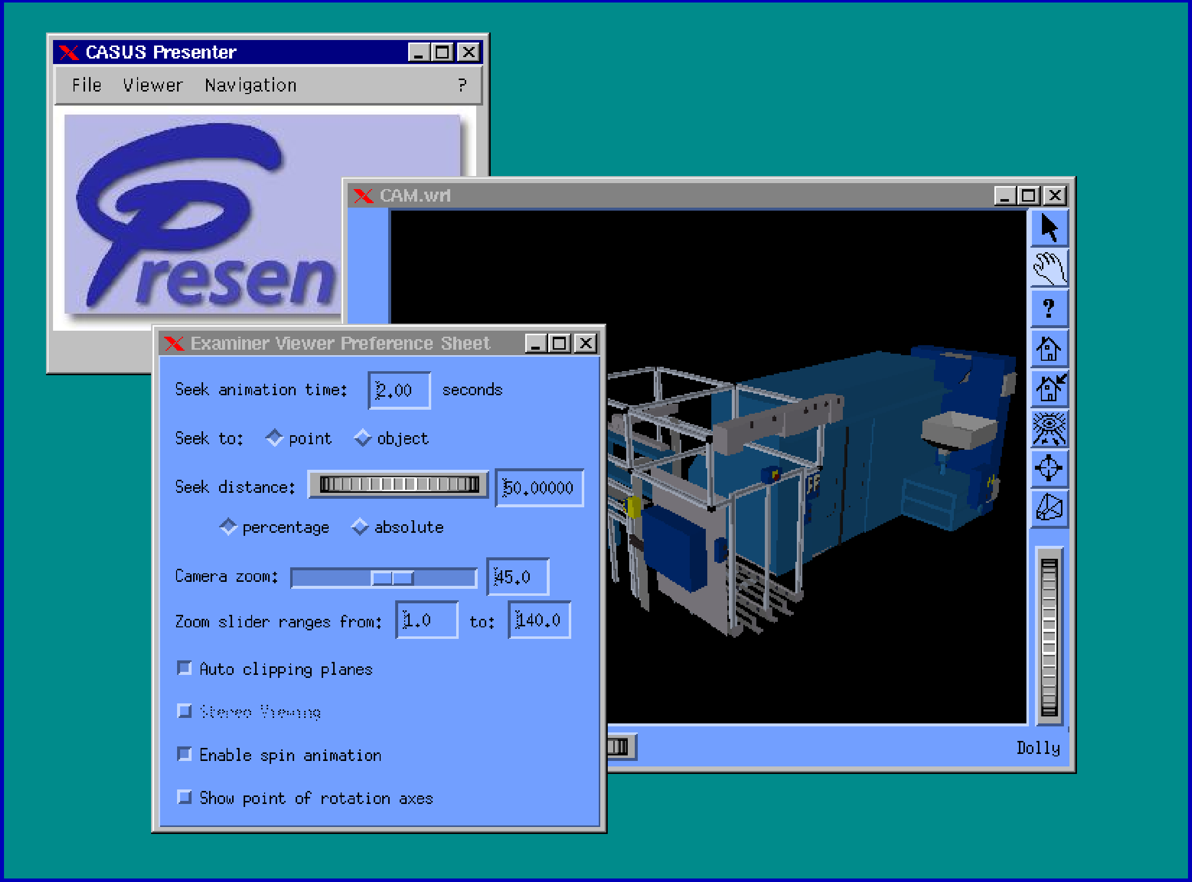

USE!-Editor3D V0.3b [/usr/demo/casus/CASUS/3D-Project/Modelle/Demo_4/Demo_4.mgf]
File
Edit
Tools
View
Layers
Preferences
IML
44%
bau_11
bau_4
bau_2:bau_6
bau_2
bau_9
bau_5
bau_2:bau_7
bau_15
bau_17
bau_18
SELECT
DA: X: 928, Y: 307, W: 0, H: 0 World: X: 92.80, Y: 30.70, W: 0.00, H: 0.00
Demo_4.wrl
Rotx
Roty
Dolly

Example: VRML Output

- Geometry: VRML   Behavior: Java
- Using the VRML external authoring interface



CASUS Presenter



Seek animation time: 2.00 seconds

Seek to: ◇ point ◇ object

Seek distance: 50.00000

◇ percentage ◇ absolute

Camera zoom: 45.0

Zoom slider ranges from: 1.0 to: 140.0

□ Auto clipping planes

□ Stereo Viewing

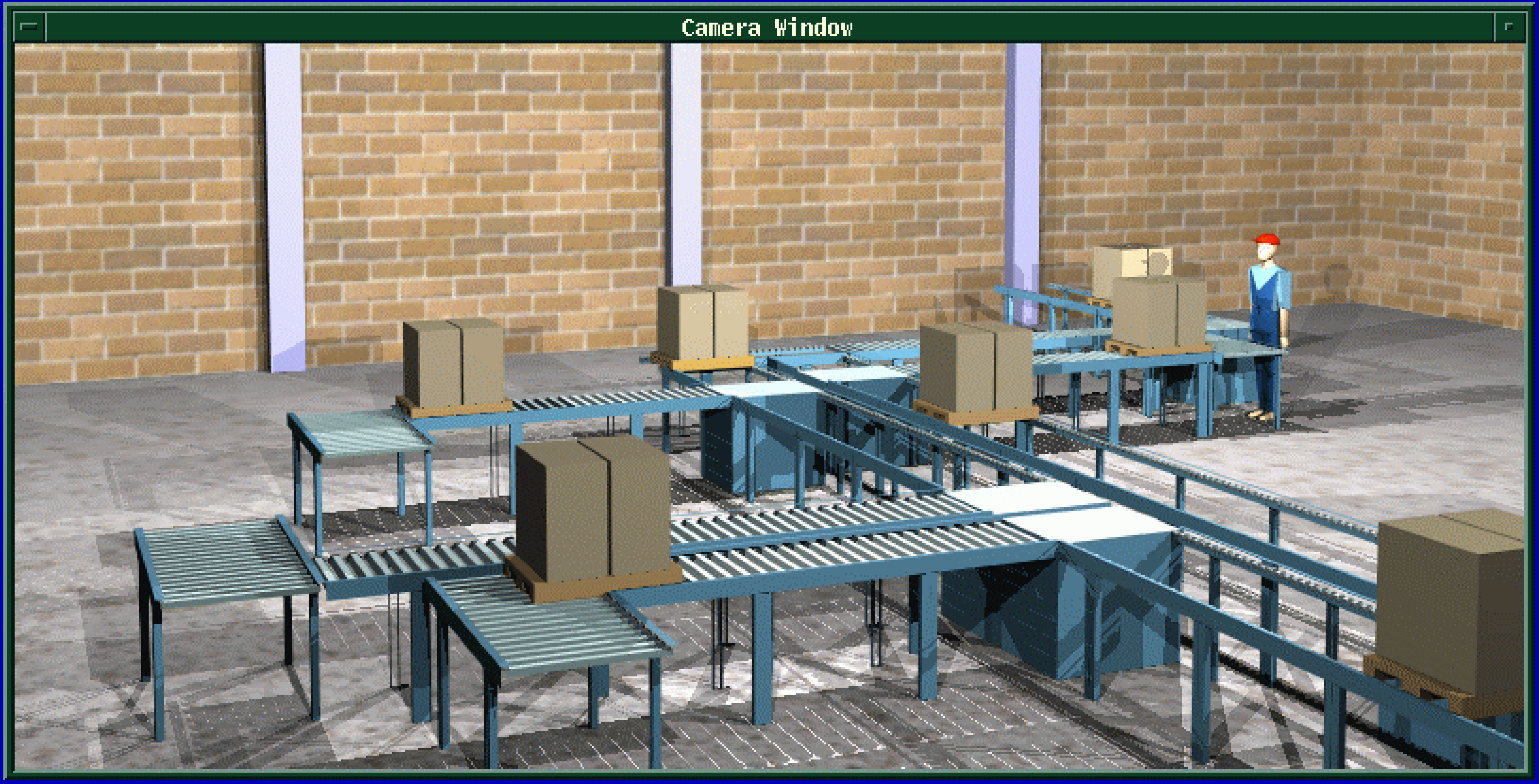
□ Enable spin animation

□ Show point of rotation axes

Flexibility

- Design of each tools should keep multi-purpose requirement in mind
- Example: CASUS Presenter
  - Platform independence (PC to high-end graphics workstation)
  - VR scalability (ranging from desktop VR to immersive VR, e.g. video-based head-tracking, adaption for virtual table, stereo viewing)

Applications (I)



Applications (II)

- Architectural visualization
- Simulation result visualization
- Planning support
- Seamless integration in WWW courses
- Medical applications
- 3D graphical user interfaces

Conclusion

- Animation element concept is a novel Clipart - like authoring and presentation paradigm
- Cost-effiecency and Reusability
- Modular toolkit
- CASUS: Implementation with VRML output

Question & Answers

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