Generating Adaptable Multimedia Software from Dynamic Object-Oriented Models: The *OBJECTWAND* Design Environment

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Introduction

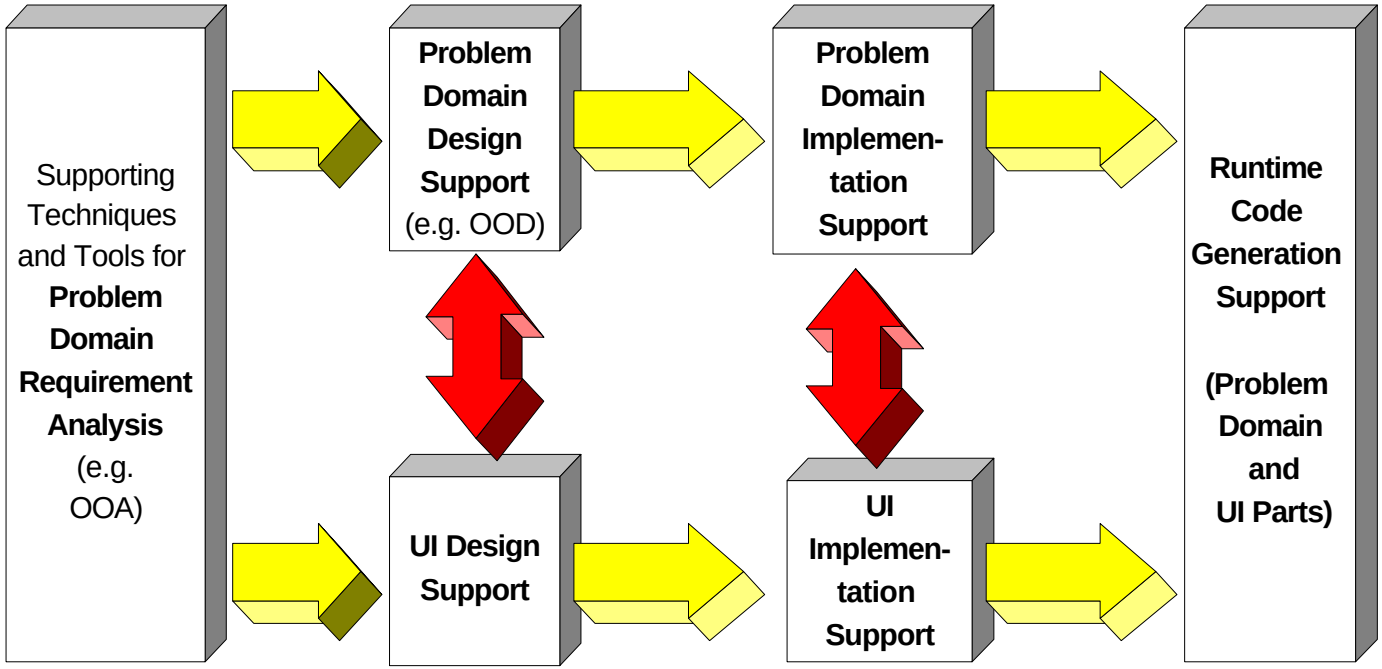
- From *AME* to *ObjectWand*
- Automated, model-based design of adaptable multimedia applications
- Designer-system cooperation over the whole life cycle
- Looking for automation tasks in life cycle activities
- Integrating multimedia-specific design requirements into OO application models
- Future directions

From *AME* to *OBJECTWAND*

- *OBJECTWAND*
  - evolutionary successor to *AME,* a design and generation environment for interactive applications based on dynamic OOA/D-models
- Related work on model-based systems
  - current state-of-the-art is documented in [Vanderdonckt, 1996]
- *OBJECTWAND* introduces
  - improved features for detailed OO modeling and design
  - easy integration of standard multimedia elements
  - better cooperation between interactive and automated design and generation tools
  - a new application generator component (Borland Delphi)

Integration of the life cycles

- OO technology as the common denominator

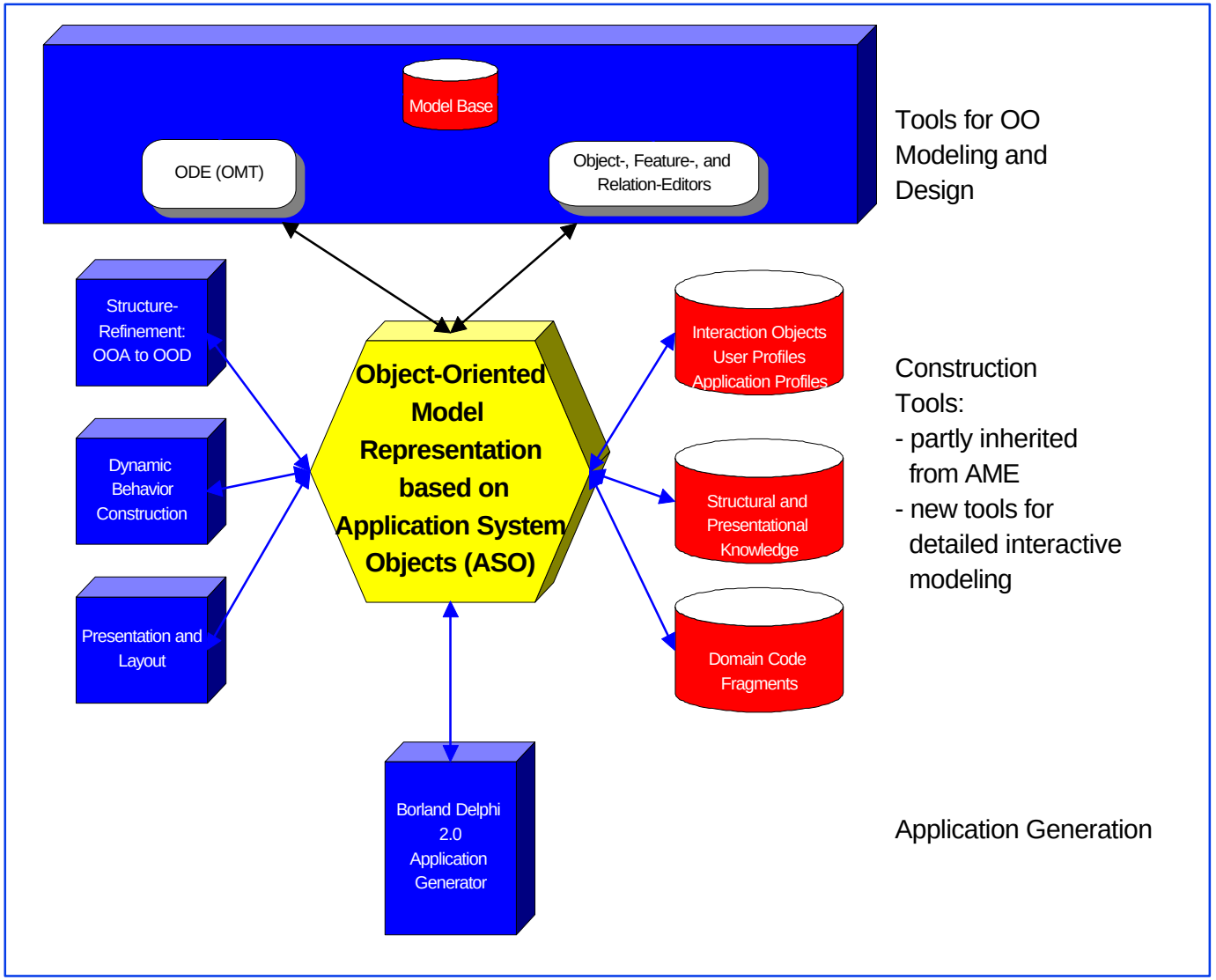


Unifying specification and generation

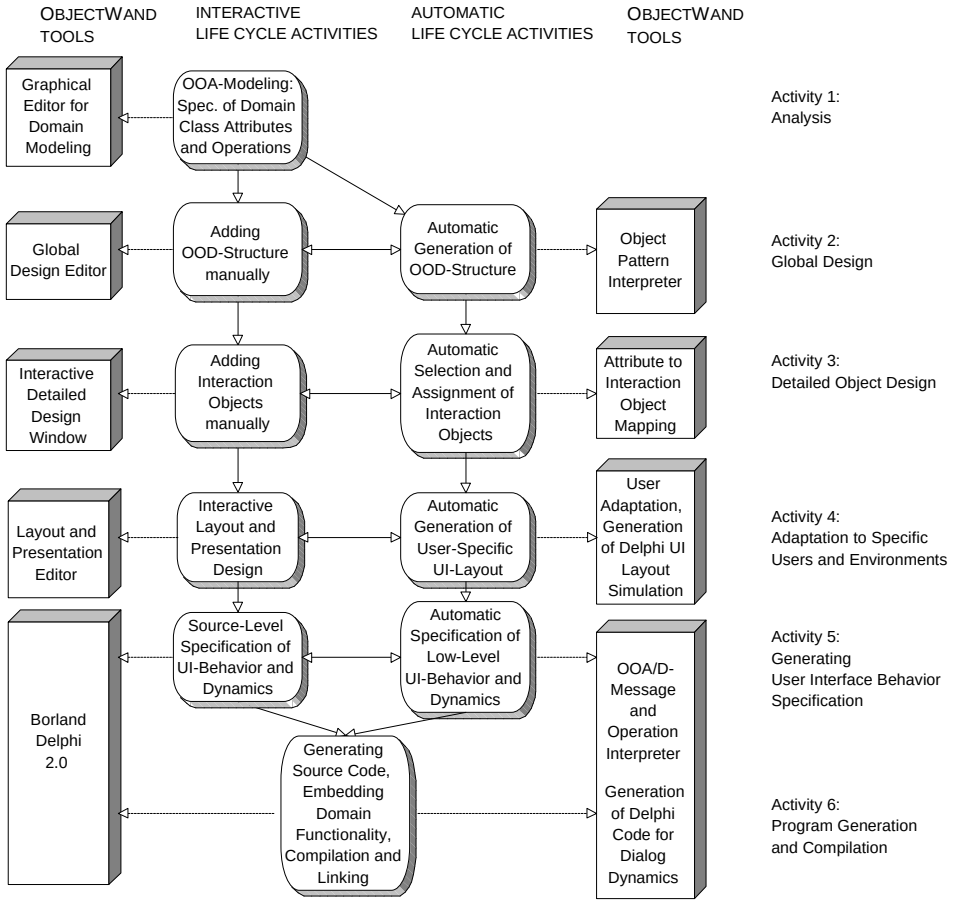
- Balancing the ratio of flexibility vs. automation
  - **The designer´s choice at each life cycle activity**
    - accept the intermediate model as proposed by the system
    - partly modify or extend the intermediate model interactively
    - integrate reusable components into the intermediate model
  - **Model refinement knowledge**
    - standard knowledge for standard design problems
    - optional domain or user specific knowledge for adaptation
    - experience of the designer
    - technical knowledge for automated system integration

OBJECTWAND Architecture

- **Three tool categories:**
  - OO modeling/ design
  - application construction
  - generation
- **ASO representation scheme**
- **Target applications:**
  - Business domain

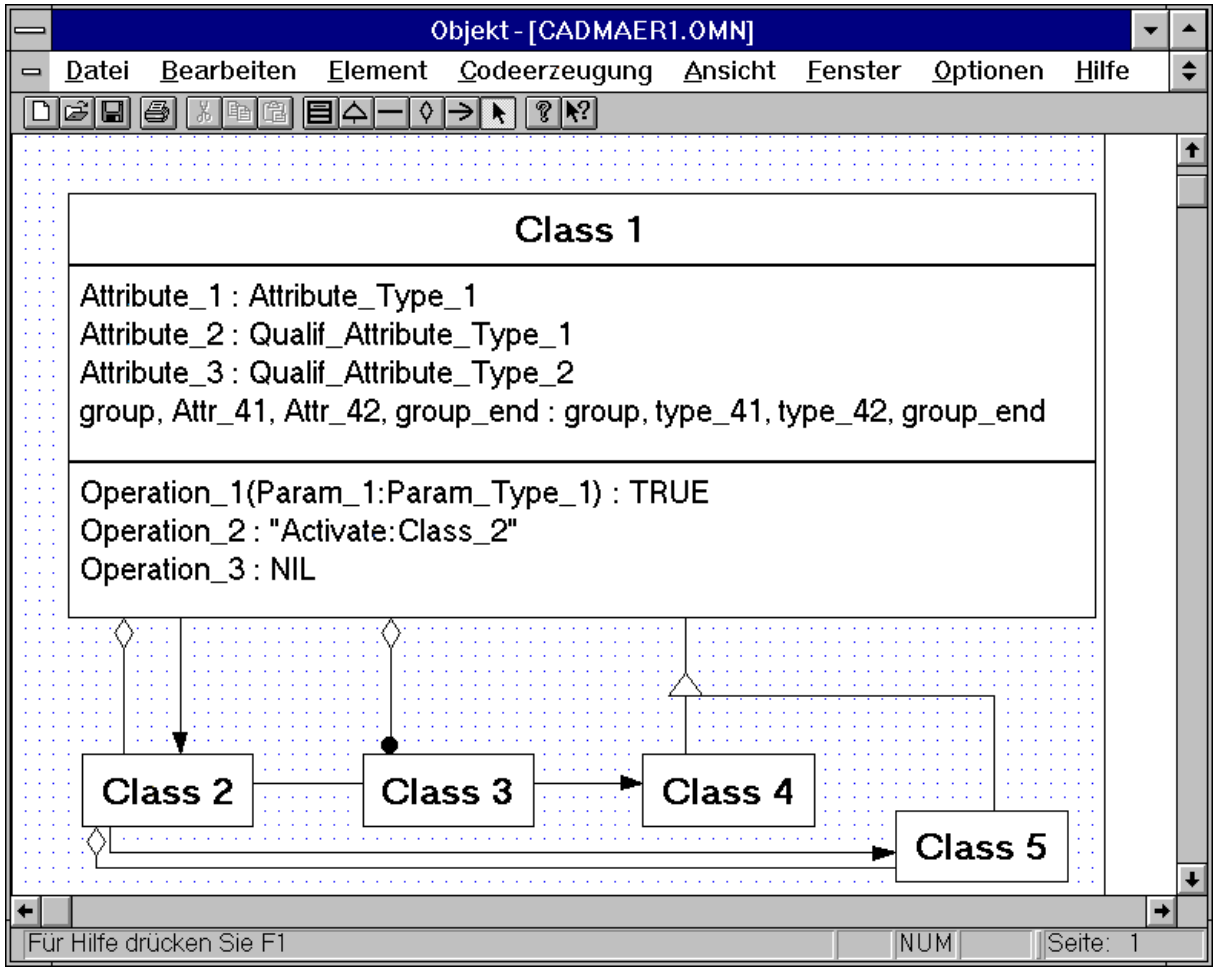


Life Cycle Support and Designer-System Cooperation



OOA Modeling

- Example OOA model specification
  - **attributes**
  - **operations**
  - **gen/spec relations**
  - **aggregations**
  - **associations**
  - **message channels**



Generating the window hierarchy

- Mapping of complex OOA classes to windows, if possible
  - **expanding gen/spec relations**
  - **exploiting attributes, attribute types, grouped attributes**
  - **exploiting aggregational object patterns**
- Creating the menu- and command hierarchy
  - **exploit target environmental constraints and synonym lists**
  - **assignment of OOA operations to menu entries or buttons**
- Refine generated results interactively

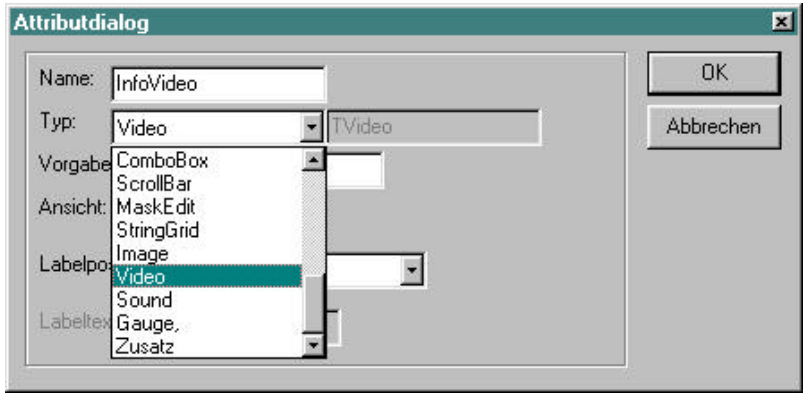
Assigning interaction objects

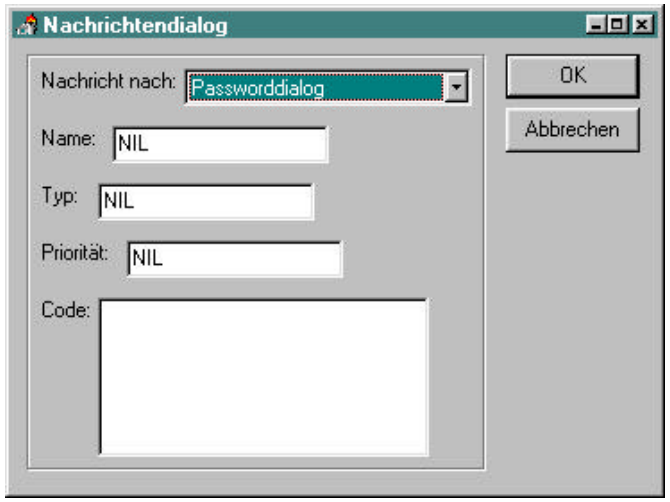
- **Exploiting qualified attribute types, if available:**
  - map the attribute type to a specific OOD object pattern
  - assign abstract interaction objects (AIOs) to the OOD objects
- **If not: activate a number of rule groups**
  - exploit content oriented meta data
  - exploit synonym lists to find the correct qualified data type
  - exploit the cardinality of attributes and/or operations
  - refinement of already assigned AIOs
  - rules in user and environment profile
- **Alternatively**
  - assign or modify the AIO manually

UI behavior spec

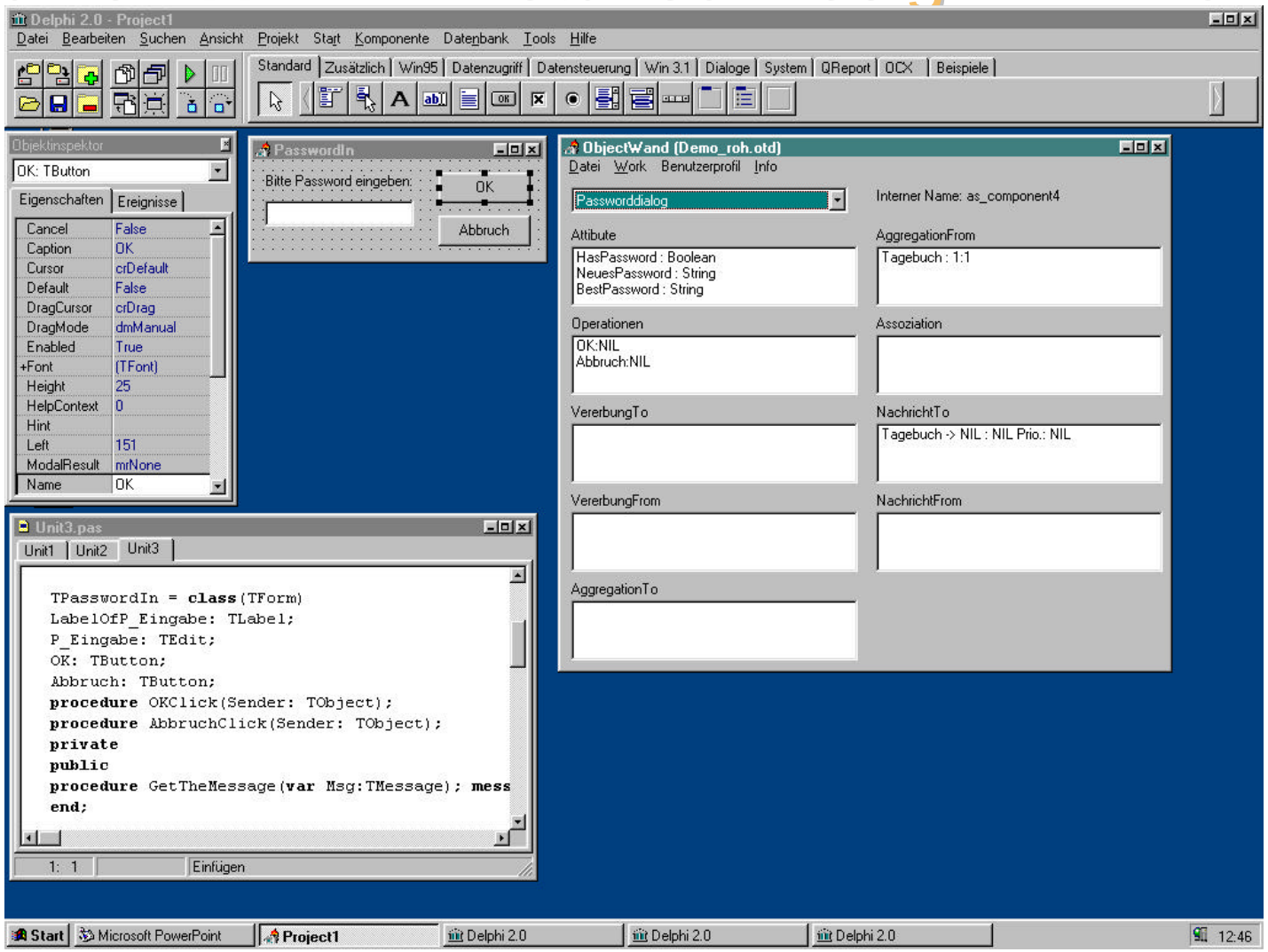
- ***OBJECTWAND* exploits**
  - OOA/D-messages, relational OOA/D patterns (including OOA/D class features),
  - detailed-design-level object groups for target functionality (e.g. non-standard multimedia behavior)
- **to automatically generate**
  - menu/command activation methods, inter-object communication by message-passing, domain method code integration
- **Designer adds domain-specific functionality and dynamics**
  - *OBJECTWAND* provides method- and message-editors

OBJECTWAND Detailed Design Environment





OBJECTWAND Detailed Design Environment



Additional Features

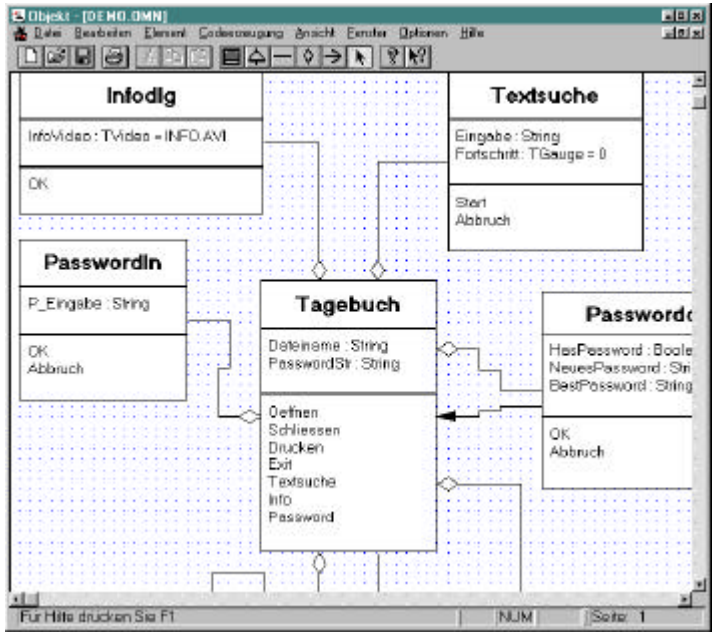
- **Generation of standard UI layouts (inherited from *AME*)**
  - choosing dialogbox and window layout types automatically
    - based on types and number of certain AIOs within a window
    - based on inter-object-relations (patterns) among OOA/D classes
  - adaptable standard layout alternatives,
  - individual rules in user/env. profiles
- **Interactive modification of generated layout and interaction object features (in Delphi)**
- **Adding domain- or database-specific program components, before creating runtime applications (in Delphi)**

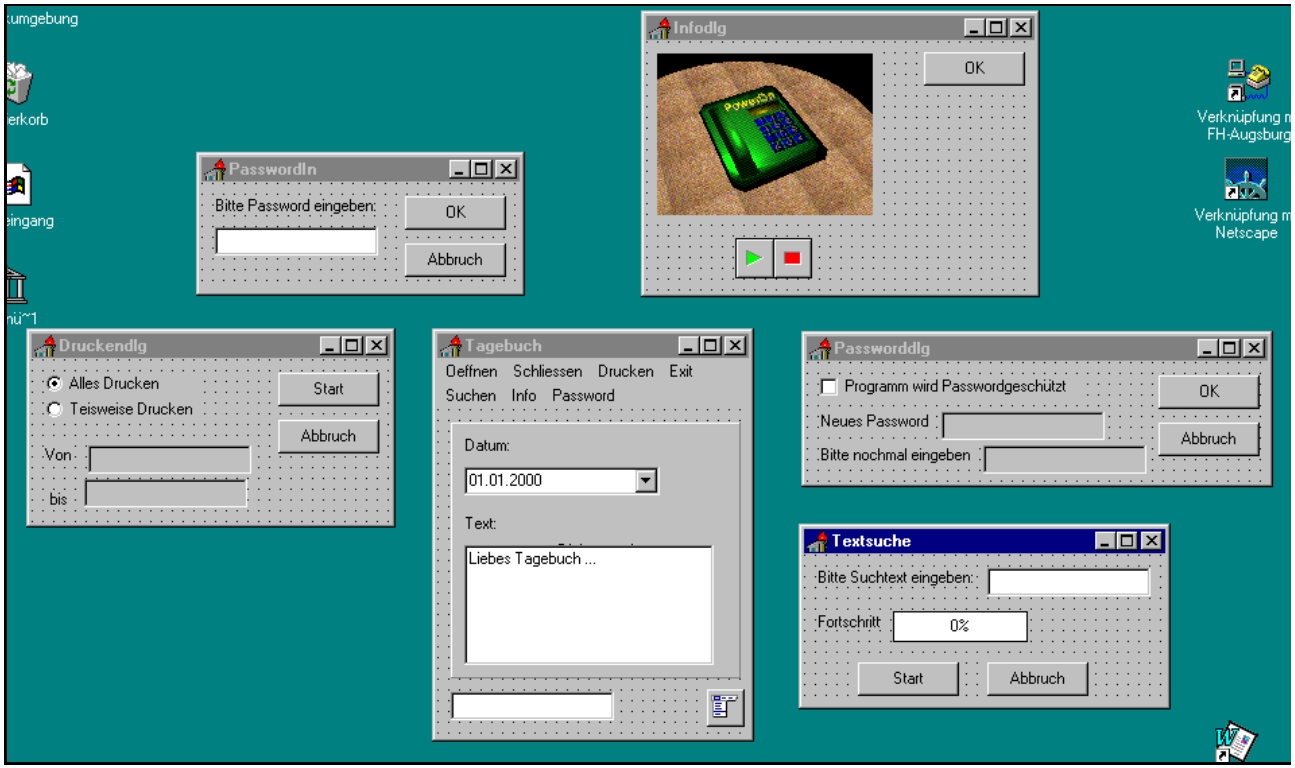
Target application generation

- Scanning/Parsing the detailed specification
- Generating C++-code, callbacks, defaults
- Integration of existing domain method code
- Integration of standard dialog boxes and behavior
- Integration of reusable major application parts
- Activating the Borland C++-compiler

- As an alternative a UIMS interface exists

Generated Target Application with its Original OOA Model





Conclusions and future work

- **Benefits**
  - complete prototypical life cycle support for computer-aided development of interactive systems
  - automating many standard design tasks for modeling interactive systems
- **Current and future work**
  - For improving the degree and the quality of automation, we will
    - look for exploitable software patterns at all life cycle activities
    - define standard model fragments at all life cycle activities
    - extend the expressional power of our representation scheme (ASO)
    - look for alternative ways for modeling system level dialog dynamics (e.g. including dynamic patterns and task modeling)
    - look for synergies with other disciplines and similar problems

Thank you for your attention!