



**Mission Oriented Architectural
Legacy Evolution**

MORPH

**Model Oriented Reengineering Process
for Human Computer Interface**

User Interface Reengineering

Rapid improvements in computer hardware and new developments in operating systems often make it desirable to migrate mission-critical systems to faster and more cost-efficient computing environments. This system migration presents a myriad of challenges in software evolution. Often the legacy application runs on a mainframe with a character-oriented user interface and must be migrated to a more powerful workstation with graphical user interface capabilities. Since *half or more of the code of an interactive application system is devoted to implementing the user interface*, the majority of the cost of system migration is in reengineering the user interface. The MORPH technique and toolset provide automated support for user interface migration, significantly reducing the time and cost of migrating legacy applications.

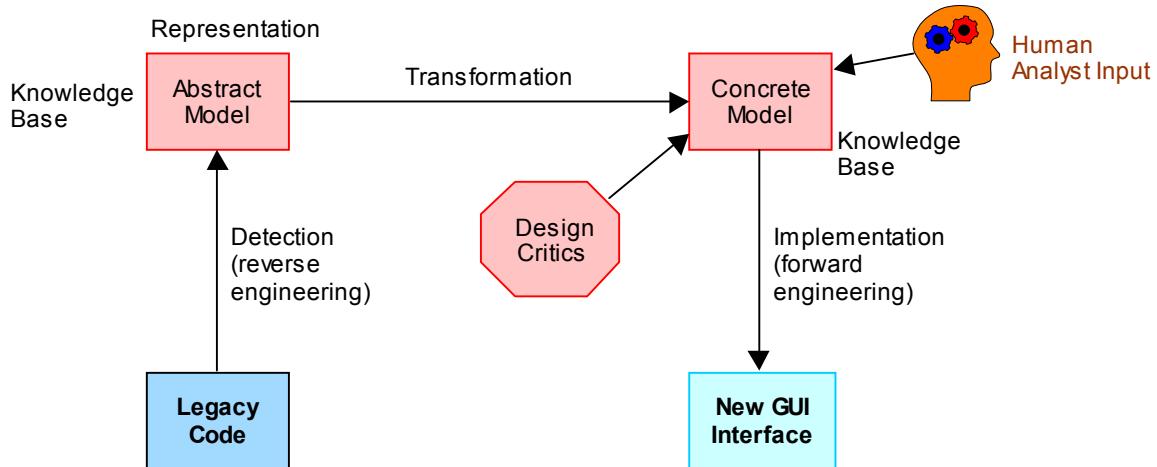
MORPH Program Description

The MORPH toolset supports user interface reengineering. It provides automated reverse engineering of character-oriented user interfaces and transforms them to graphical user interfaces. MORPH identifies basic user interaction tasks and associated attributes in legacy code by applying static program analysis techniques, including control flow analysis, data flow analysis, and pattern matching. The resulting model is then used to transform the detected abstractions in the model to a specific graphical widget toolkit.

Program Features

The MORPH reengineering toolkit consists of three components:

1. Detection Engine - Analyzes source code to identify the user interface components in the legacy system.
2. Knowledge Base Representation - Stores the model of the existing user interface from the detection step.
3. Transformation Engine - Manipulates, augments, and restructures the resulting model to allow forward engineering into a graphical environment. The human analyst can refine the model in the transformation stage. The transformation stage suggests specific graphical implementations and integrates them for user interface abstractions into the legacy code.

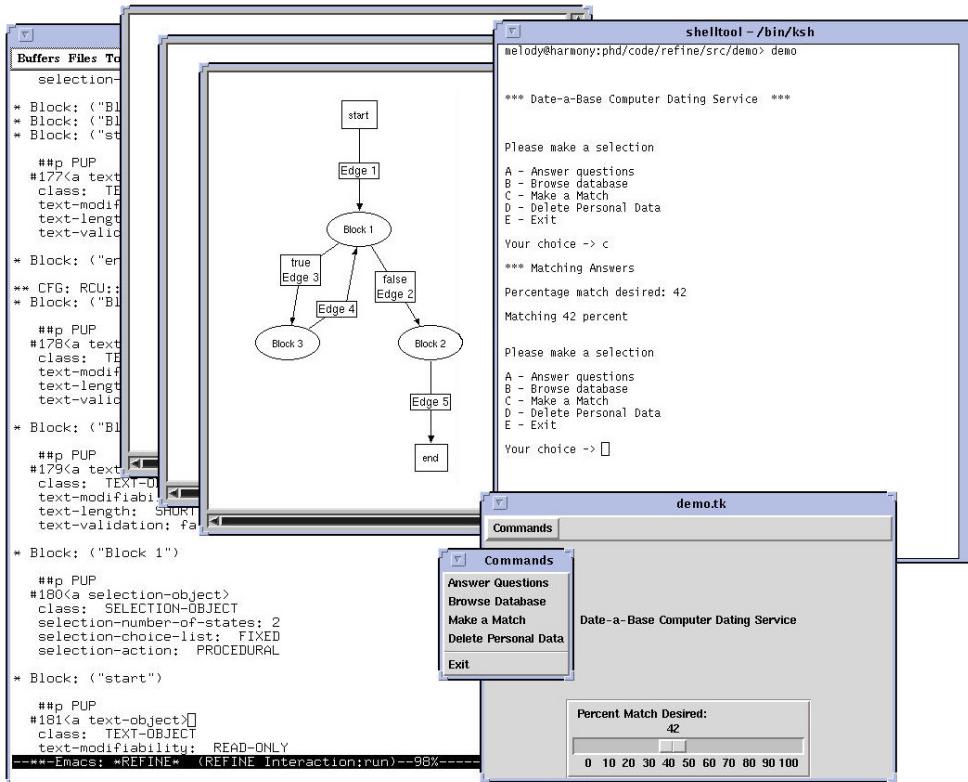


MORALE

MORPH supports the Mission Oriented Architectural Legacy Evolution (MORALE) reengineering process. The goal of the MORALE project is to facilitate the evolution of legacy software systems. Facilitation takes the form of improved quality by requirements validation, reduced risk via architectural evaluation and assessment, and increased productivity from maintenance and access to design rationale and from high level reuse of architectural components.

The MORPH Toolkit

The MORPH toolkit, currently under development, provides automated support for reengineering user interfaces. The screen shots below show a character-oriented user interface being processed by MORPH: the upper right window is the old interface, the diagram showing the control flow of the program is in the upper center, and the MORPH window showing the user interface components identified is on the left. The resulting graphical user interface suggested by MORPH is on the lower right.



Graphical Interfaces Supported

MORPH processes code from applications with character-oriented user interfaces (all input and output are characters, as with old 3270 and vt100 programs) and provides automated support to migrate to graphical toolkits. Currently, the graphical toolkits supported are:

- tcl/tk - a scripting language that runs on Unix, PC, and Macintosh platforms
- Java AWT - Java's Abstract Windowing Toolkit (although MORPH does not translate the entire program to Java, only the user interface components)

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System Requirements

Since MORPH performs static analysis, it can process character-oriented user interfaces from code written for any environment. The MORPH research prototype itself runs in the following environment:

- Sun Solaris Unix, version 2.6 or greater and X11r5
- Software Refinery from Reasoning Systems (now distributed by Kestrel)
- CLASSIC, a knowledge base system from AT&T

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