Wisdom is not the product of schooling but the lifelong attempt to acquire it.
- Albert Einstein

Embedding Critics into Design Environments

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Examples of Domain-Oriented Design Environments

- kitchen design
- voice dialog design
- computer network design
- urban design and transportation planning — Envision and Discovery Collaboratory (EDC)
- multi-media design (color)
- website design
Domain-Oriented Design Environments (Janus-Construction)

Janus-Construction

Appliance Palette
- walls
- doors
- windows
- sinks
- stoves

Catalog
- L-Shaped-Kitchen
- DW

Clear Work Area
- Load Catalog
- Save In Catalog

Critique All
- Edit Global Descriptions
- Select Context

Work Area

Messages
- The length of the work triangle (Double-Bowl-Sink-1, Four-Element-Stove-1, Single-Door-Refrigerator-1) is greater than 26 feet.
- Single-Door-Refrigerator-1 is not near Four-Element-Stove-1.

Commands
- Critique All?
Janus-Argumentation

Answer (Refrigerator, Sink, Stove)
The distance between sink, stove and refrigerator, the work triangle, should be less than 23 feet.

\[ d_1 + d_2 + d_3 < 23 \text{ feet} \]

Figure 10: the work triangle

Argument (Walking Distance)
The work triangle is an important concept in kitchen design. The work triangle denotes the center front distance between the three main appliances: sink, stove and refrigerator. This length should be less than 23 feet to avoid unnecessary walking and to ensure an efficient work flow in the kitchen.

Argument (Small Room)
In small kitchens where the work triangle is less than 16 feet.
VDDE: Voice Dialog Design Environment
Domain-Oriented Design Environments (DODEs)

**construction**

**specification**  
Is the cook right- or left-handed?

**perspectives**  
resale  
personal  
electrical  
plumbing  
American  
Japanese

**critics**

**design rationale**

issue:
  answer:
    argument:
    argument:
  answer:
    argument

**catalog**
Reflection-in-Action as a Problem Solving Theory

Designer's understanding \(\rightarrow\) situated action

DESIGN

Reflection on knowledge

 catalogs design rationale interpretation

\(\leftarrow\) breakdown (critics)

construction specification perspective
Computational Critics (= “Virtual Human Critics”)

- spelling correctors
- grammar checkers
- color critics
- graphs critics

  - Web Site Garage → provides services for maintaining and improving your Web site. Automate site maintenance checks, optimize your graphics and analyze your traffic.
  
  - “tune up” → performance is critical for a Web site's success. Tune Up delivers comprehensive, automated diagnostics on your Web page. Run anytime to find hidden problems on your site.
  
  - “gif lube” → are you losing visitors because your Web page takes too long to load? GIF Lube will decrease your load time quickly and easily by optimizing your graphics.
The Rationale / Need for Critiquing


  “but when color is used inappropriately it can be very counter productive and few software designers have much experience with the use of color; the aim of this book is to synthesize our current knowledge in the area and specify guidelines so that programmers, engineers, and psychologist can use color.”


  “one reason for the abundance of bad graphs is the proliferation of low-cost microcomputers and ‘business graphics’ packages which often seduce the user into producing flashy but muddled displays; many graphs are designed without consideration of principles of human perception and cognition”
EMMA (Environment for MultiMedia Authoring) and Color Critiquing
Computer-Based Critiquing: Examples and Mechanisms

- **examples:**
  - the length of the work triangle is more than 23 feet
  - a critiquing rule in the EDC: “the maximum distance between two bus stops is 1 mile”

- **mechanism:**
  - enable relevant critics
  - analyze construction and specification (e.g., the specification states that this is a part of town where many old people live)
  - signal breakdowns
  - deliver relevant knowledge
Giving Domain Designers Control about the Intrusiveness of Critics

Select Perspective:

Select the standard(s) you want to use when analyzing your design. This allows you to view your design from multiple perspectives. Click on the button to the left to enable the rule set. Click on Argumentation to list all the rules which belong to the selected standard. You can disable and enable individual critic rules within each standard from this overview. To change priority, disable the rule set, then enable it again.

Priority Enable/Disable Set

- 1 USWEST Rule Set
- 0 UMUIF Rule Set
- 0 International Rule Set
- 0 Consistent with:

Type of Application: General Conceptual Unit Critiquing

Critiquing Thermometer

Active

3 6 9 12 15

Passive

Critique All
An Implementation of Critics

- Specification Component
- Construction Component
- Construction Analyzer
- Argumentation Component
- Argumentation Illustrator
- Catalog Component

- critic messages
- design rationale
- catalog examples
Embedding Critics in the Contexts of Design

**generic domain knowledge**
"kitchen design"

design rationale
catalog of past designs

**construction**
"this design"
graphical construction
generic critics

**specification**
"left-handed kitchen"
partial specification
specific critics

**perspective**
"the resale perspective"
redefined knowledge
interpretive critics
Generic Critics in Construction

**Construction**

**Design Rationale**

**issue:**
Where should the dishwasher be placed?

**answer:**
Left side of sink.

**argument:**
Dishwasher on left provides efficient work flow for right-handed people.

**Generic Critic**

IF the dishwasher is right of sink, THEN "move dishwasher left of sink"
## A Partial Specification of a Specific Client

<table>
<thead>
<tr>
<th>questions in specification component</th>
<th>answers by client:</th>
</tr>
</thead>
<tbody>
<tr>
<td>name:</td>
<td>Smith’s kitchen</td>
</tr>
<tr>
<td>size of family:</td>
<td>four to six</td>
</tr>
<tr>
<td>primary cook:</td>
<td>left-handed</td>
</tr>
<tr>
<td>size of meals:</td>
<td>huge (big eaters)</td>
</tr>
<tr>
<td>entertainment:</td>
<td>often</td>
</tr>
<tr>
<td>cooking frequency:</td>
<td>often</td>
</tr>
<tr>
<td>type of sink:</td>
<td>double bowl sink</td>
</tr>
</tbody>
</table>

**specification component in EDC:** questionnaire for citizens how long they would wait for the bus
Specific critics in specification

**Specification**
Is the primary cook right or left-handed?
- left-handed
  (left-handedness)

**Design Rationale**

**issue:**
Where should the dishwasher be placed?

**answer:**
Right side of sink.
(right-of dishwasher sink)

**argument (pro):**
If the cook is left-handed, then the dishwasher should be right of the sink.

**Specific Critic**
(left-handedness)
(right-of dishwasher sink)

**Critic Message**
"Move the dishwasher to the right of the sink."
Interpretive critics in perspective

Define a new perspective

Name: Smith's Kitchen

Resale Ranch House Residential

American Plumbing near Electrical

Resale right Residential

Smith's Kitchen DW left of sink

Add Perspective Save Cancel
Benefits of Embedding Critics

• increase integration of design environment components

• allow system to infer “task at hand”

• enabling only relevant critic rules

• deliver richer, more relevant information
Global Objective of Embedding Critics

saying the ‘right’ thing
at the ‘right’ time
in the ‘right’ way