

Design Environments

An Historical Overview

AI in Design

Software Architecture

Evolving Artifacts

Theory and mechanisms for computer supported design

AI and Design

Strong vs Weak AI

An HCI perspective aims to augment human intelligence

Role Distribution

Delegation of responsibilities

Design Media

Trading off between Tradition and Transcendence

Research Approach

Theory, System Building, Evaluation

Critiquing - the LISPcritic

```
(defun perm (s r)
  (cond ((equal r 1) (mapcar (function list) s))
        (t (mapcar (function
                    (lambda (x)
                      (mapcar (function (lambda (y) (cons x y)))
                              (perm (remove x s) (sub1 r))))
                          s))))))
```

Lisp-CRITIC

```
(cond ((equal r 1) (mapcar #'list s))
      (t (mapcar #'(lambda (x)
                    (mapcar #'(lambda (y) (cons x y))
                              (perm (remove x s) (sub1 r))))
              s)))
```

==>

```
(if (equal r 1)
    (mapcar #'list s)
    (mapcar #'(lambda (x)
              (mapcar #'(lambda (y) (cons x y))
                      (perm (remove x s) (sub1 r))))
          s))
```

Explanation (Why-cond-to-if-also)

IF is more readable than **COND** because it uses fewer parentheses and because **IF** has a common English meaning.

Abort	Explain New Code	Show New Code
Accept	Reject	Show Original Code
Accept All	Set Parameters	<u>Why Is This Better</u>

Critiquing systems should be domain-oriented

Software Architecture

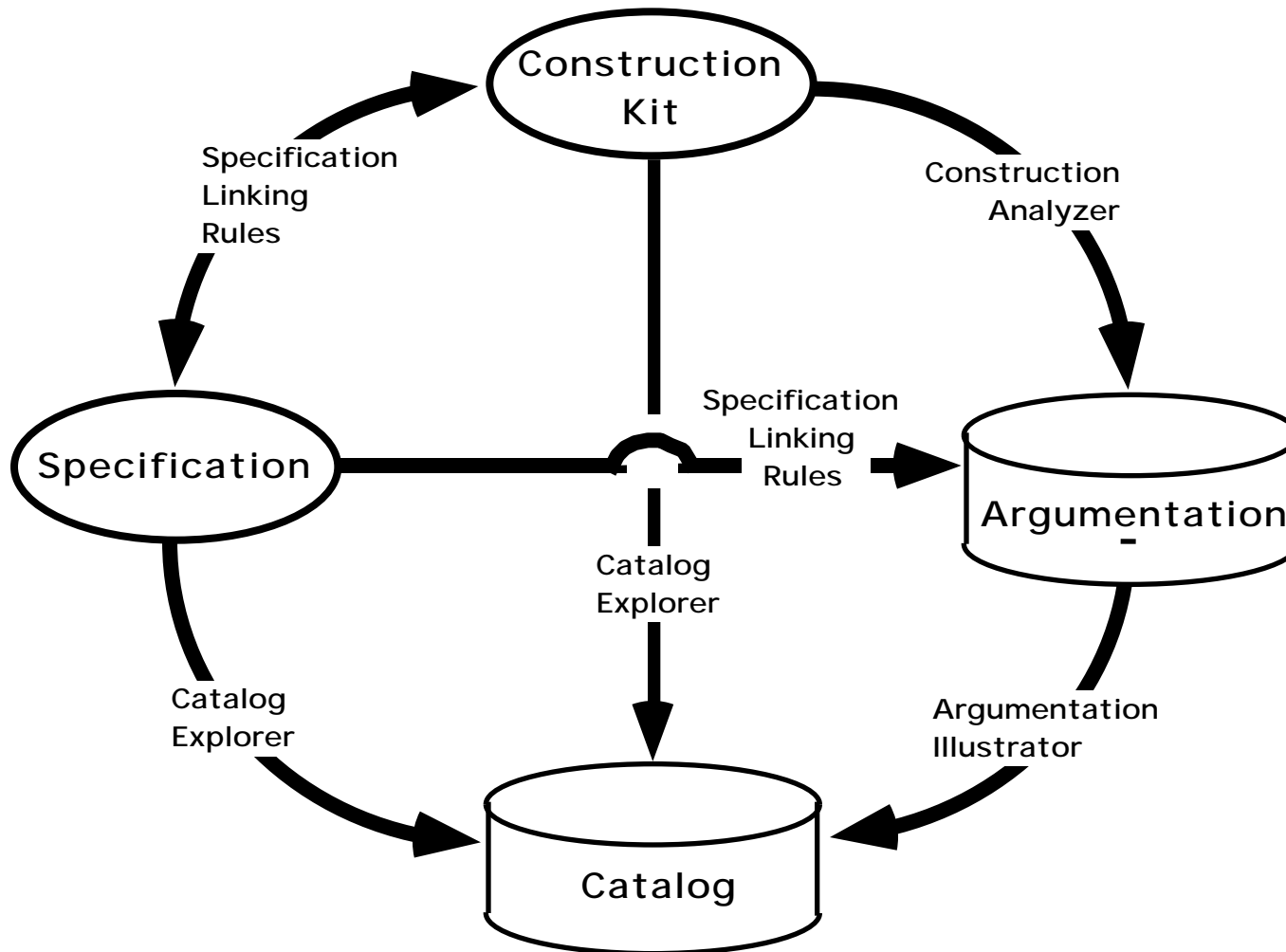
Architecture and Theory Co-Evolve

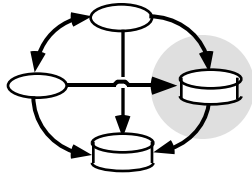
Domain Independent vs Domain-Oriented

Domains

**Kitchen, Planning, Software Development, Watershed
Management, Voice Dialog, Lunar Habitat, . . .**

The Multifaceted Architecture





Argumentation

ISSUE 133:

133: What should the location of the refrigerator be?

ANSWER:

Near the entrance to the kitchen.

ARGUMENTS:

If there is frequent snacking, then locating the refrigerator near the entrance will decrease traffic conflict between the persons getting snacks from the refrigerator and those preparing meals or doing cleanup.

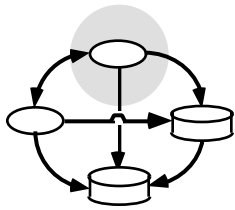
ARGUMENTS:

This will only be a problem when there is more than one person in the household at a time.

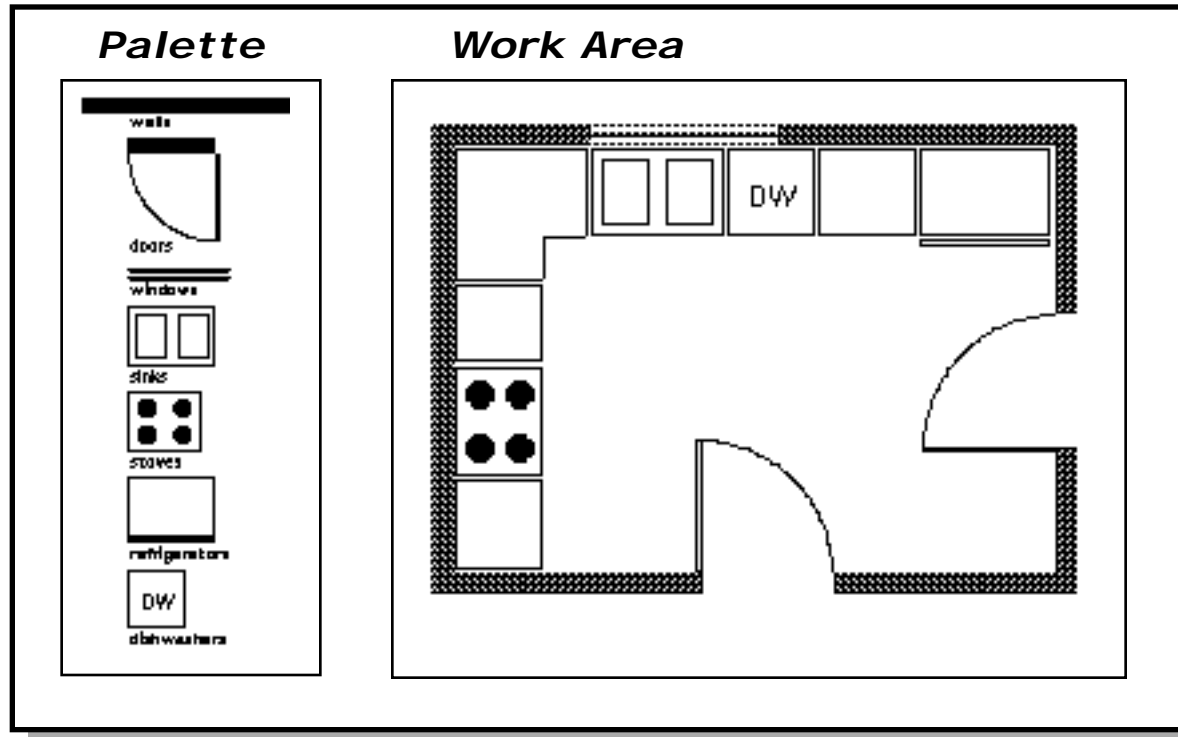
This might also be a problem if members of the household don't eat meals together.

Close to the service entrance

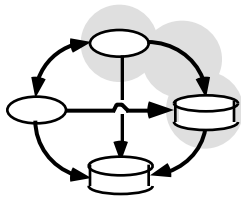
Argumentation Must Serve Design



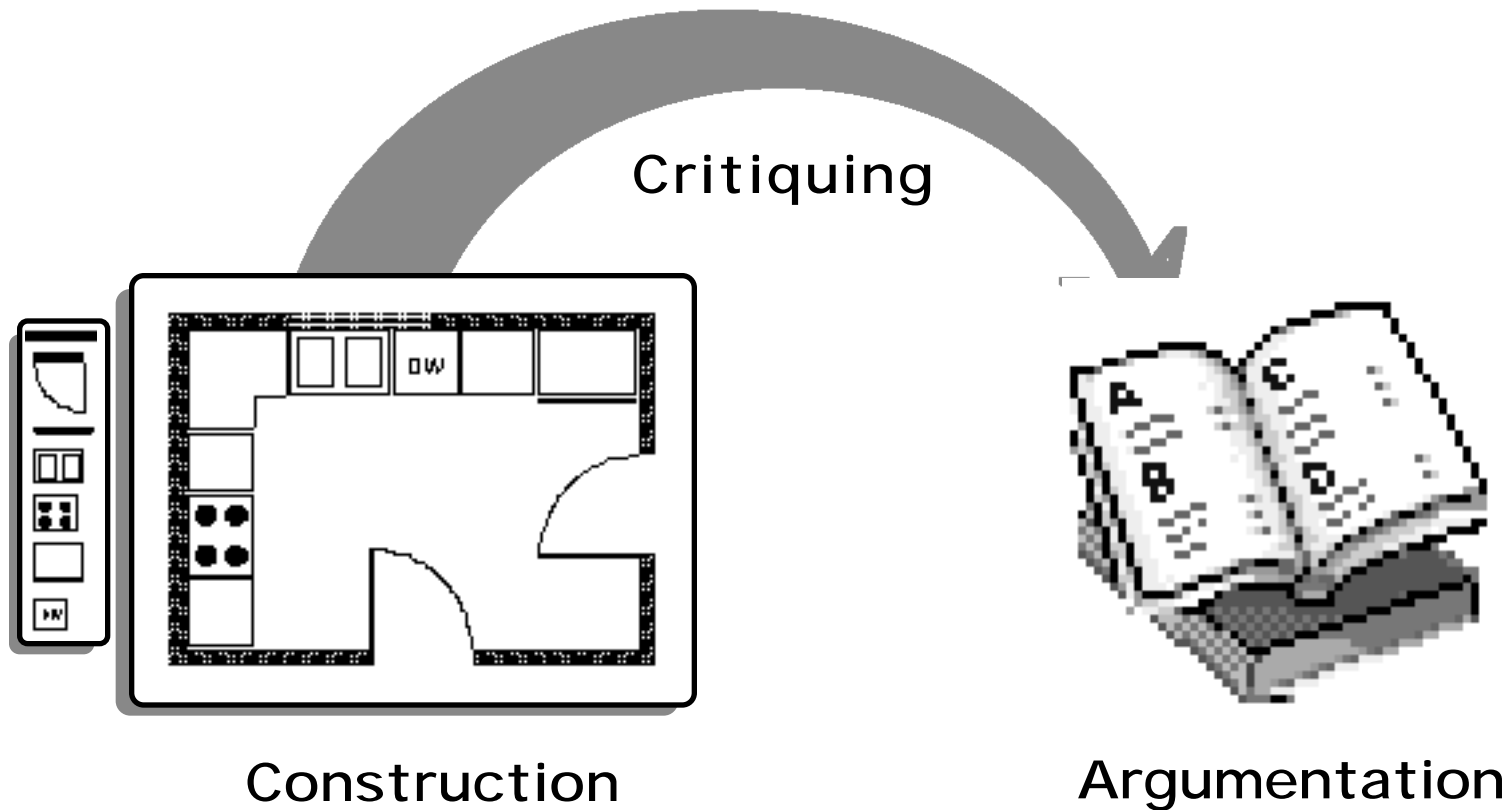
Construction



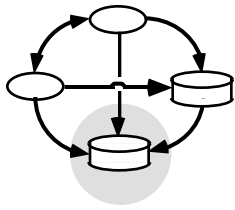
Construction Kits do not, in themselves, ensure a good artifact.



Integration



Integration produces a synergistic effect



Catalog

Janus-Construction

Clear Work Area Load Catalog Critique All Save In Catalog Edit Global Descriptions Select Context

Appliance Palette

walls

doors

windows

sinks

stoves

Catalog

L-Shaped-Kitchen

Work Area

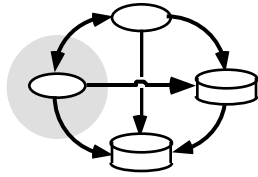
Messages

- *The length of the work triangle (Double-Bowl-Sink-1, Four-Element-Stove-1, Single-Door-Refrigerator-1) is greater than 23 feet.
- *Single-Door-Refrigerator-1 is not near Four-Element-Stove-1.

Commands

- ▶ Critique All
- ▶ ■

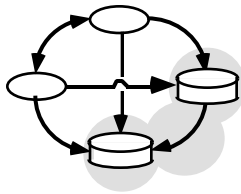
Reuse and case-based reasoning require computational support



Specification

- + Size of family?
 - Seven or More
 - **One**
 - Two
 - Three
 - Four to Six
- How many cooks usually use the kitchen at once?
 - two
 - one
 - [answer suggested because size-of-f
 - three or more
- + Is the primary cook right-handed or left-handed?
 - Right handed
 - **Left handed**
 - Switchable

Specification Increases Shared Context



Argumentation Illustrator

Argumentation

Issue (Stove)
 What should the location of the stove be?
 See also: "SubIssue (Stove)"

Answer (Stove, Door)
 The stove should be away from a door.

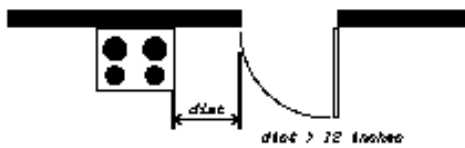



Figure 5: stove-door

Argument (Fire Hazard)
 By placing the stove too close to a door it will be a fire and burn hazard to unsuspected passers by (such as small children)

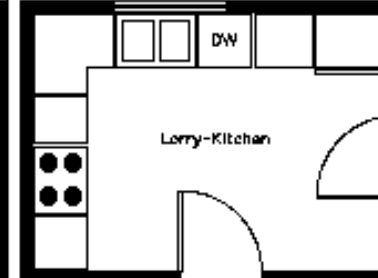
Argument (Dining Room)
 If the door leads into a dining room, it will be easy to bring hot food from the stove into the dining area!

Answer (Stove, Window)
 The stove should be away from a window.



Viewer: Default Viewer

Catalog Example



Stove is away from Door.

Visited Nodes

- Prime Issue (Kitchen) Section
- Issue (Stove) Section

Commands

Show Examples "Answer (Stove, Door)"

Show Example Answer (Stove, Door)

Commands

Show Outline

Search For Topics

Show Argumentation

Show Context

Resume Construction

Show Construction

Show Example

Show Counter Example

The Multifaceted Architecture

