Wiederverwendung in Anforderungsspezifikationen

Der FOREST-Ansatz

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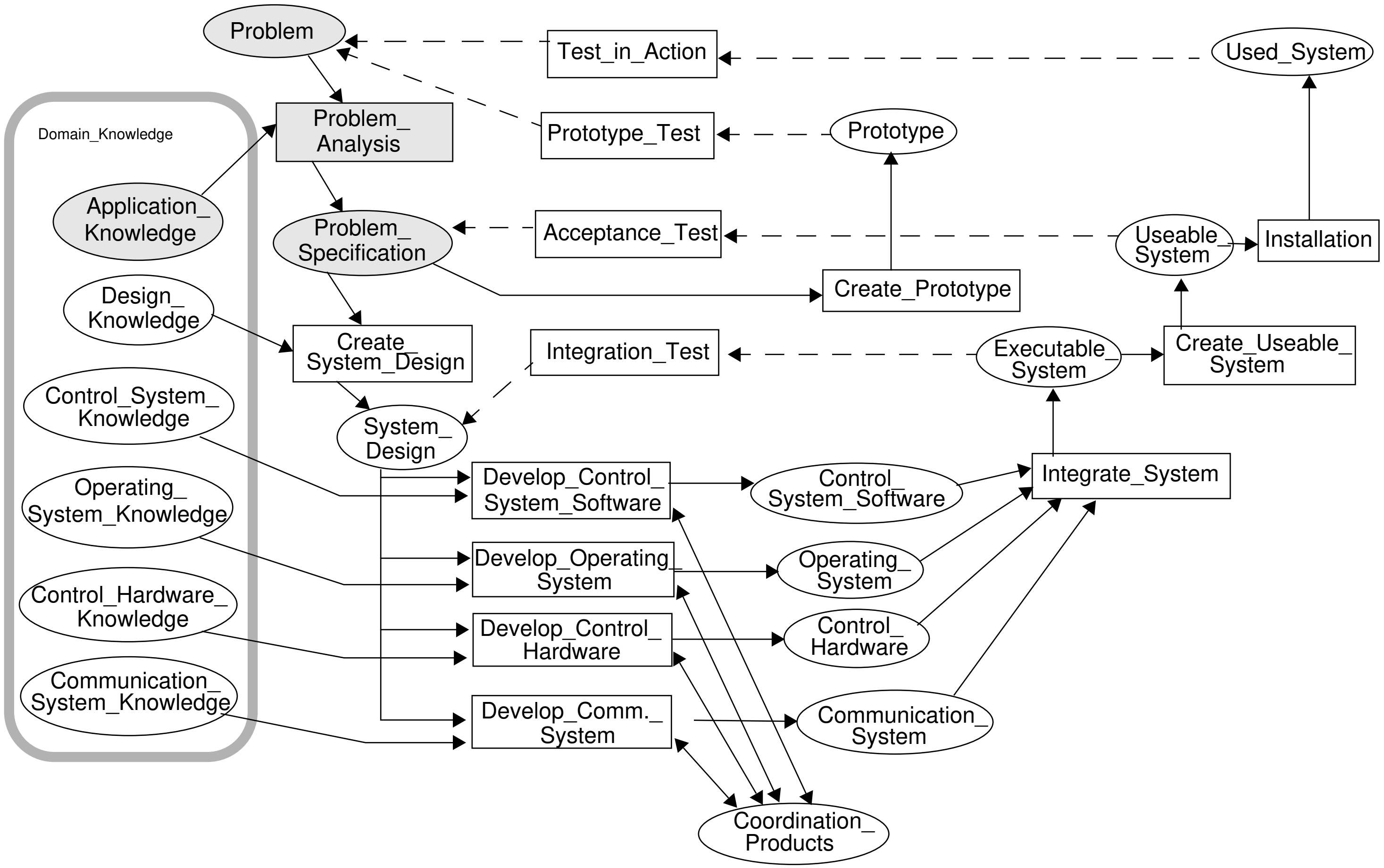
Aufbau des Vortrags

- Einordnung in das SFB-Referenzmodell
- Der FOREST-Ansatz
- Wiederverwendung im FOREST-Ansatz

Einordnung in das SFB-Referenzmodell



modelliert durch B1

Problemspezifikationen (1)

Menge von Größen

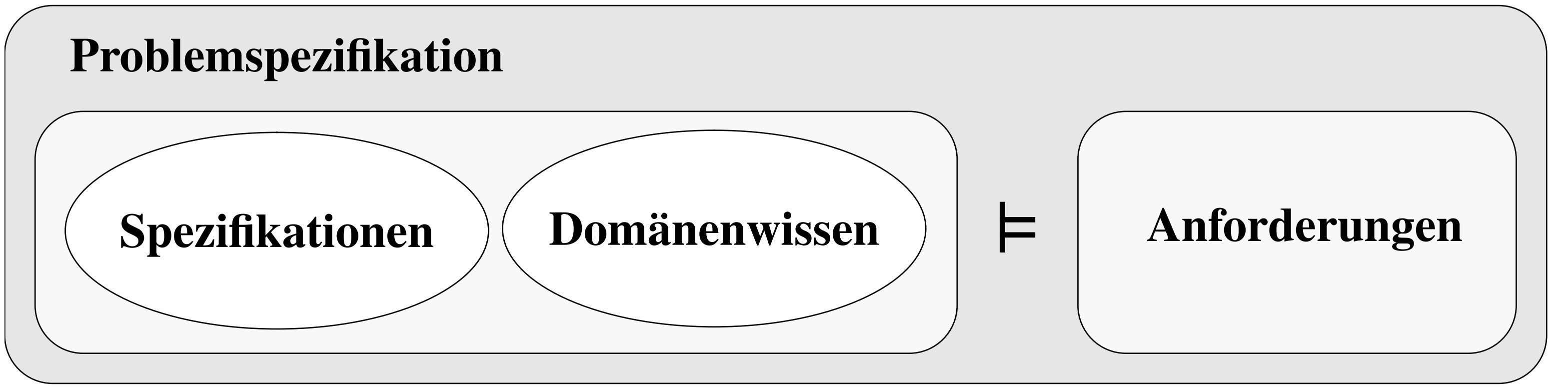
- Umgebung und Maschine
- Kontrolle
- Sichtbarkeit

Menge von Aussagen über diesen Größen

- Indikative und optative

Problemspezifikationen (2)

- Menge von Größen
- Domänenwissen (indikativ, alle Größen sichtbar für Umgebung)
- Anforderungen (optativ, eine unsichtbare Umgebungsgröße)
- Spezifikationen (optativ, alle Größen sichtbar für die Maschine)



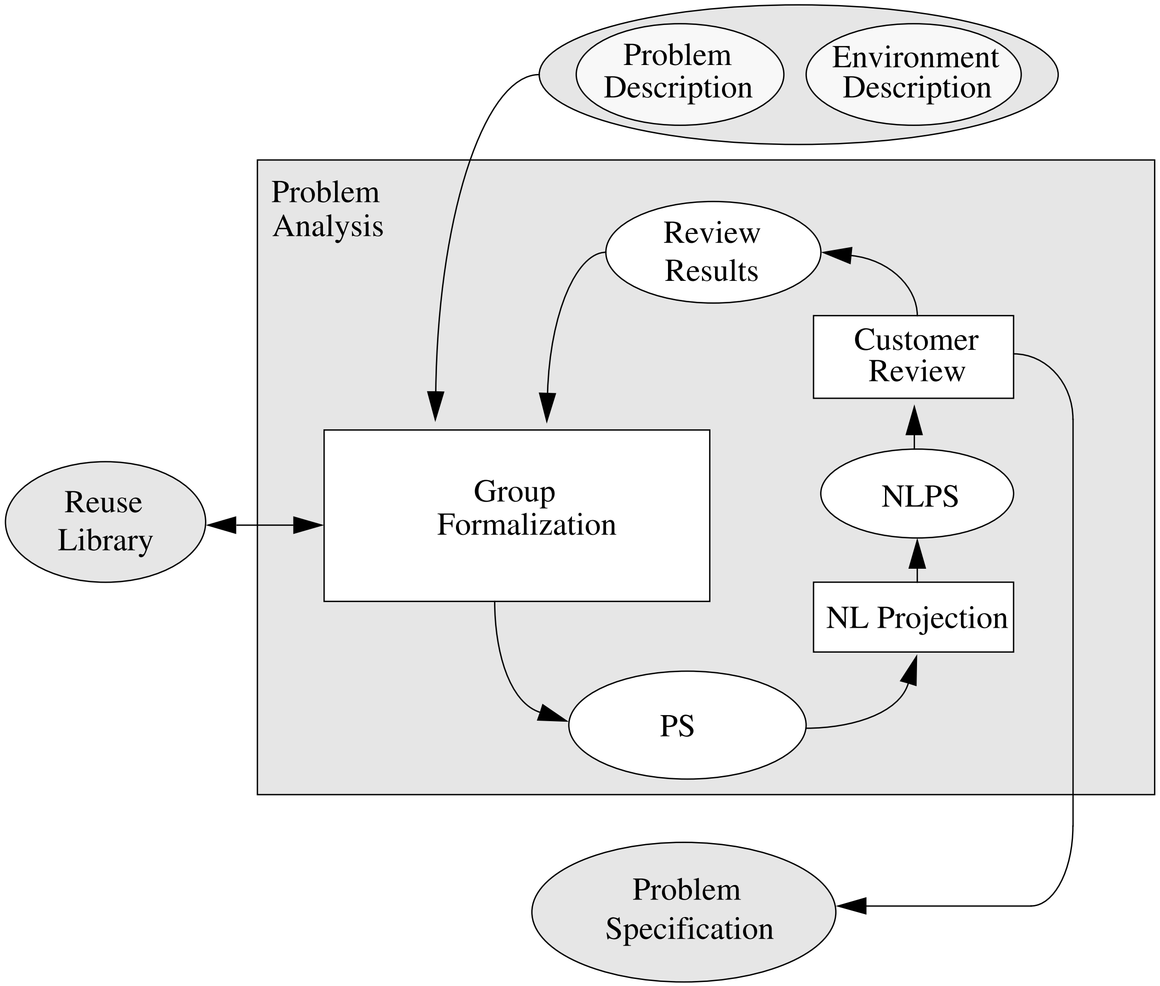
Ziele

- Hohe Kundenzufriedenheit
- Weniger Fehler in der nachfolgenden Entwicklung

durch

- Iteratives Prozeßmodell
- Präzise und verständliche Problemspezifikation
- Werkzeugunterstützung

Iteratives Prozeßmodell



Übersicht

- ➤ **Aussagenmuster**
- ➤ **Klassenbildung**
  - Parametrisierung
  - Aggregation
  - Vererbung

Aussagenmuster (1)

Predicate *roomOccupied*

Intention : The room is occupied by a person (motion detector)

Scope : environment controlled, visible

Predicate *safeLight*

Intention : The light is sufficient to move safely.

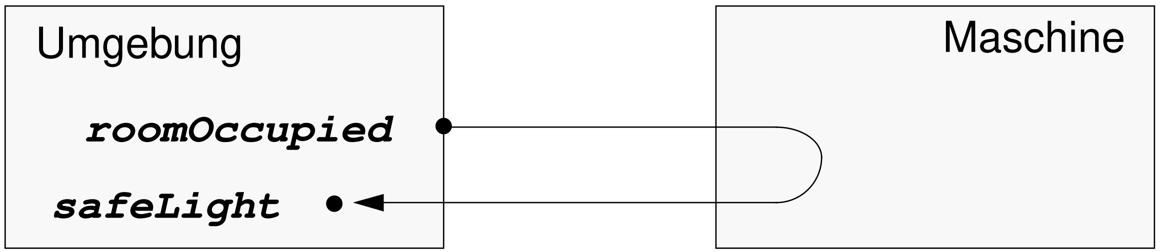
Scope : environment controlled, hidden

Requirements

Property *safeLightCondition*

Formal : $\square(\mathit{roomOccupied} \rightarrow \Diamond_{\leq 1\,s}\ \mathit{safeLight})$

NL : Whenever the room is occupied, the light is sufficient to move safely within 1 second.



Aussagenmuster (2)

Predicate *hazCon*

Intention : The outdoor conditions are hazardous (storm, rain).

Predicate *windowsClosed*

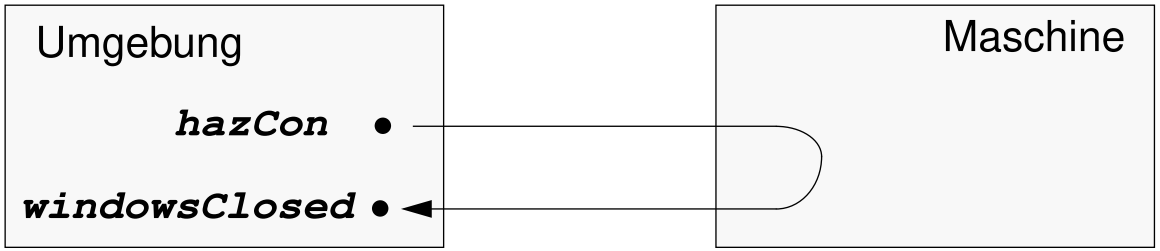
Intention : The windows are closed.

Requirements

Property *safeWindowsCondition*

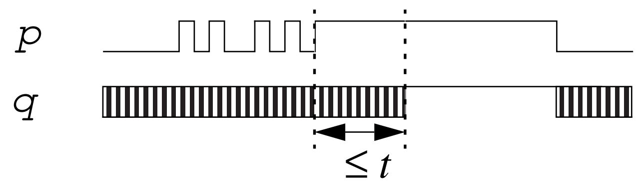
Formal : $\Box(hazCon \rightarrow \Diamond_{\leq 30\,s}\ (windowsClosed\ \mathbf{W}\ hazCon\ ))$

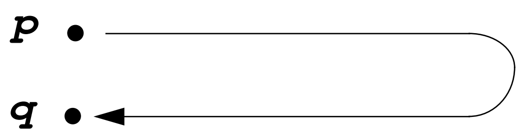
NL : Whenever the outdoor conditions are hazardous for at least *30 s*, the windows are closed within these *30 s* and remain closed at least as long as the hazardous condition is true.



Aussagenmuster (3)

Pattern *DelayedImplication (p, q, t)*

Intention	: q is depending on p with time delay t.
Definition	: $\Box(p \Rightarrow_{\leq t} q)$, where $\Box(p \Rightarrow_{\leq t} q) =_{\mathrm{Df}} \Box(p \rightarrow \Diamond_{\leq t}(q\ \boldsymbol{W}\ p))$
NL	: Whenever p for at least t, q within this t and q at least as long as p.
Illustration	: 
Example	: $\Box(\mathit{hazCon} \Rightarrow_{\leq 30\,s} \mathit{windowsClosed})$ Whenever the outdoor conditions are hazardous for at least *30 s*, the windows are closed within these *30 s* and remain closed at least as long as the hazardous condition is true.



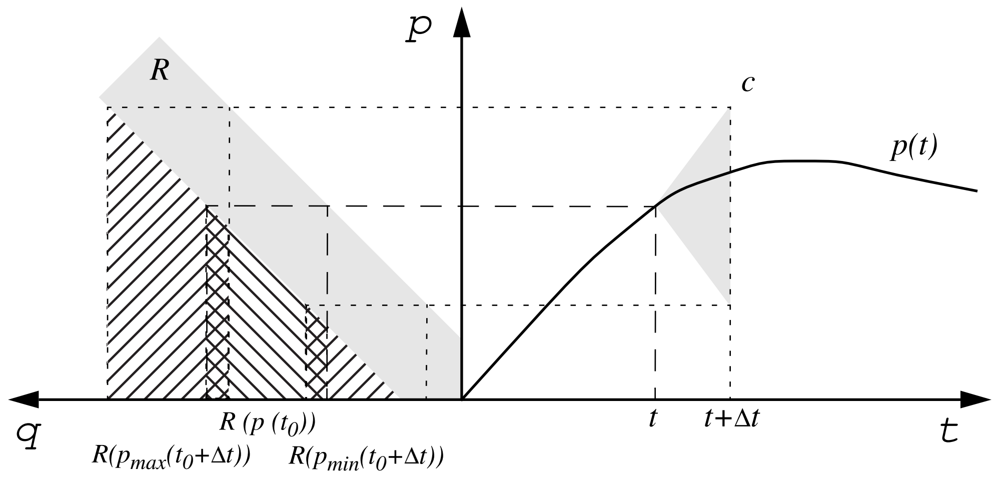
Aussagenmuster (4)

Pattern *DelayedCopyWithSourceRestriction (p, q, R, c)*

Intention : *q* is depending on a restricted *p* with respect to r.

Definition : ❑ $(p \Rightarrow_c^R q)$, where ❑$(p \Rightarrow_c^R q)$ $=_{Df}$
❑(p,q)∈ *R* ∧ ❑ $(|dp/dt| < c)$

Illustration :



Example : ❑ (temp $\Rightarrow_c^R$ tempValue) with *(temp, tempValue)*∈ *R* ↔
0.95 temp < tempValue < 1.05 temp and *c < 2 °C/h*

Klassenbildung

Description Class *Room* (Predicate *hazConForm*)

Intention : *Room* contains all specifications concerning a room.

Signature

Predicate *windowsClosed, roomOccupied, safeLight*

Predicate *lightOn*

Intention : The value adjusted for a light actuator.

Scope : machine controlled, visible

DomKnow

Property *reliableLight*

Formal : $\Box(\ lightOn \Rightarrow_{\leq 0.5\,s}\ safeLight\ )$

Requirements

Property *safeWindowsCondition*

Formal : $\Box(\ hazConForm \Rightarrow_{\leq 30\,s}\ windowsClosed\ )$

Property *safeLightCondition*

Formal : $\Box(\ roomOccupied \Rightarrow_{\leq 1\,s}\ safeLight\ )$

Aggregation

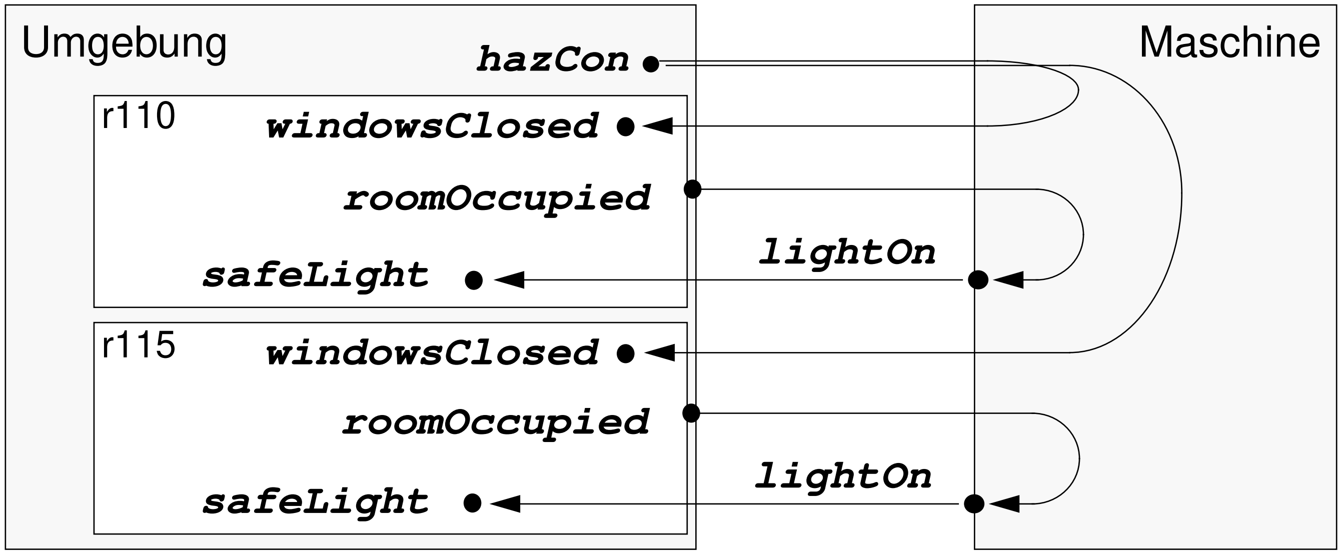
Description Class *Floor*

Intention : *Floor* contains all specifications concerning a floor.

Signature

Predicate *hazCon*

Object *r110, r115 : Room (hazCon)*



Vererbung

Description Class *Office*

Intention : *Office* contains all specifications concerning an office.

Base Classes

Class *Room*

Signature

Function *temperature* : Real

Object *w1, w2, w3, w4 : Window*

DomKnow

Property *windowRefinement*

Formal : ❑ (*windowsClosed* $\leftrightarrow$ *w1.closed* $\wedge$ *w2.closed* $\wedge$ *w3.closed* $\wedge$ *w4.closed)*

Requirements

Property *comfortTemp*

Formal : ❑ $(21\ ^{o}C < temperature < 23\ ^{o}C)$

Zusammenfassung und Ergebnisse

➤ Zusammenfassung des FOREST-Ansatzes

- Modulare Problemspezifikationen
- Formal und natürlichsprachlich

➤ Ergebnisse von zwei Fallstudien

- Strukturierung notwendig
- Unterstützung formaler Analysen (Vollständigkeit, Konflikte, ...)
- Anwendungsbeispiele von Mustern hilfreich
- Wiederverwendungsprozeß nicht zu feingranular

Ausblick

- **Werkzeug**
  - Automatische Analyse
  - Halbautomatische Erzeugung der natürlich-sprachlichen Spezifikation
  - Sichten und Projektionen
  - Katalog
- **Experiment**
  - Verständlichkeit der FOREST-Spezifikationen
- **Weitere Fallstudien**

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