



Variants of student solutions to assignments concerning functional testing (classification tree method)

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Contents

- Lesson Functional Testing
- Tool CTE (Classification Tree Editor)
- Assignment “select test cases with classification tree method”
- Student Solutions: Examples
- Summary

The lesson Functional Testing



Topic 20 Functional Testing

DAAD Project
“Joint Course on Software Engineering”

Humboldt University Berlin, University of Novi Sad, University of Plovdiv,
University of Skopje, University of Belgrade, University of Niš, University of Kragujevac,
University of Timisoara, University of Zagreb, University of Tirana, University of Sarajevo,
University of Banja Luka, University of Rijeka, Polytechnic University Tirana

Part of this lecture has been presented as part of the course on “Software Engineering” at Humboldt-University Berlin by
Joachim Wegener and Roman Pitschinetz (Daimler Chrysler).
First part of these slides are taken from E. Lehmann, J. Wegener: “Test Case Design by Means of the CTE XL”, EuroSTAR’00, Copenhagen,
4.-8. December 2000.

Version: May 24, 2010

20. Functional Testing

- a) Introduction
- b) Guidelines for taskclasses
- c) Use-case based approach
- d) Analysis of boundary values
- e) Classification Tree Method
- f) Classification Tree Editor CTE
- g) Complex example for CT Method
- h) Model-based test: State automata

DAAD project „Joint Course on Software Engineering” ©

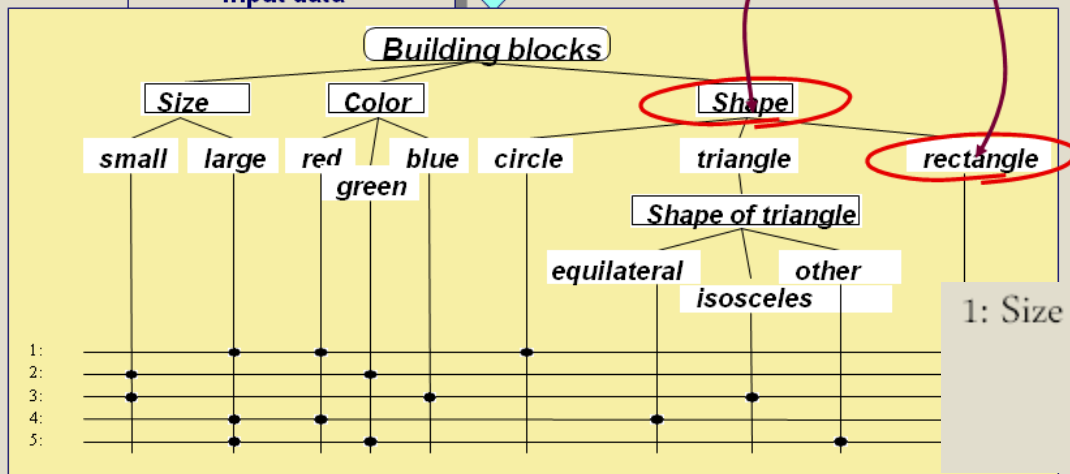
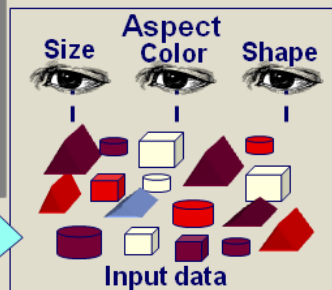
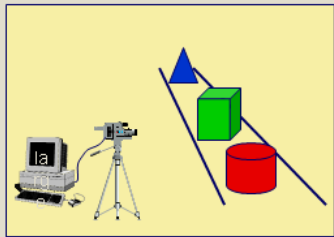
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- Translation by Zoran Putnik

The lesson: Some Examples to explain the CT-method

**Classification tree:
covers all classifications and classes**

Comp. Vision System:
Identification of Shapes
with typical properties
1: relevant aspects
2: test cases



1: Size = large, Color = red, Shape = circle



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www.systematic-testing.com

CTE, CTE XL, CTE Professional

Tool support for the classification tree method:

CTE (ca. 1995) implemented in C
CTE XL (ca. 2002) in Java
CTE Professional (2010)

www.systematic-testing.com

- Classification Tree Editor
eXtended Logics
- free Version of CTE XL
- the tool is popular amongst developers and testers and is successfully used in various domains
- for possibilities see the link

The tool window

CTE XL 1.9.3

File Edit View Tools Options Window Help

local:/C:/daad/workshops/ohrid_11/vortrag/A2.cte

Properties

Standard Violations TCSpecification

Name

ID = 297

Layout

minimal number.Testcase 1

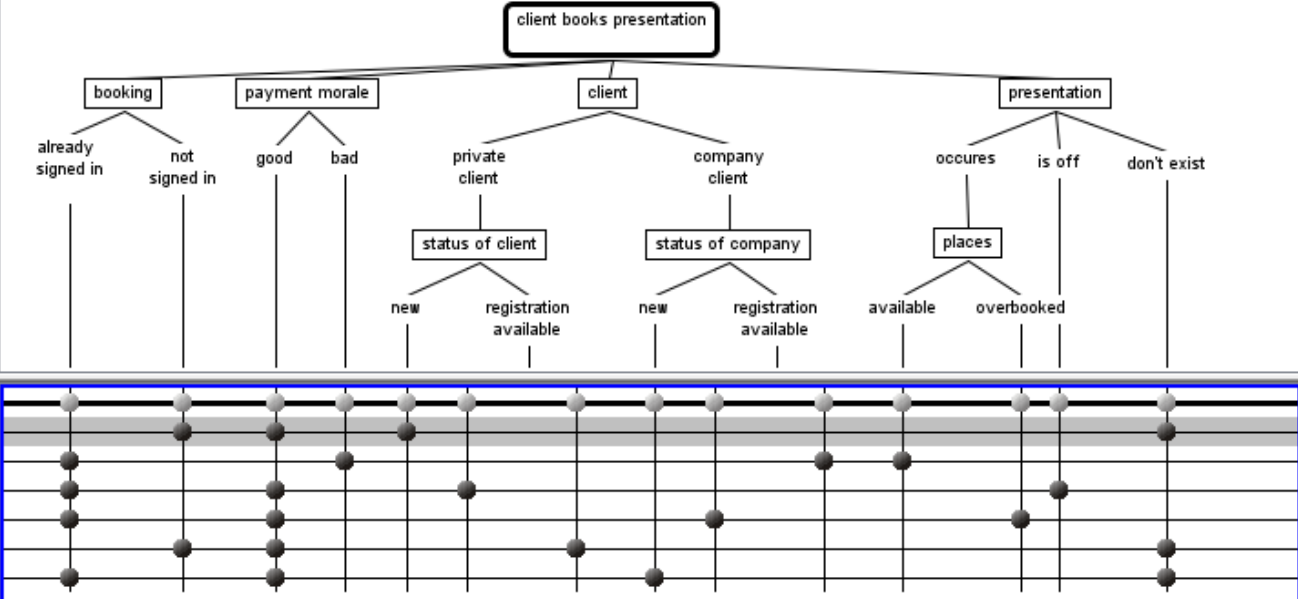
Description

Text

new private client, good payment morale books a don't exist presentation

minimal number

- minimal number.Testcase 1
- minimal number.Testcase 2
- minimal number of test cases.
- minimal number of test cases.
- minimal number of test cases.
- minimal number of test cases.



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Reminder of assignments

- **Berlin:** **8 assignments**
- **Novi Sad:** **7 assignments**
- **Tirana:** **4 assignments**

Assignments		HU	NS	TIR
1.	Review requirements specification "SemOrg"	x	x	x
2.	Function points	x	x	x
3.	Review structured analysis model	(x)	x	-
4.	Develop an OOA model	x	x	-
5.	Formal specifications	x	x	x
6.	Metrics	x	x	x
7.	Select test cases functionally by the CTE	x	-	-
8.	Select regression test cases by ATOS	x	-	-
9.	Review of a assgn solution of another team	-	x	-
10.	Test coverage with SOTA	x		

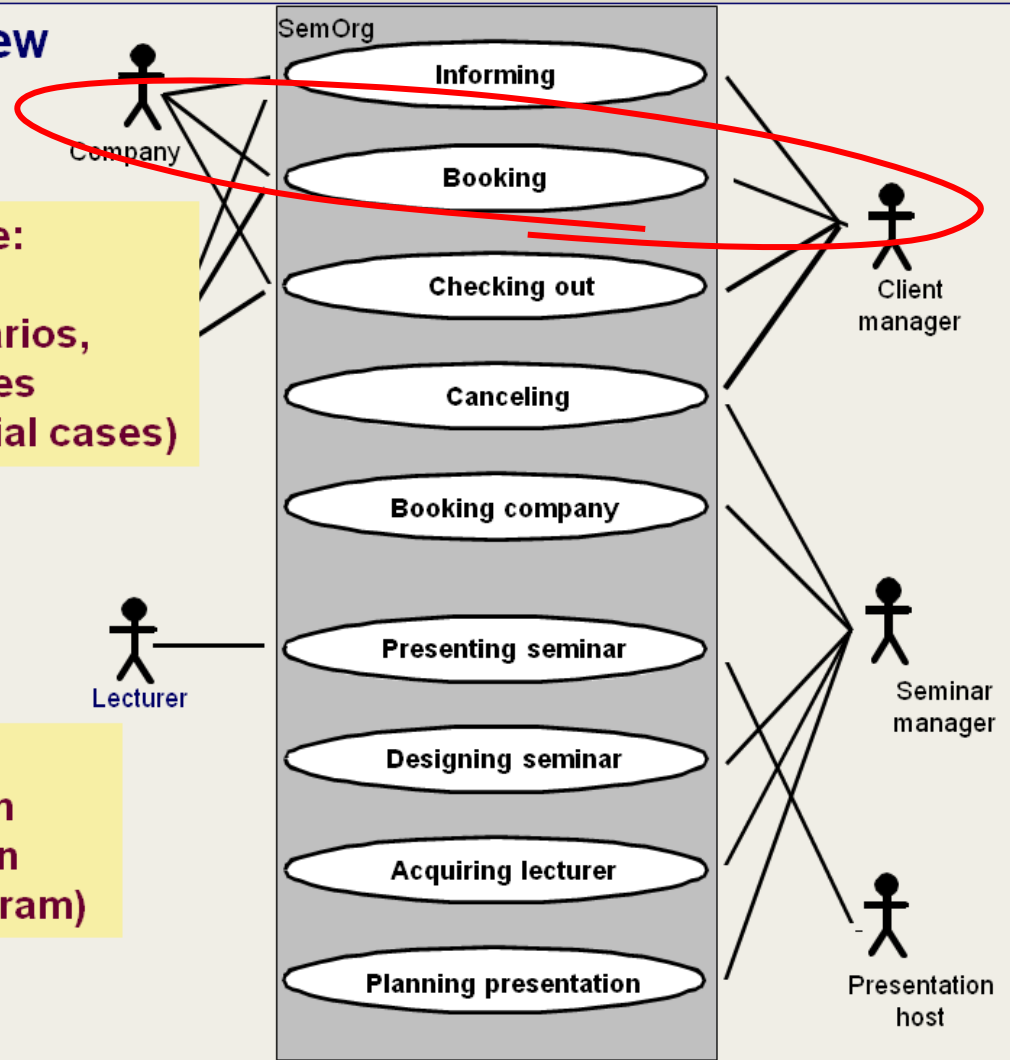
Use cases of "Seminar Organisation"

3 Product overview

For each use-case:
Variety of typical
Application scenarios,
i.e. Many test-cases
(normal and special cases)

Basis:

- verbal description
- formal description
(e.g. Activity diagram)



The tasks for the students (teams)

- think about the possible inputs for the use case “**booking**”, find out classifications and classes
- study the tutorial of CTE to understand the main possibilities of the tool
- create a classification tree with the help of CTE
- find out necessary test cases for **Minimality Criterion** (every class must be represented at least once)
- find 3 additional „interesting“ test cases

Schema description of "booking"

/F20/ (/PF20/)

Use case: booking: from registration to booking.

Category: primary

Preconditions: -

Post condition success: client is notified.

Post condition failure:

notification to clients that presentation is overbooked, or does not exist, or a booking for the client is already made.

Actor: client manager, client, company

Triggering event: client registration is available.

Description:

- 1 Client data retrieval
- 2 Presentation verification
- 3 Booking undertaking
- 4 Registration notification and sending invoice
- 5 Sending invoice copy to the accounts department

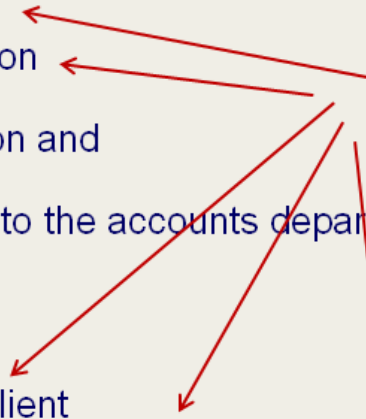
Extension:

-

Alternatives:

- 1a Inclusion of a new client
- 2a When the presentation is over booked, to point out the alternative one
- 2b Notification of "false presentation", if the presentation does not exist

**For each use-case:
typical application
scenarios lead to
test cases.**



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Relevant aspects of “booking”

- the kind of the Seminar: company-internal, public
- kind of client: company, private
- registration status of client or company:
available, obsolete, new
- kind of presentation: don't exist, occurs, fully booked
- payment morale
- ...

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Example 1

local:/C:/daad/workshops/ohrid_11/vortrag/A2.cte

Properties

Standard | Violations | TCSpecification

Name

ID = 297

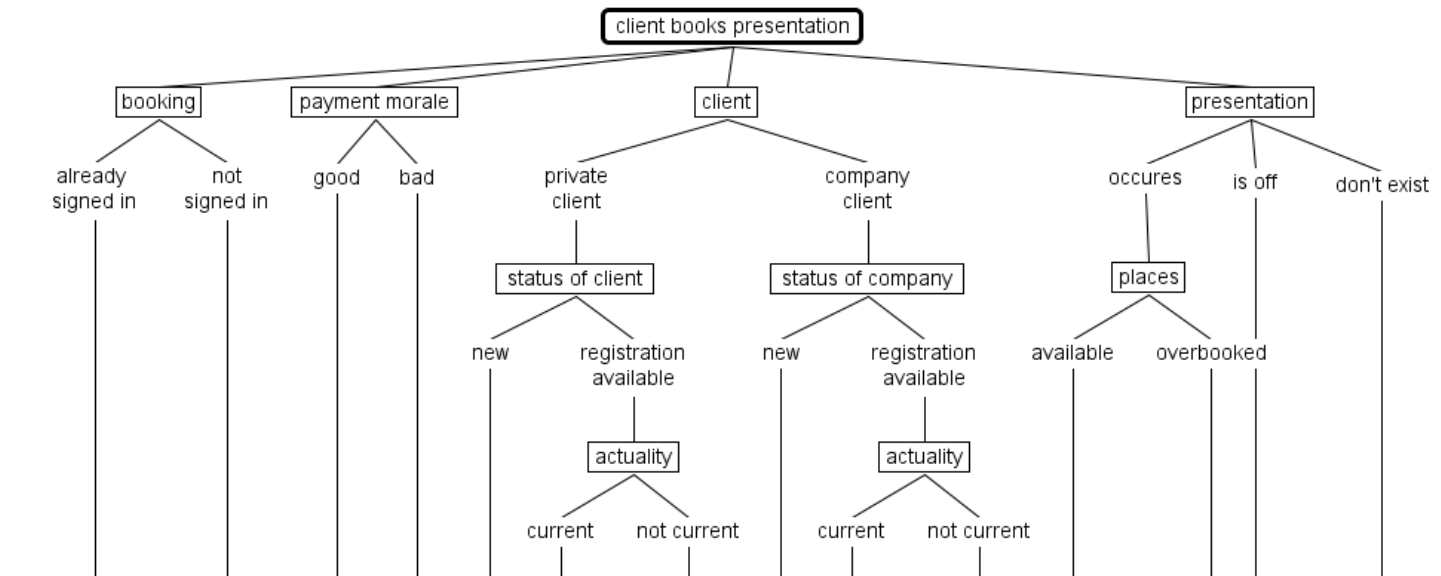
Layout

minimal number.Testcase 1

Description

Text

new private client with good payment morale books a don't exist presentation



```

graph TD
    Root[client books presentation] --> booking
    Root --> payment_morale[payment morale]
    Root --> client
    Root --> presentation

    booking --> already_signed_in[already signed in]
    booking --> not_signed_in[not signed in]

    payment_morale --> good
    payment_morale --> bad

    client --> private_client[private client]
    client --> company_client[company client]

    private_client --> status_of_client[status of client]
    company_client --> status_of_company[status of company]

    status_of_client --> new_sc[new]
    status_of_client --> registration_available_sc[registration available]
    status_of_company --> new_cc[new]
    status_of_company --> registration_available_cc[registration available]

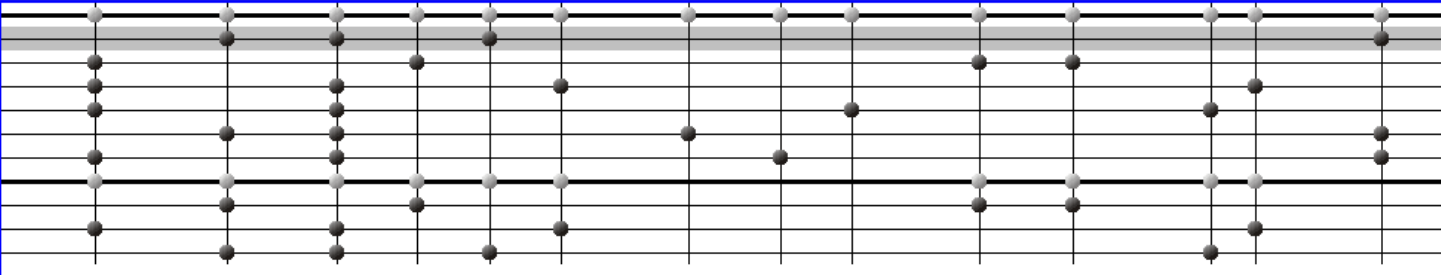
    registration_available_sc --> actuality_sc[actuality]
    registration_available_cc --> actuality_cc[actuality]

    actuality_sc --> current_sc[current]
    actuality_sc --> not_current_sc[not current]
    actuality_cc --> current_cc[current]
    actuality_cc --> not_current_cc[not current]

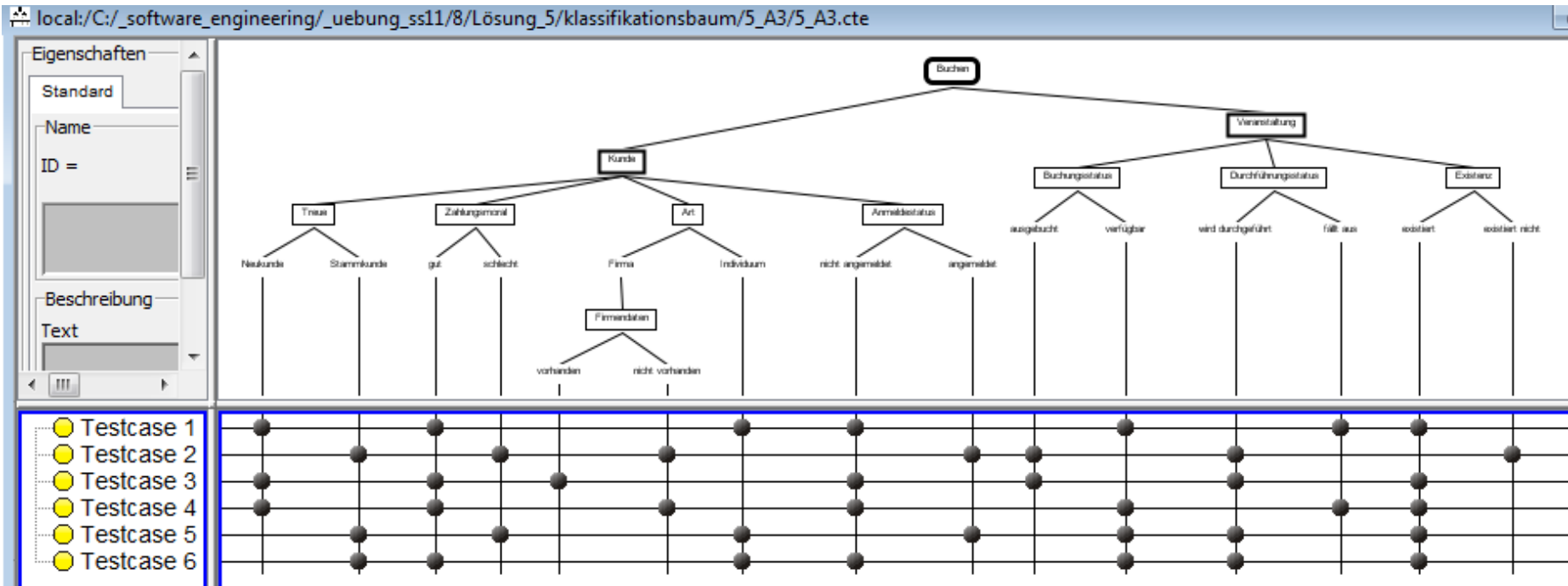
    presentation --> occurs
    presentation --> is_off[is off]
    presentation --> dont_exist[don't exist]

    occurs --> places
    places --> available
    places --> overbooked
    
```

- minimal number
 - minimal number.Testcase 1
 - minimal number.Testcase 2
 - minimal number.Testcase 3
 - minimal number.Testcase 4
 - minimal number.Testcase 5
 - minimal number.Testcase 6
- Interesting test cases
 - Testcase 1
 - Testcase 2
 - Testcase 3

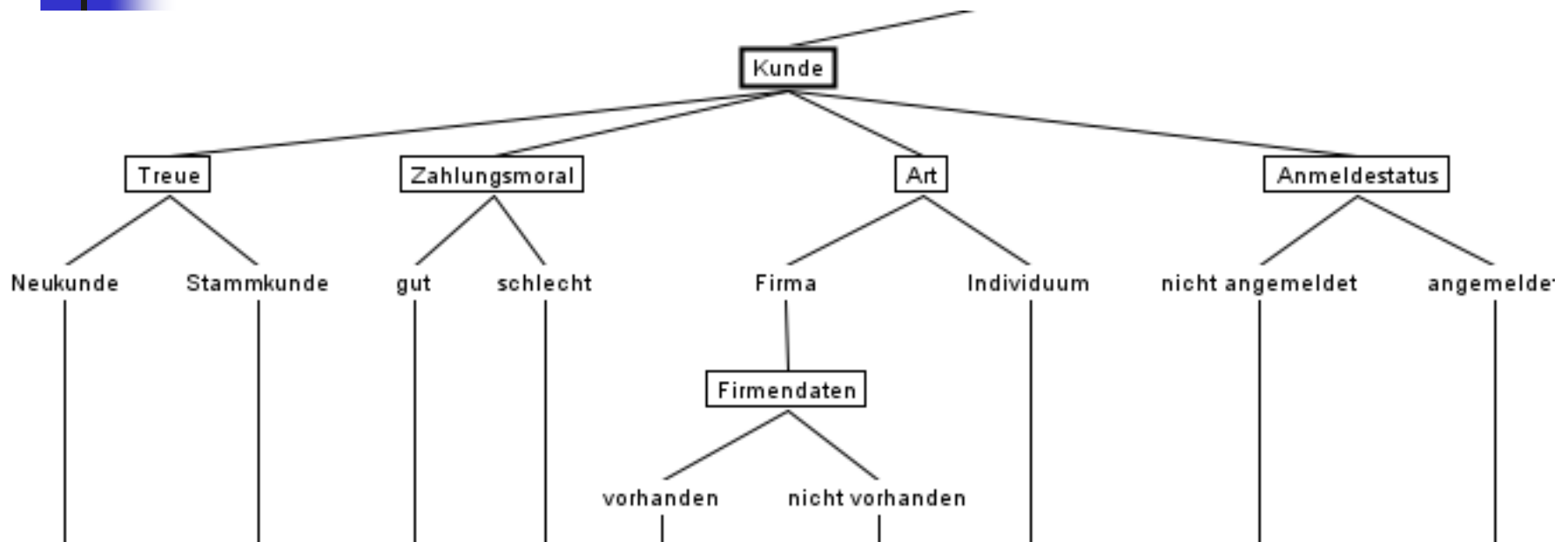


Example 2



- flat hierarchy with element composition

Example 2

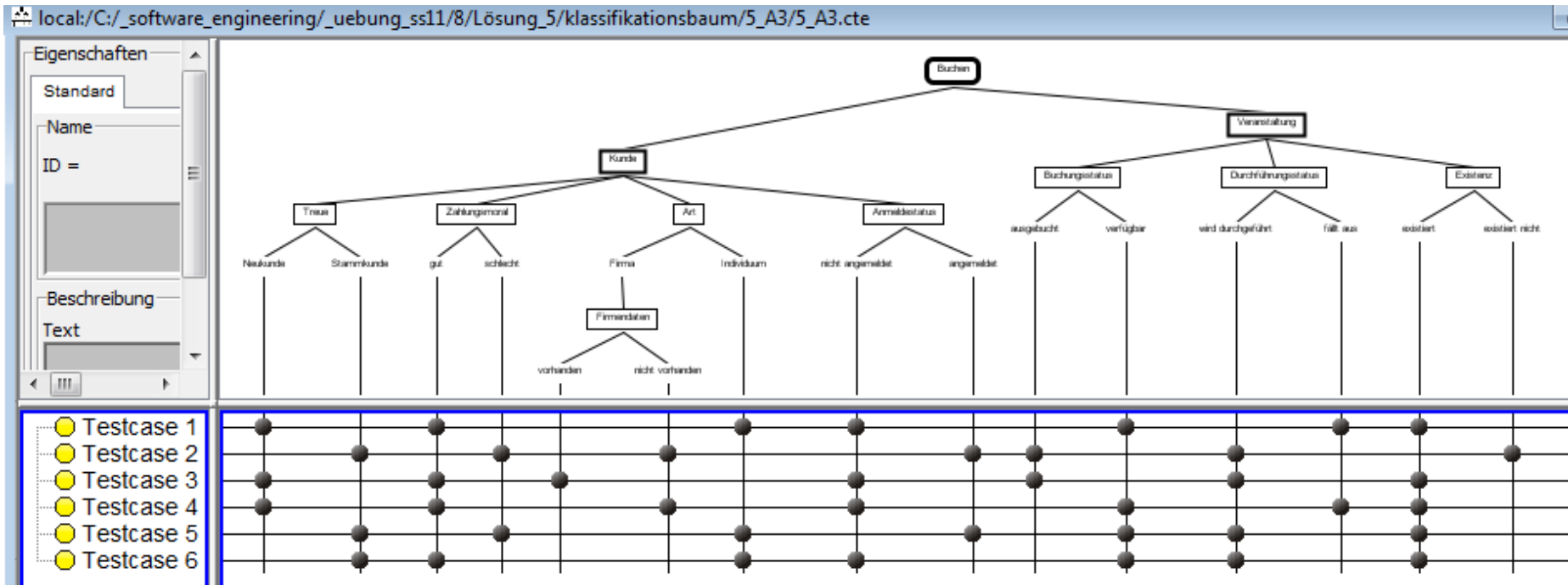


Composition

Compositions can summarize several classifications. The classes of several classifications, which are located under a composition, are **not mutually exclusive**.

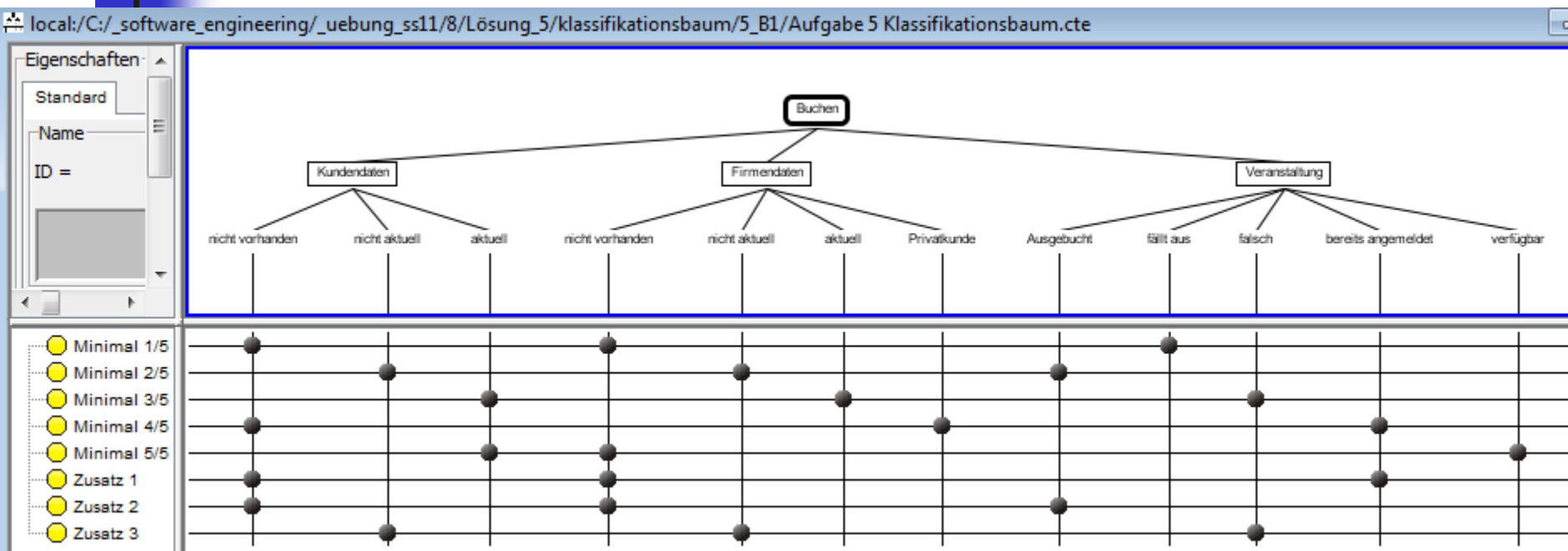
Classifications and more compositions can be created under a composition.

Example 2



- 3 test cases to fulfill Minimality Criterion

Example 3



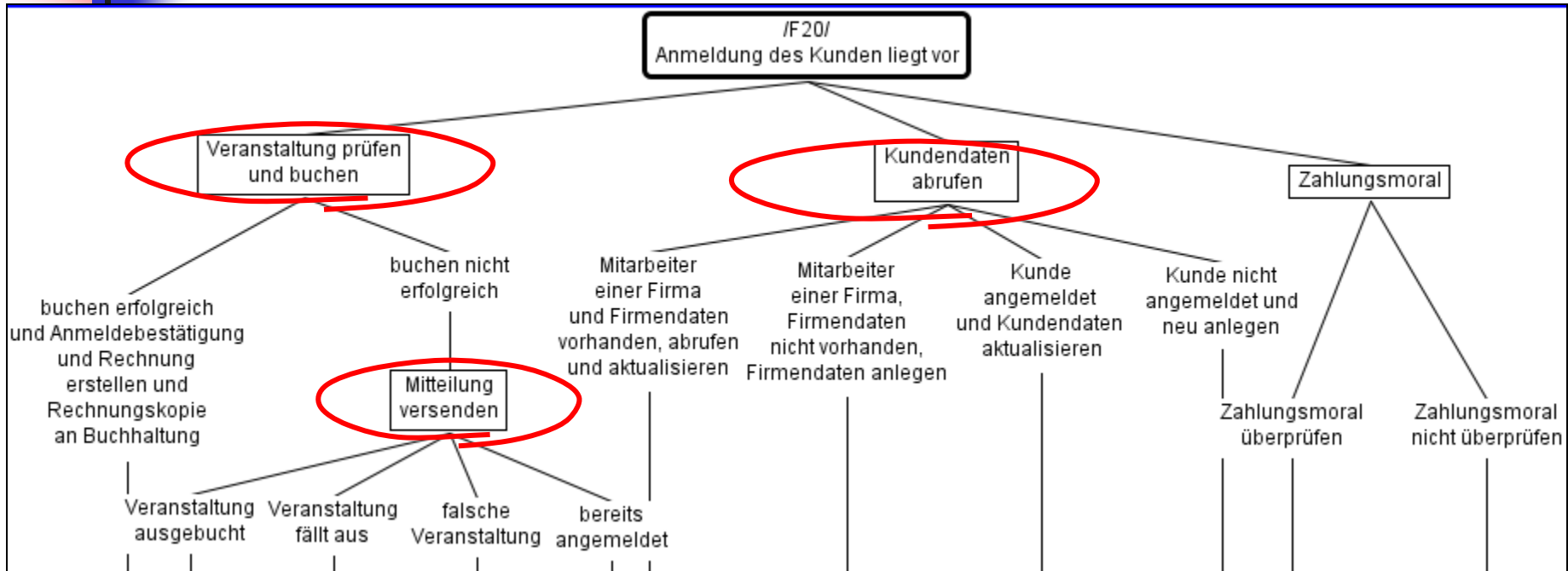
- flat hierarchy without composition

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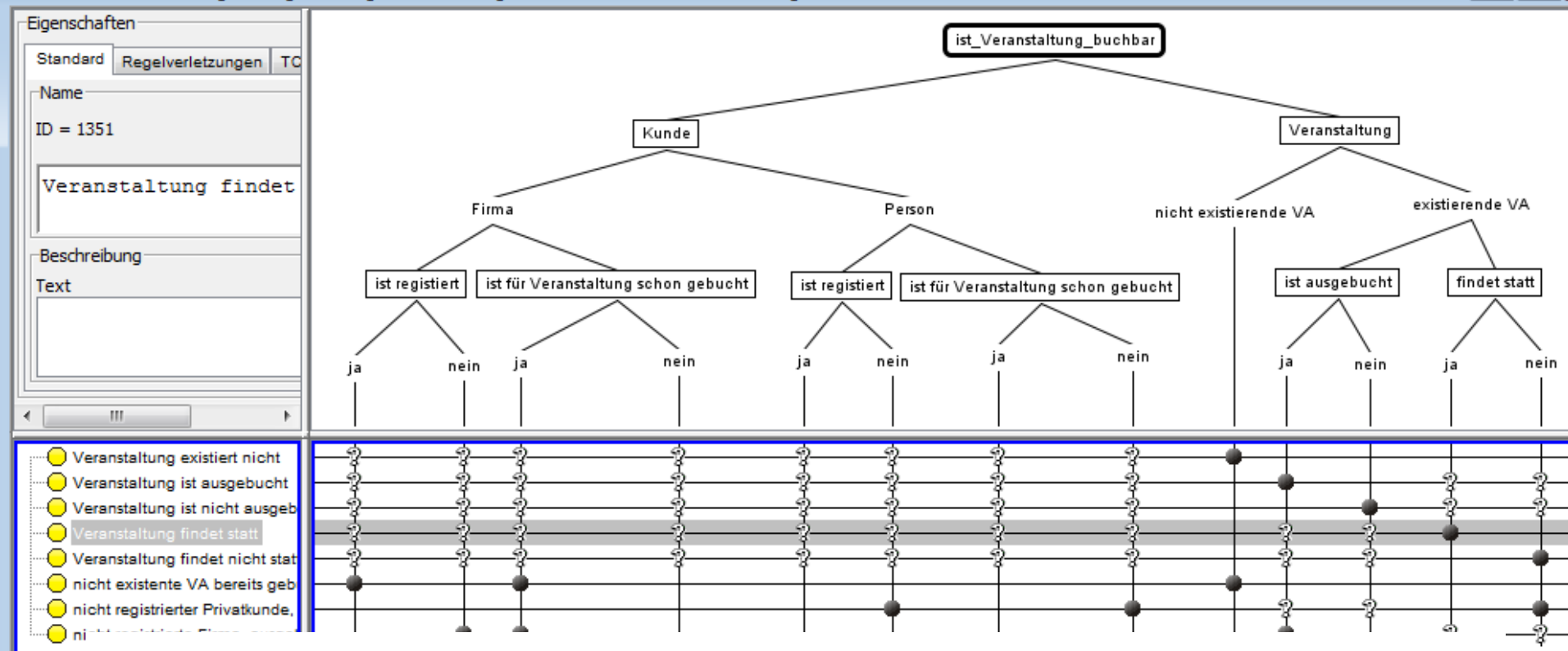
Example 1



- classification and classes: decomposition of the input space
 - not activities (check presentation, recall client data ...)
 - not outputs (send informations ...)

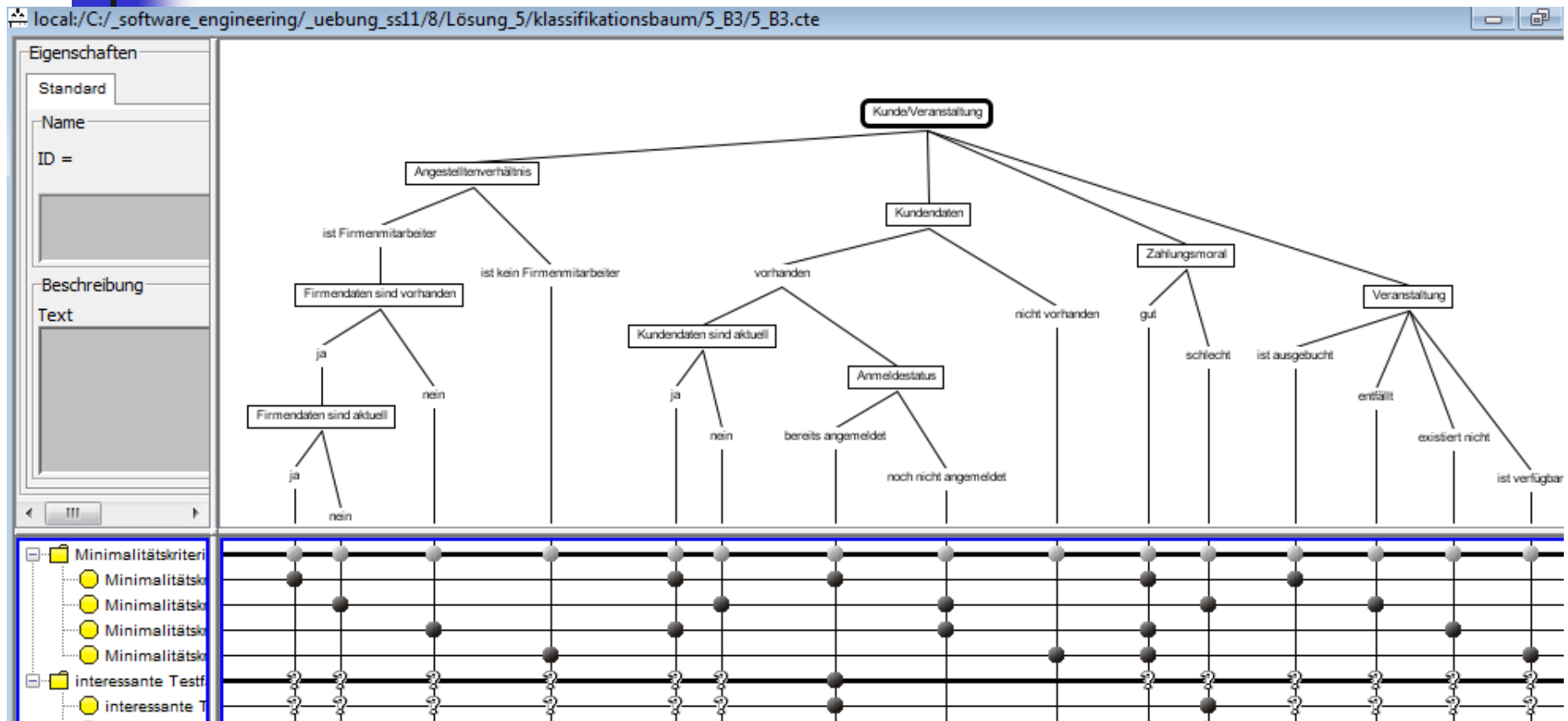
Example 2

local:/C:/_software_engineering/_uebung_ss11/8/Lösung_5/klassifikationsbaum/5_Z2/Aufgabe 5.cte



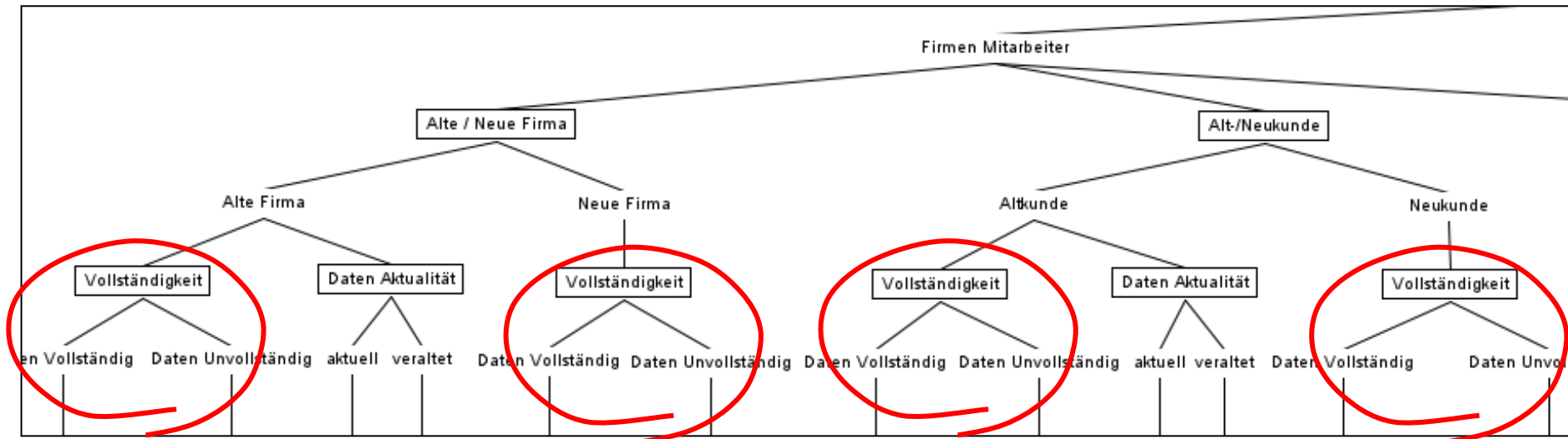
- incomplete test cases: question mark means that no class has yet been marked

Example 3



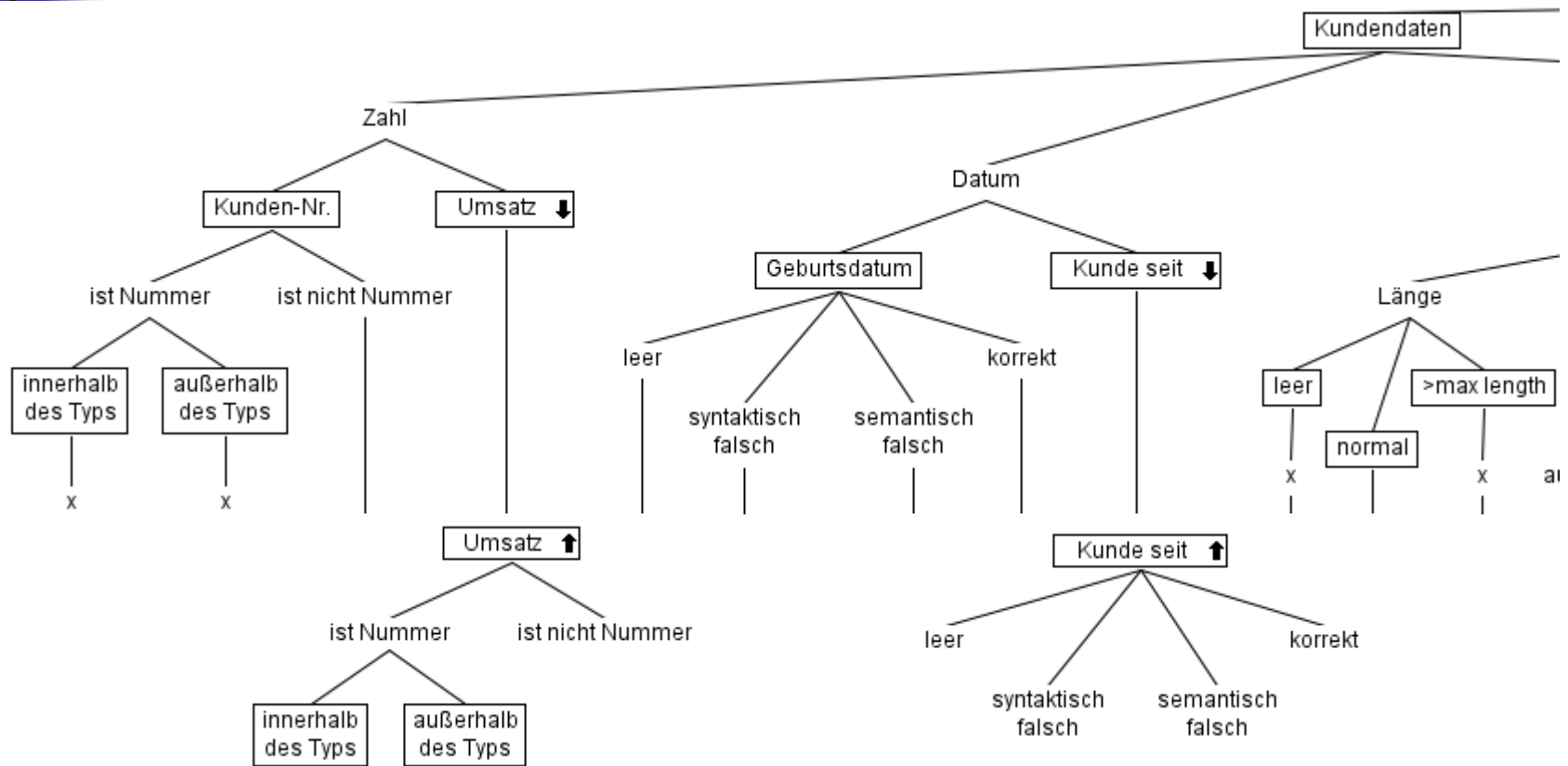
■ 5 test cases necessary for Minimality Criterion

Example 4: inconvenient solution



- several identical classification and classes

Example 5



- type of data of the input space: digit, date, String ...
- possible mistakes in the input stream: not a number

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Summary

- students learn how it's possible to find test cases early in software development process
- there are many possibilities for the design of the CT, so we get different solutions
- work with a professional Tool
- think about useful test cases and about the minimal and maximal number
- the method is easy to understand
- students have further tasks

Entirely new CTE XL Professional



CTE XL Professional - For Even More Systematic Test Case Design

Dear Michael Ritzschke,

You are registered as a potential professional user of the CTE XL.

Therefore, we would like to inform you that Berner & Mattner has developed an entirely new classification-tree editor to cope with the growing demands from testing experts: the **CTE XL Professional**. Many feature requests desired from current users have been integrated.

The Eclipse based implementation features new major functionalities such as

- > Prioritization of test cases based on weightings for test-relevant aspects
- > Deterministic test case generation
- > Statistical test case generation
- > Significantly improved integration with IBM Rational DOORS and HP Quality Center



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Summary

Thank you for your attention!