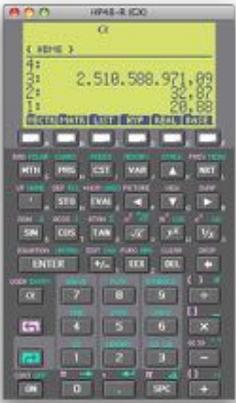


Testbare Eigenschaften

```
class Roots {  
    // Löse  $ax^2 + bx + c = 0$   
    public roots(double a, double b, double c)  
    { ... }  
  
    // Ergebnis: Werte für x  
    double root_one, root_two;  
}
```

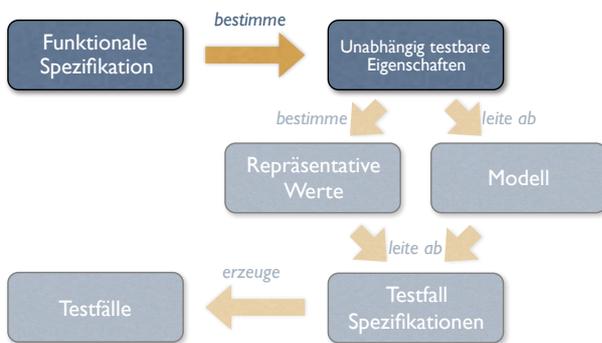
- Was sind die unabhängig testbaren Eigenschaften?

Testbare Eigenschaften



- Beispiel: Multifunktionaler Taschenrechner
- Was sind die unabhängig testbaren Eigenschaften?

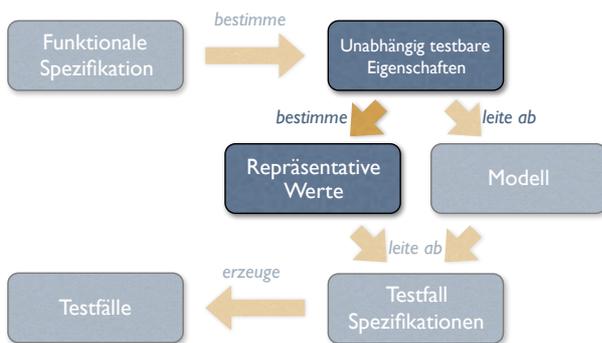
Testbare Eigenschaften



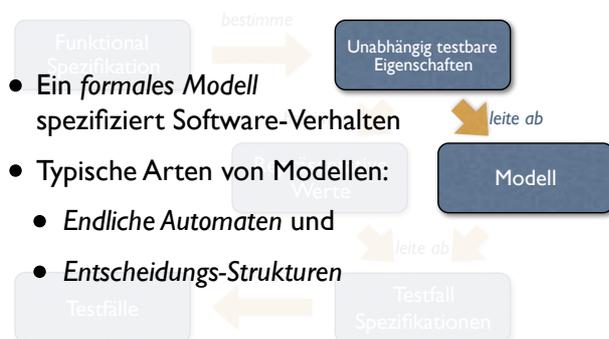
Gutjahrs Hypothese

Partitionstesten
ist effektiver
als Zufallstesten.

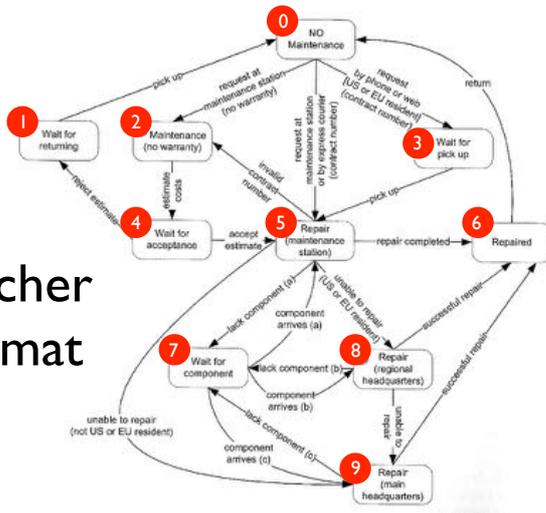
Repräsentative Werte



Modellbasiertes Testen



Endlicher Automat



Maintenance: The *Maintenance* function records the history of items undergoing maintenance.

If the product is covered by warranty or maintenance contract, maintenance can be requested either by calling the maintenance toll free number, or through the Web site, or by bringing the item to a designated maintenance station.

If the maintenance is requested by phone or Web site and the customer is a US or EU resident, the item is picked up at the customer site, otherwise, the customer shall ship the item with an express courier.

If the maintenance contract number provided by the customer is not valid, the item follows the procedure for items not covered by warranty.

If the product is not covered by warranty or maintenance contract, maintenance can be requested only by bringing the item to a maintenance station. The maintenance station informs the customer of the estimated costs for repair. Maintenance starts only when the customer accepts the estimate. If the customer does not accept the estimate, the product is returned to the customer.

Small problems can be repaired directly at the maintenance station. If the maintenance station cannot solve the problem, the product is sent to the maintenance regional headquarters (if in US or EU) or to the maintenance main headquarters (otherwise).

If the maintenance regional headquarters cannot solve the problem, the product is sent to the maintenance main headquarters.

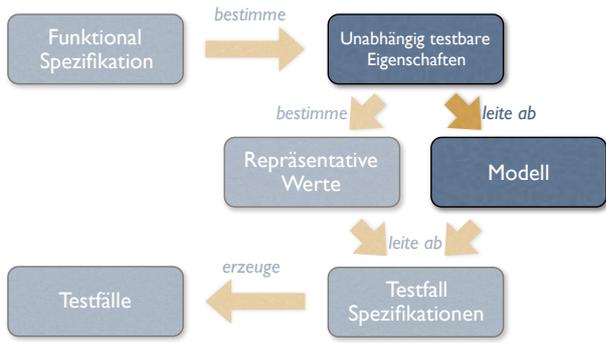
Maintenance is suspended if some components are not available.

Once repaired, the product is returned to the customer.

Abdeckungskriterien

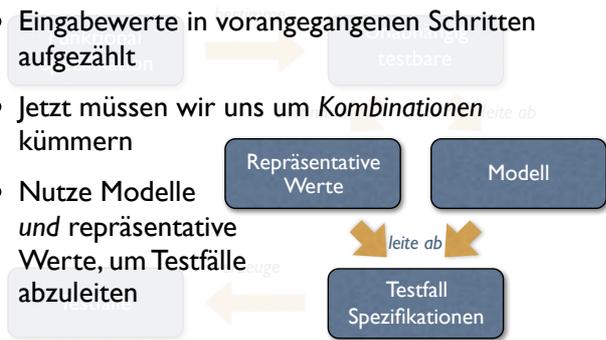
- **Pfad-Abdeckung:** Tests decken jeden Pfad ab
In der Praxis nicht möglich, da unendlich viele Pfade
- **Zustands-Abdeckung:** Jeder *Knoten* wird erreicht
Mindest-Kriterium zum Testen
- **Übergangs-Abdeckung:** Jede *Kante* wird erreicht
Sinnvolles und gewöhnlich erfüllbares Abdeckungs-Kriterium

Modellbasiertes Testen

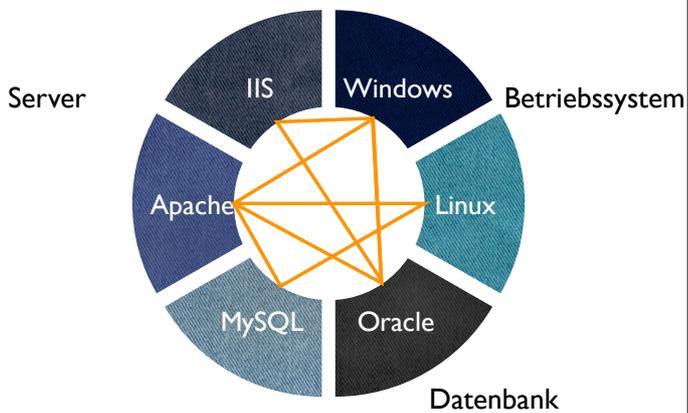


Testfall-Spezifikationen ableiten

- Eingabewerte in vorangegangenen Schritten aufgezählt
- Jetzt müssen wir uns um *Kombinationen* kümmern
- Nutze Modelle und repräsentative Werte, um Testfälle abzuleiten



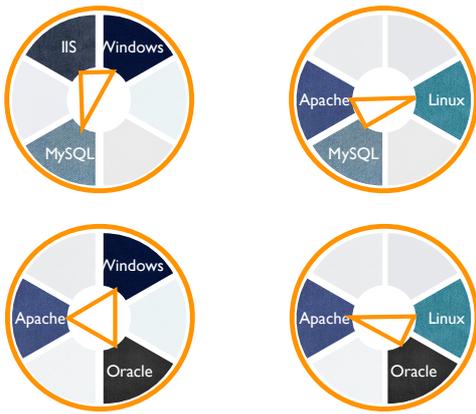
Kombinatorisches Testen



Kombinationstesten

- **Ungültige** Kombinationen ausschließen
IIS etwa läuft nur auf Windows
- **Alle Paare** aus Kombinationen abdecken
wie etwa MySQL auf Windows und Linux
- Kombinationen gewöhnlich *automatisch generiert*
und – hoffentlich – auch automatisch getestet

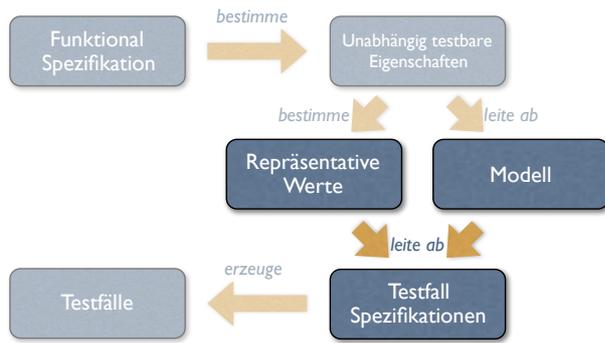
Paarweises Testen



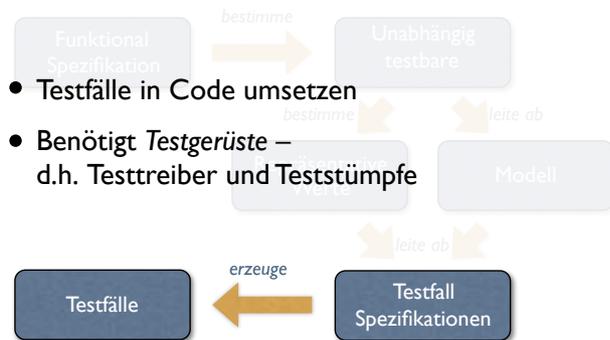
Testumgebung

- Millionen von Konfigurationen
- Getestet auf Dutzenden verschiedener Maschinen
- Alles, um Fehler zu finden und zu reproduzieren

Testfall-Spezifikationen ableiten



Testfälle ableiten



JUnit

