

# 5 DINGE, DIE SIE ÜBER REGRESSIONSTESTS WISSEN SOLLTEN

Dr. Jeremias Rößler

**Wer hat manuell getestet?**

**Wer hat manuell regressionsgetestet?**

**Wem hat das Spaß gemacht?**

**Warum haben Sie nicht automatisch getestet?**

## Probleme heutiger UI-Testautomatisierung:

- Tests aufwendig zu Erstellen
- Tests aufwendig zu Pflegen
- Tests brüchig
- Tests unvollständig



# Tests aufwendig zu Erstellen

The screenshot shows the Selenium IDE interface with the following details:

- Base URL:** http://retest.de/
- Test Case:** Untitled \*
- Table View:** Shows a list of commands:

Command	Target	Value
open	/	
clickAndWait	link=Häufige Fragen	
- Detail View (clickAndWait row):** Shows the command, target, and value fields. The value field is expanded to show a dropdown menu of locator strategies:

Command	clickAndWait
Target	link=Häufige Fragen
Value	<ul style="list-style-type: none"><li>link=Häufige Fragen</li><li>//a[contains(text(),'Häufige Fragen')]</li><li>//ul[@id='nav']/li[2]/ul/li[2]/a</li><li>//a[@href='http://www.retest.de/fa...']</li><li>//li[2]/a</li></ul>
- Log Tab:** Displays the command: clickAndWait(locator)
- Reference Tab:** Shows the generated code from click(locator):

```
click(locator)
```
- UI-Element Tab:** Shows the locator dropdown expanded with the following options:
  - link=Häufige Fragen
  - //a[contains(text(),'Häufige Fragen')]
  - //ul[@id='nav']/li[2]/ul/li[2]/a
  - //a[@href='http://www.retest.de/fa...']
  - //li[2]/a
- Rollup Tab:** Shows the locator dropdown expanded with the following options:
  - link=Häufige Fragen
  - //a[contains(text(),'Häufige Fragen')]
  - //ul[@id='nav']/li[2]/ul/li[2]/a
  - //a[@href='http://www.retest.de/fa...']
  - //li[2]/a
- Arguments:**
  - locator - an element locator
- Description:** Clicks on a link, button, checkbox or radio button. If the click action causes a new page to load (like a link usually does), call waitForPageToLoad.

## Tests aufwendig zu Erstellen

**HumiCalc with Uncertainty**

File Options Help

**Configuration**

Temperature Scale: ITS-90 Carrier Gas: Dry Air Mode: Normal  
Equilibrium Over: Water Apply Enhancement Factors:  Known: Dew Point

**Known Values (Standard u)**

Dew Point	10.0	±0.0577
Temperature	25.0	±0.025
Pressure	14.7	±0.025

**Calculated Values (Expanded U with 95.45% Confidence)**

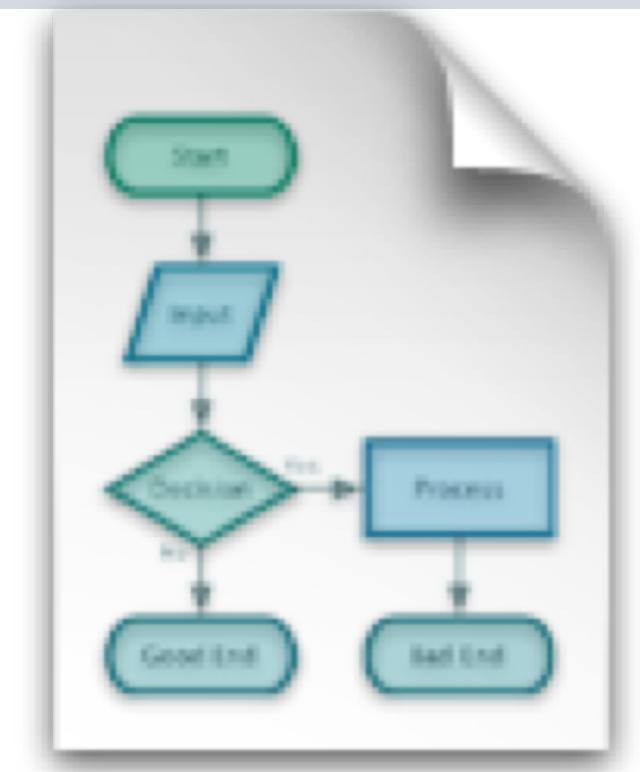
%RH	38.7340793	±0.3212	Specific Humidity	0.0076028	±6E-005
Frost Point			Absolute Humidity	8.962178468	±0.0694
Dew Point	10.0	±0.1155	Dry Air Density	1169.837556	±4.0342
PPMv	12314.00364	±105.31	Moist Air Density	1178.799735	±4.033
PPMw	7661.045263	±65.521	Saturation Temperature		
Grains/lb	53.62731684	±0.4586	Saturation Pressure		
Enthalpy	44.63021277	±0.1744	Wet Bulb Temperature	16.10904106	±0.0559
SVP@Tt	3169.90395	±9.4493	Mixing Ratio by Volume	0.012314004	±0.0001
SVP@Td	1228.13339	±9.5028	Mixing Ratio by Weight	0.007661045	±7E-005
SVP@Ts			Percent by Volume	1.216421347	±0.0103
F@Tt,Pt	1.004109348	±1E-005	Percent by Weight	0.760279987	±0.0065
F@Td,Pt	1.003863842	±1E-005	Vapor Mole Fraction	0.012164213	±0.0001
F@Ts,Ps			Dry Air Mole Fraction	0.987835787	±0.0001

**Calculate**

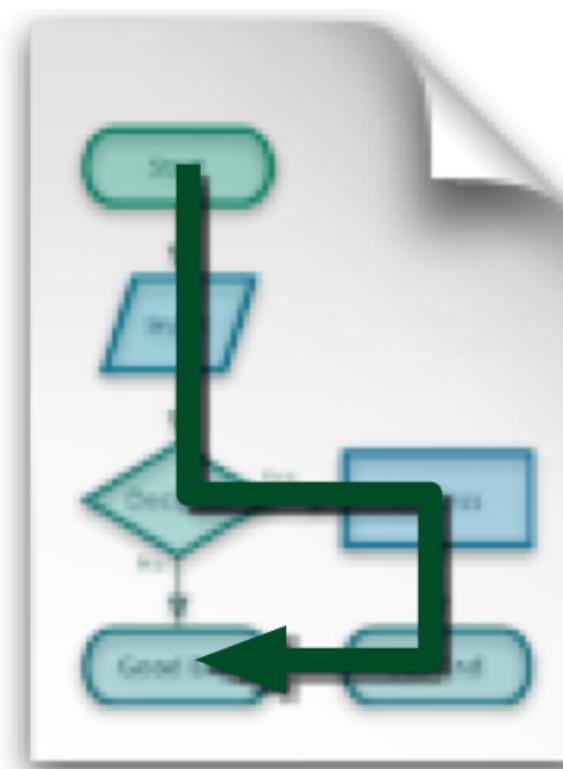
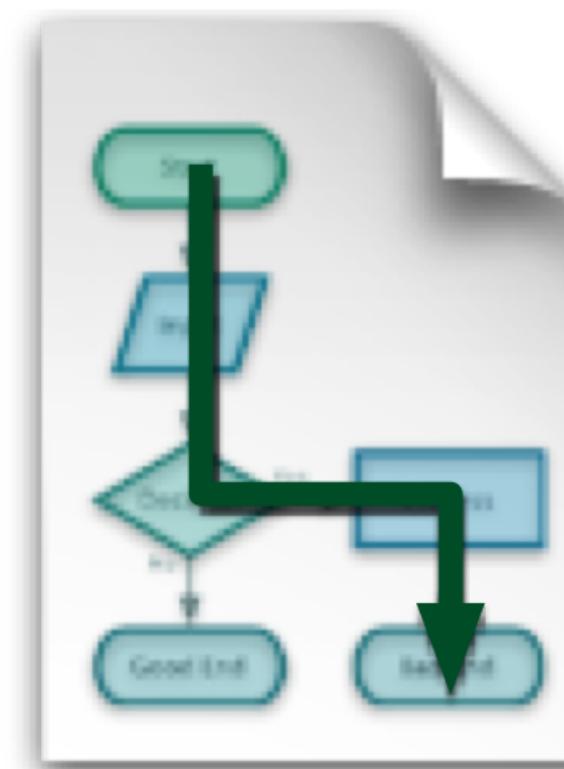
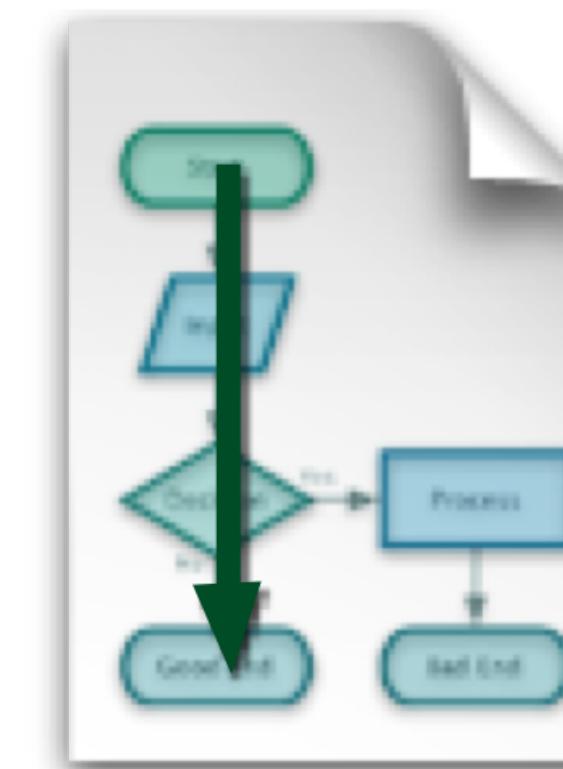
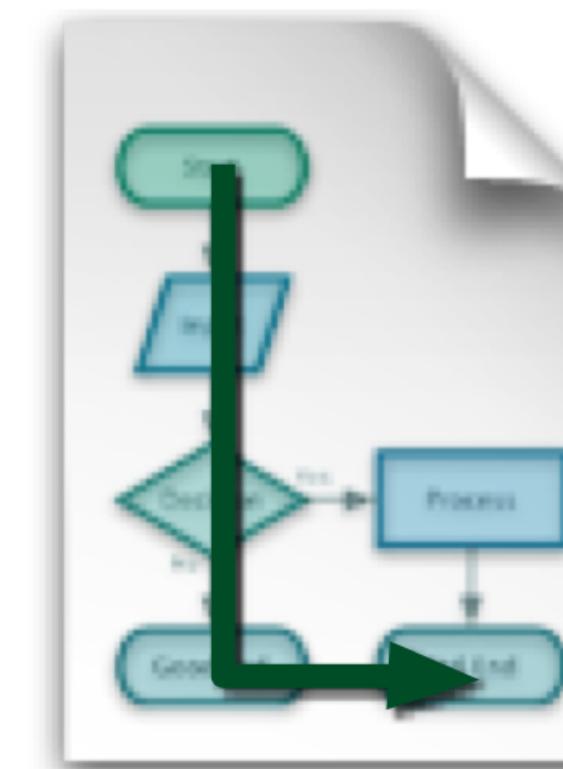
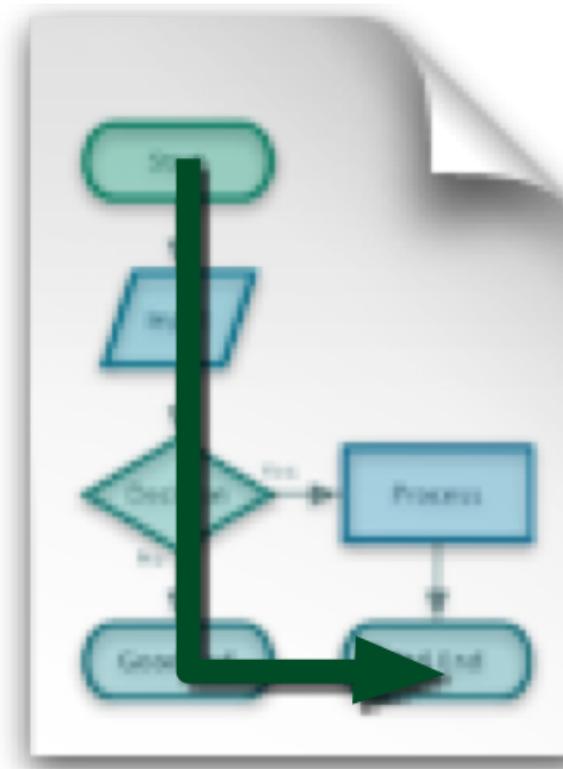
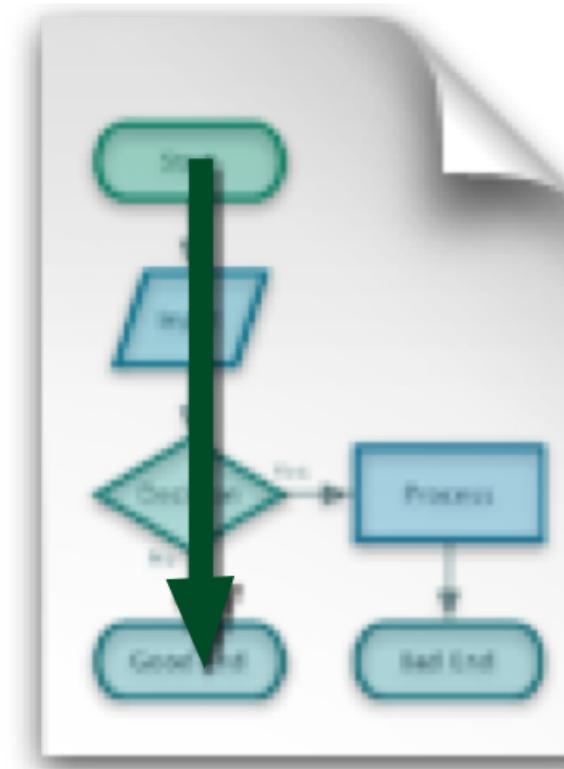
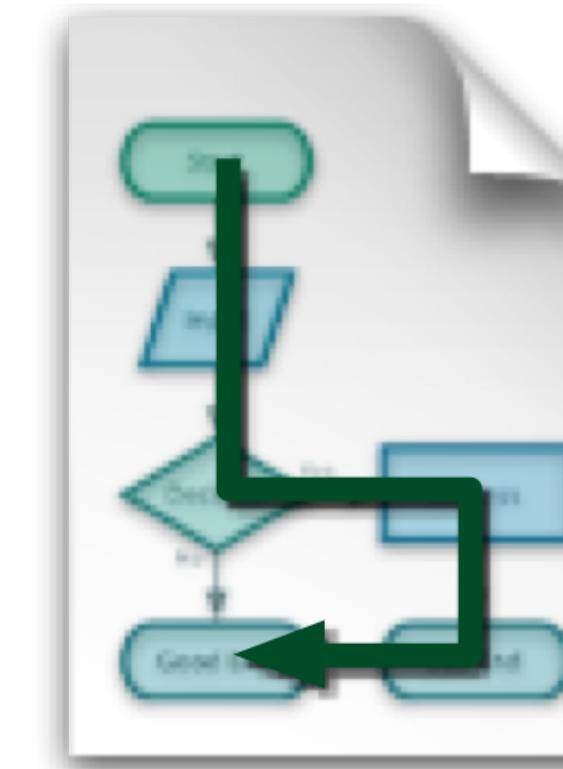
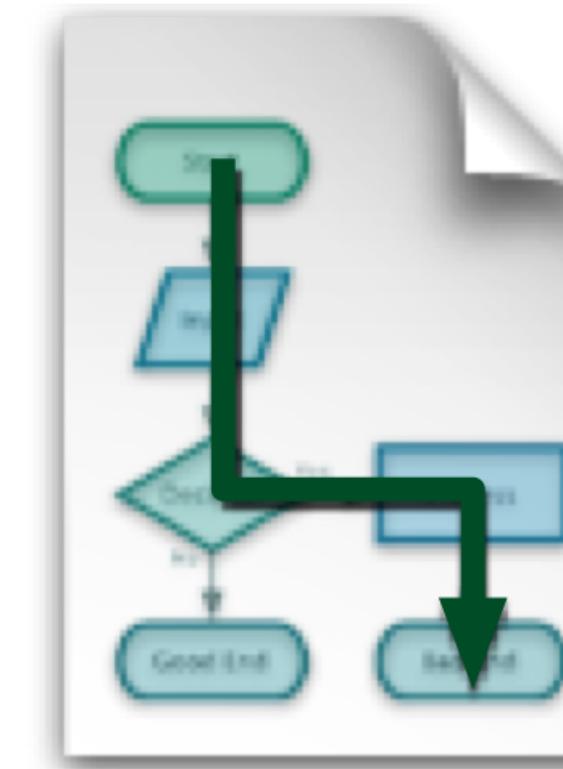
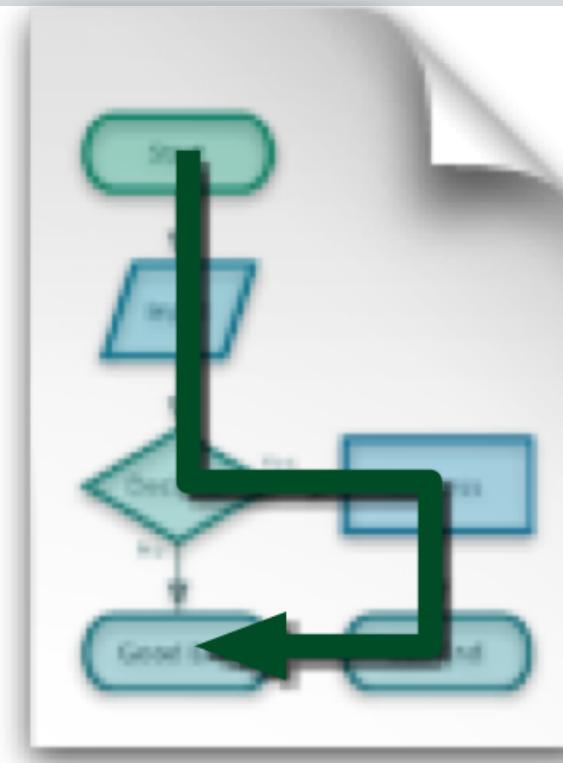
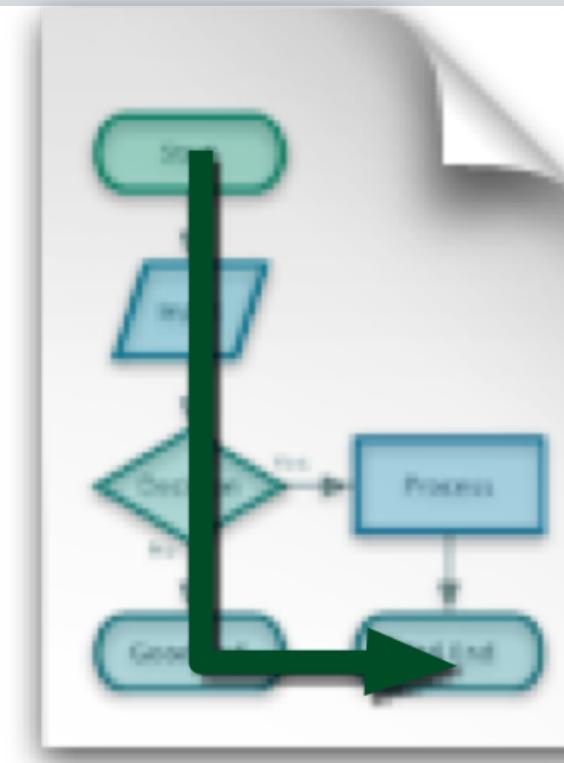
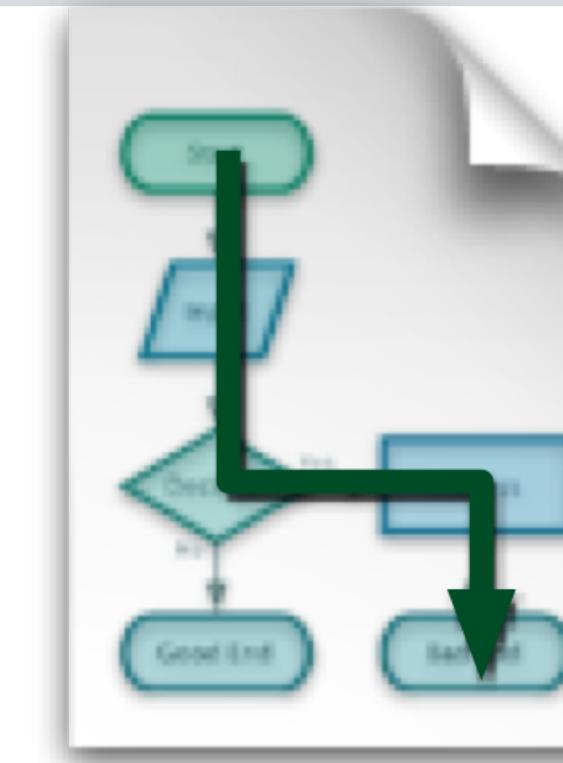
**Units**

Temperature	°C
Pressure	psia
Vapor Pressure	Pa
Density and Abs Humidity	g/m^3
Enthalpy	J/g

# Tests aufwendig zu Pflegen



# Tests aufwendig zu Pflegen



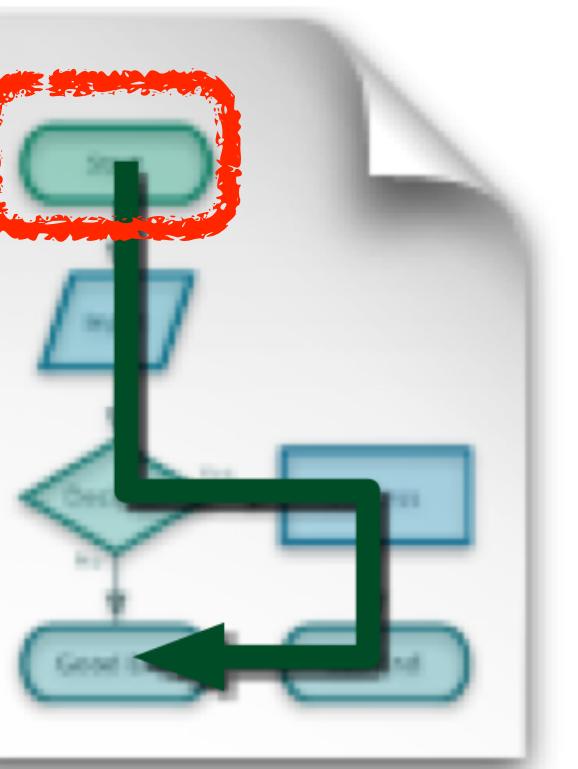
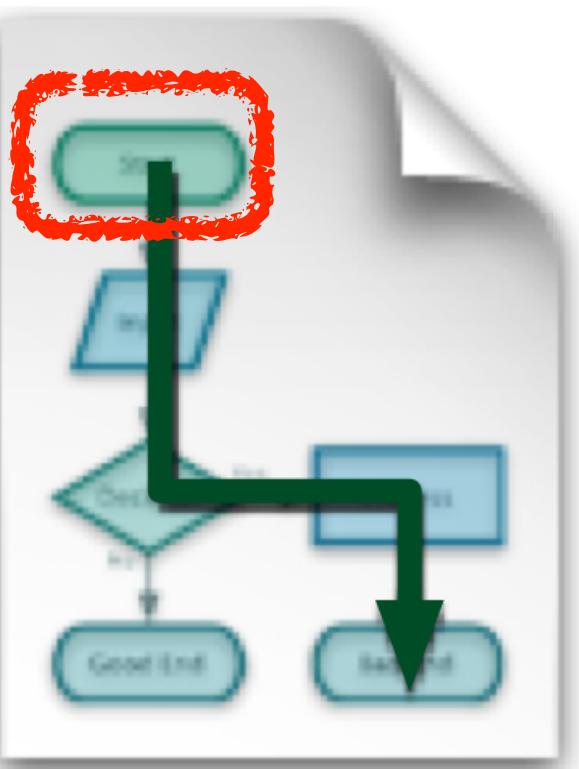
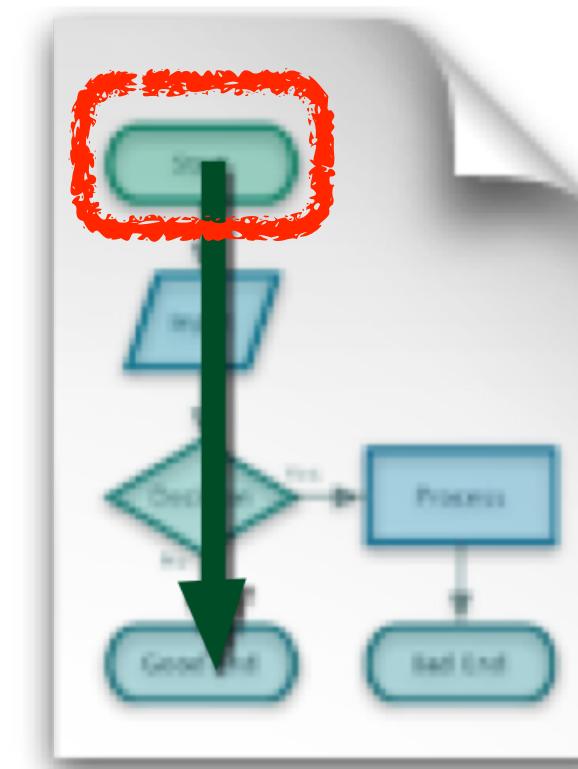
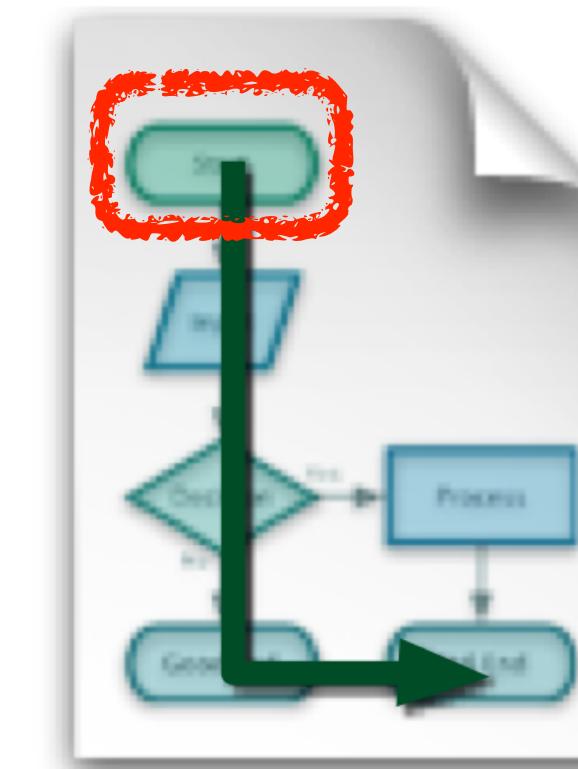
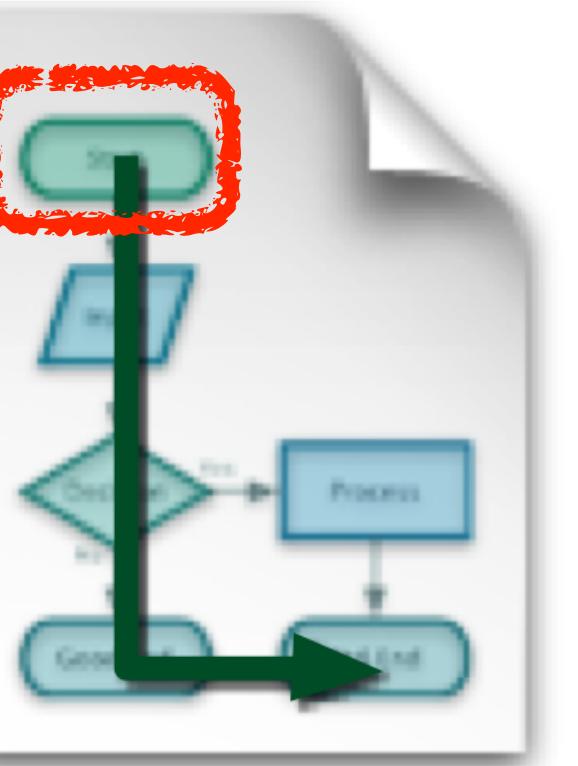
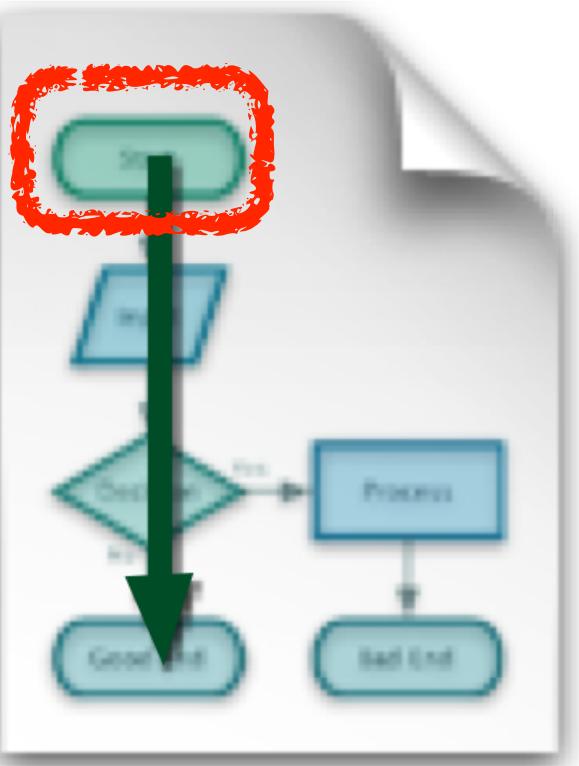
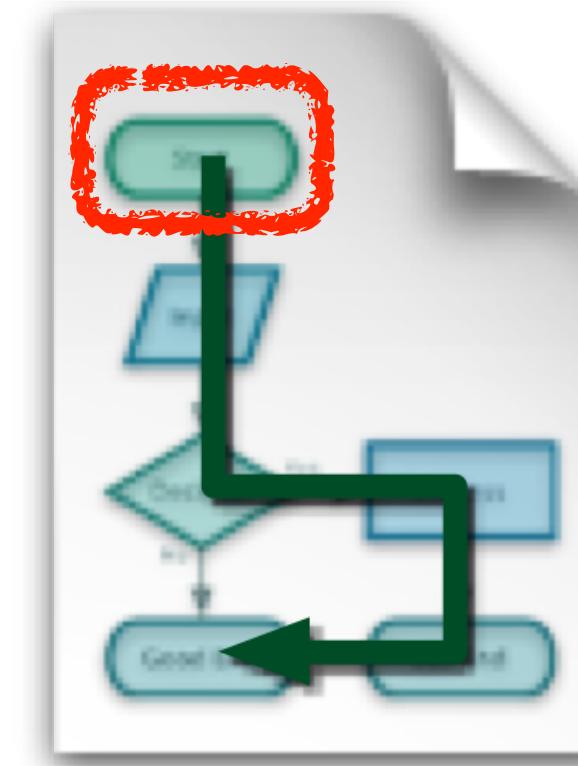
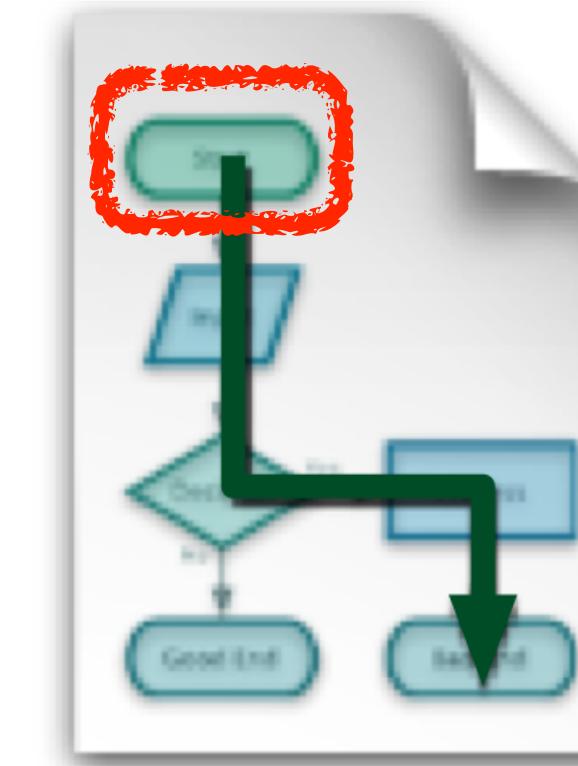
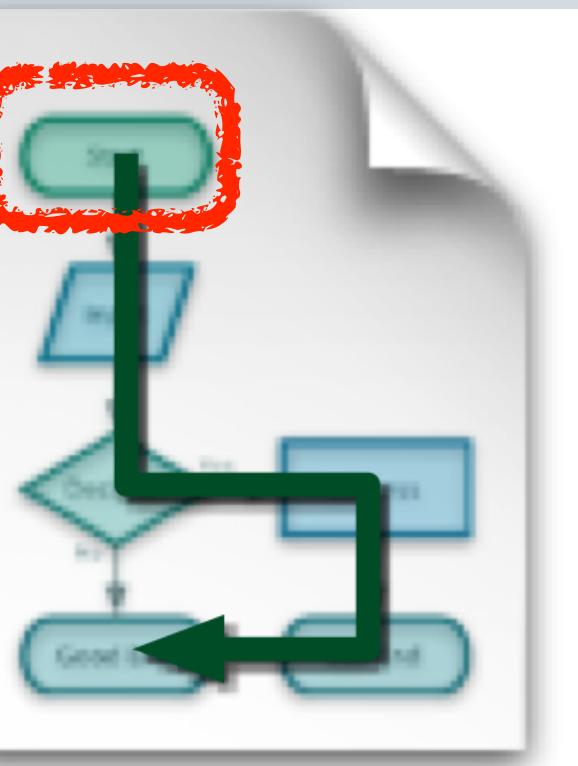
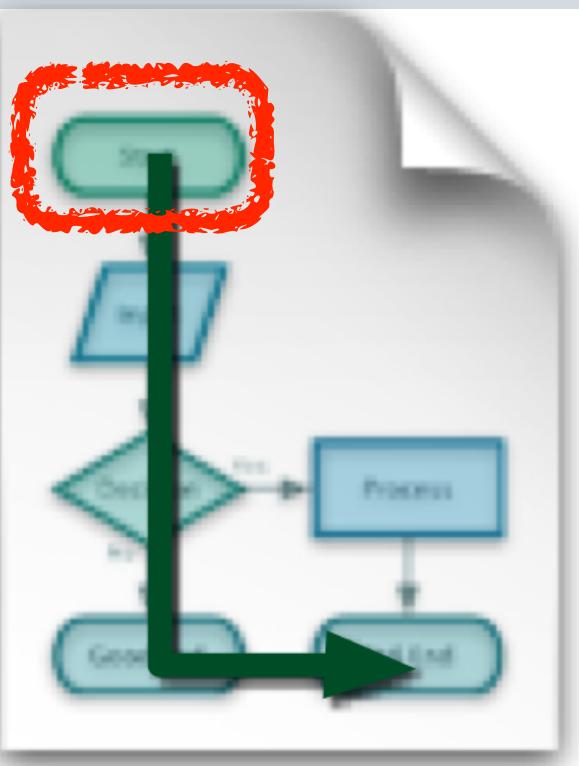
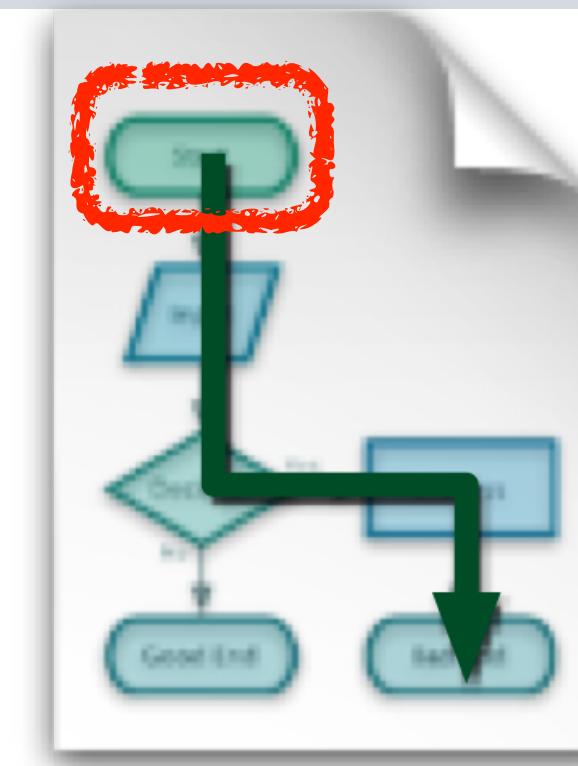
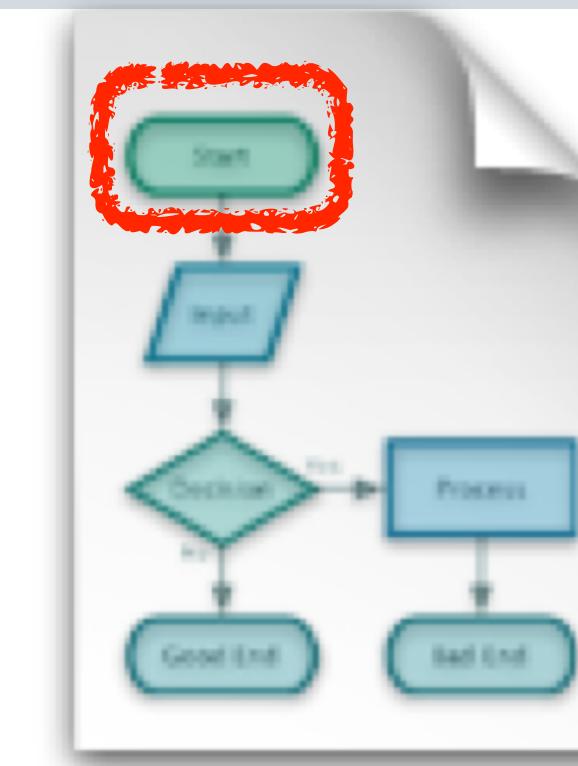


# Tests aufwendig zu Pflegen

The screenshot shows the Selenium IDE interface with the following details:

- Base URL:** http://retest.de/
- Test Case:** Untitled \*
- Table View:** Shows two rows:
  - Command: open, Target: /
  - Command: clickAndWait, Target: link=Häufige Fragen
- Locator Pop-up (clickAndWait row):** A dropdown menu lists several locator strategies:
  - link=Häufige Fragen (selected)
  - link=Häufige Fragen (link)
  - //a[contains(text(),'Häufige Fragen')] (xpath:link)
  - //ul[@id='nav']/li[2]/ul/li[2]/a (xpath:idRelative)
  - //a[@href='http://www.retest.de/fa...'] (xpath:href)
  - //li[2]/a (xpath:position)
- Log Tab:** Displays the command: clickAndWait(locator)
- Description:** Generated from click(locator)
- Arguments:**
  - locator - an element locator
- Note:** Clicks on a link, button, checkbox or radio button. If the click action causes a new page to load (like a link usually does), call waitForPageToLoad.

## Tests aufwendig zu Pflegen



## 2. Programmierprojekt

## Tests brüchig

Test History for CleanCode

View

View as Overview | Purge > 30 days | Purge > 7 days | Purge all | Cancel

Page	Pass	Fail	Latest	Last 20 Results						
CleanCode	13	27	11 Jul 13, 19:54	-	-	-	-	-	-	-
CleanCode.ConcatFixtureTest	5	1	20 Jun 13, 19:43	+	+	+	+	+	+	-
CleanCode.ConceptNotes.AccessWindowsEnvironmentVariables	37	1	11 Jul 13, 19:54	+	+	+	+	+	+	+
CleanCode.ConceptNotes.AppSettingsTestPage	46	12	11 Jul 13, 19:54	+	+	+	+	+	+	+
CleanCode.ConceptNotes.CheckingForBlankOrNull	15	5	11 Jul 13, 19:54	+	+	+	+	+	+	+
CleanCode.ConceptNotes.DefineAndUseSymbolsAndVariables	36	1	11 Jul 13, 19:54	+	+	+	+	+	+	+
CleanCode.ConceptNotes.DemoPage	0	5	07 Jul 13, 06:08	-	-	-	-	-	-	-
CleanCode.ConceptNotes.IncludeOtherPagesToAvoidCodeDuplication.TestPageIncludingTestFragment	34	1	11 Jul 13, 19:54	+	+	+	+	+	+	+
CleanCode.ConceptNotes.OrderOfParametersMatters	26	6	11 Jul 13, 19:54	+	+	+	+	+	+	+
CleanCode.ConceptNotes.PausingTestsToExamineExternalResources	10	1	10 Jul 13, 07:06	-	-	-	-	-	-	-
CleanCode.ConceptNotes.ReturnMultipleRowsFromFixtureCode	0	27	11 Jul 13, 19:54	-	-	-	-	-	-	-
CleanCode.ConceptNotes.SuppressSetUpInheritance.SuppressInheritance	31	10	11 Jul 13, 19:54	+	+	+	+	+	+	+
CleanCode.ConceptNotes.TestForFailure	37	2	11 Jul 13, 19:54	+	+	+	+	+	+	+
CleanCode.ConceptNotes.TestPageUsingInclude	1	0	30 Jun 13, 14:18	+						
CleanCode.ConceptNotes.UsingComments	20	0	11 Jul 13, 19:54	+	+	+	+	+	+	+
CleanCode.ConceptNotes.UsingCommonArguments	6	4	07 Jul 13, 17:03	-	-	+	+	+	-	-
CleanCode.CountFixturePage	3	2	20 Jun 13, 19:43	+	+	-	-	+		
CleanCode.DataBaseNotes	3	4	09 Jul 13, 19:15	-	-	-	+	+	-	+
CleanCode.DataBaseNotes.CrudOperations	44	3	11 Jul 13, 19:54	+	+	+	+	+	+	+
CleanCode.DataBaseNotes.HelloDbTest	44	1	11 Jul 13, 19:54	+	+	+	+	+	+	+
CleanCode.DataBaseNotes.SimpleFetch	9	50	11 Jul 13, 19:54	-	-	-	-	-	-	-
CleanCode.DataBaseNotes.SpecifyingFieldsToMatch	0	15	07 Jul 13, 20:00	-	-	-	-	-	-	-
CleanCode.EchoFixturePage	7	2	20 Jun 13, 19:43	+	+	-	-	+	+	+
CleanCode.FileOperationsFixtureTest	3	0	20 Jun 13, 19:43	+	+	+				
CleanCode.FixturesWithNotes.BasicNotes	1	0	22 Jun 13, 14:33	-						
CleanCode.FixturesWithNotes.SymbolsAndVariables	2	0	30 Jun 13, 14:13	+	+					
CleanCode.FixturesWithTests	4	0	23 Jun 13, 15:01	+	+	+	+			
CleanCode.FixturesWithTests.ConcatFixtureTest	9	0	30 Jun 13, 14:08	+	+	+	+	+	+	+



# Tests brüchig

The screenshot shows the Selenium IDE interface with the following details:

- Base URL:** http://retest.de/
- Test Case:** Untitled \*
- Table View:** Shows a list of commands:

Command	Target	Value
open	/	
clickAndWait	link=Häufige Fragen	
- Locator Pop-up:** A dropdown menu for the "Value" field of the clickAndWait command is open, displaying several locator strategies:
  - link=Häufige Fragen
  - //a[contains(text(),'Häufige Fragen')] xpath:link
  - //ul[@id='nav']/li[2]/ul/li[2]/a xpath:idRelative
  - //a[@href='http://www.retest.de/fa...'] xpath:href
  - //li[2]/a xpath:position
- Status:** Runs: 0, Failures: 0
- Log Tab:** Active tab.
- Reference Tab:** Selected tab, showing the definition of clickAndWait.
- UI-Element Tab:** Available tab.
- Rollup Tab:** Available tab.
- Description of clickAndWait:** clickAndWait(locator)  
Generated from click(locator)  
Arguments:
  - locator - an element locatorClicks on a link, button, checkbox or radio button. If the click action causes a new page to load (like a link usually does), call waitForPageToLoad.

```
public void testSomething() throws Exception {  
    // here be some test code ...  
    UIElement element = driver.getElement("path/to/element");  
    assertEquals(null, element.getAction());  
    assertEquals("action", element.getActionCommand());  
    assertEquals(true, element.isEnabled());  
    assertEquals(true, element.isFocusable());  
    assertEquals("Lucida Grande", element.getFont().getName());  
    assertEquals(13, element.getFont().getSize());  
    assertEquals(0, element.getFont().getStyle());  
    assertEquals(23, element.getHeight());  
    assertEquals(null, element.getIcon());  
    assertEquals(0, element.getMnemonic());  
    assertEquals(null, element.getPressedIcon());  
    assertEquals(true, element.isSelected());  
    assertEquals("label", element.getText());  
    assertEquals(119, element.getWidth());  
    assertEquals(27, element.getX());  
    assertEquals(191, element.getY());  
}
```



# Ihr Vollautomatischer Regressionstester.

## Weniger Risiko, weniger Stress, weniger Kosten!

Haben Sie genug vom Testen?

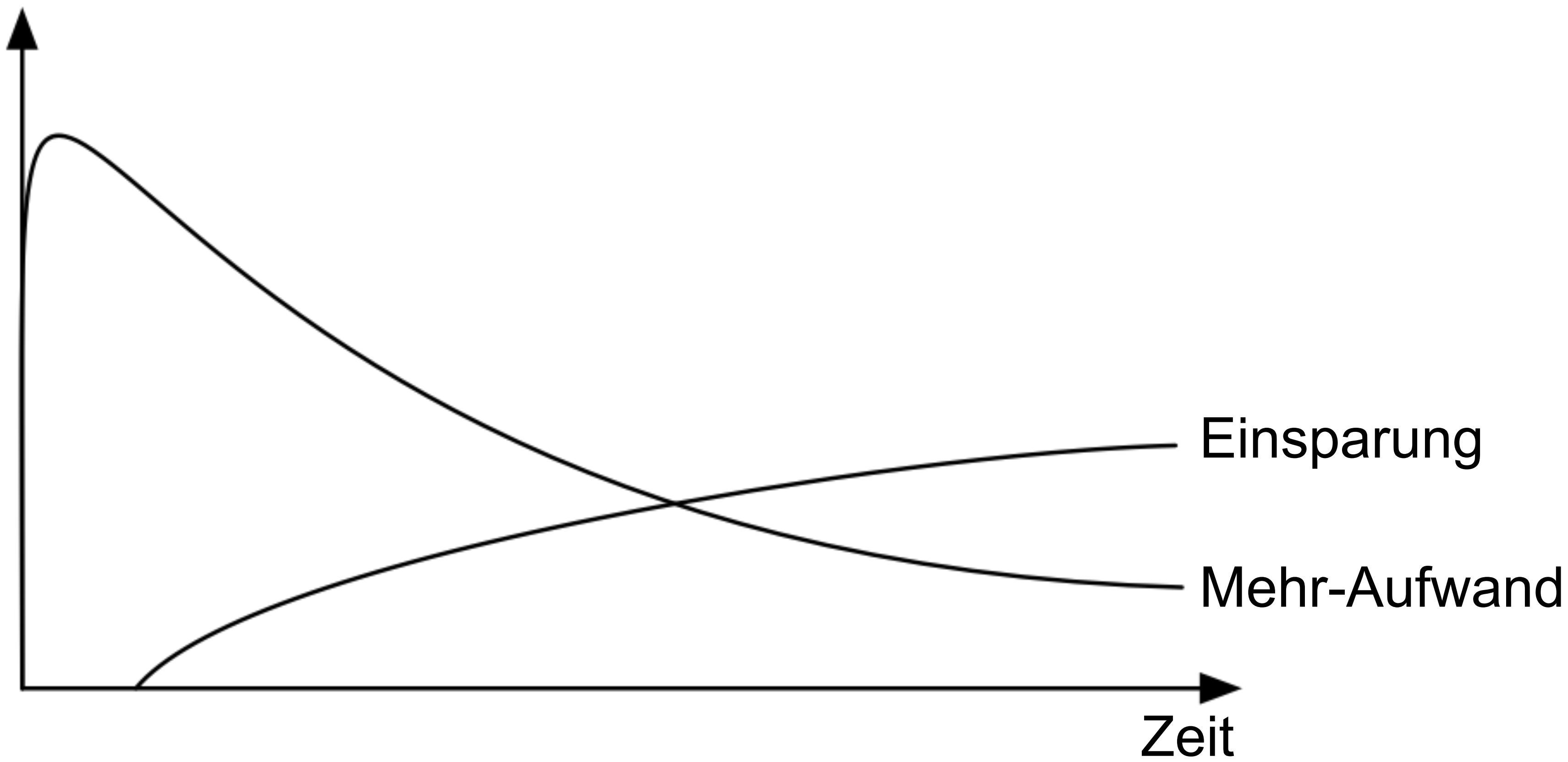
Sowohl manuelles Testen, als auch das manuelle Erstellen und Pflegen von automatischen Tests sind unbeliebte Zeitfresser. Direkt aus der Forschung ist ReTest als bisher einziges Produkt seiner Art Ihr



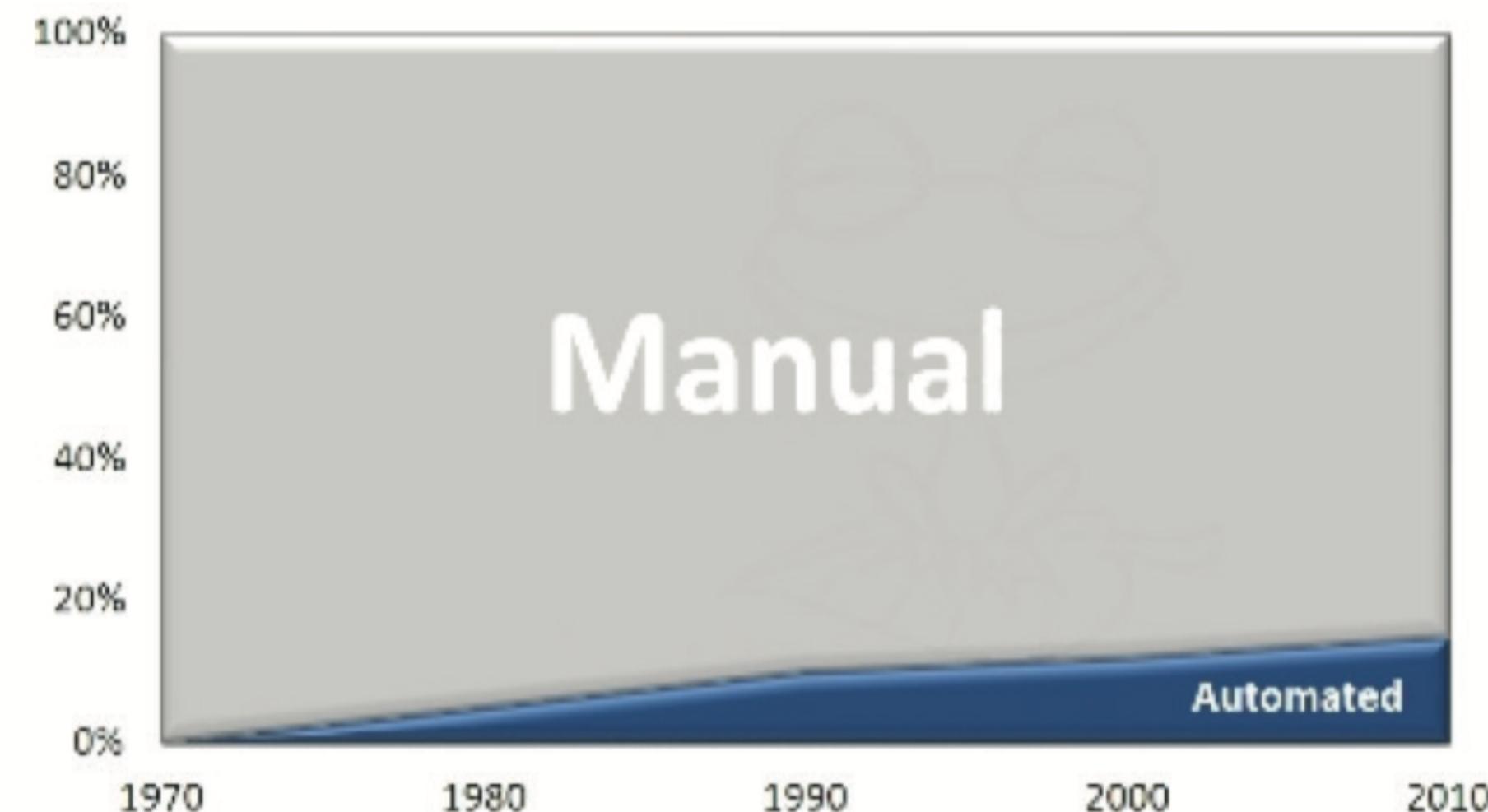
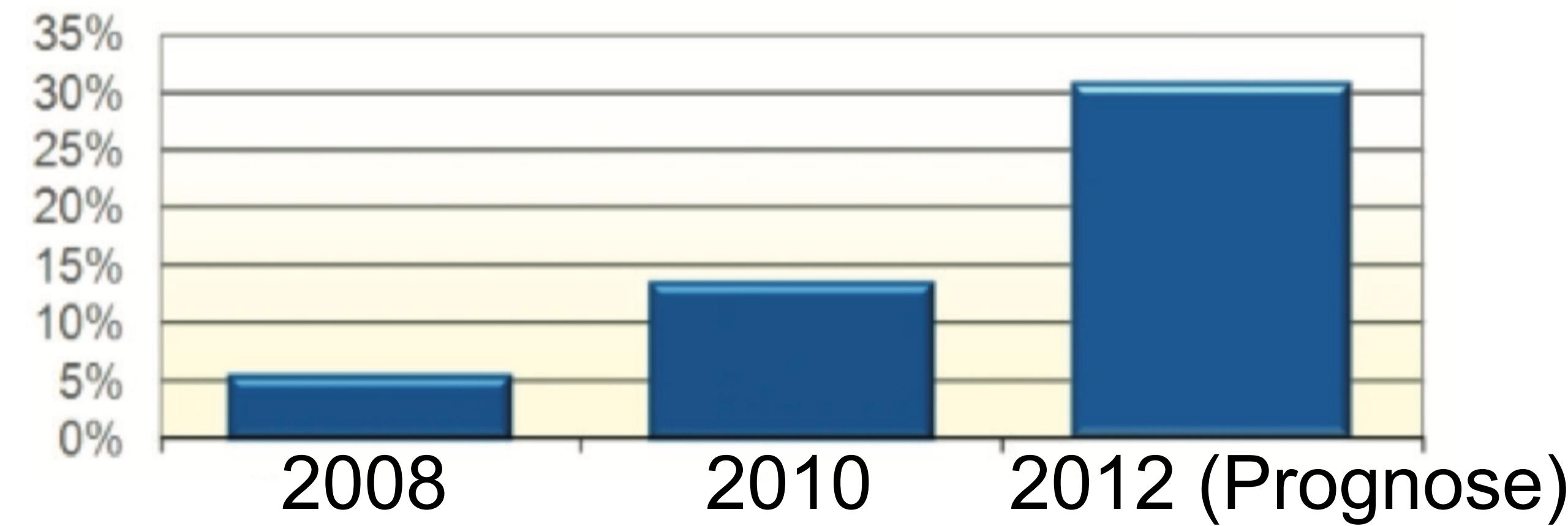


“ High test/code ratio  
is a symptom of high coupling in the code.  
Or *wasteful testing*.

Kent Beck



# Test Automatisierung



28%

Test cases  
automated now

2014

**Doing the thing right!**

**Doing the right thing?**



**HumiCalc with Uncertainty**

File Options Help

**Configuration**

Temperature Scale	ITS-90	Carrier Gas	Dry Air	Mode	Normal
Equilibrium Over	Water	Apply Enhancement Factors	<input checked="" type="checkbox"/>	Known	Dew Point

**Known Values (Standard u)**

Dew Point	10.0	$\pm 0.0577$
Temperature	25.0	$\pm 0.025$
Pressure	14.7	$\pm 0.025$

**Calculated Values (Expanded U with 95.45% Confidence)**

%RH	38.7340793	$\pm 0.3212$	Specific Humidity	0.0076028	$\pm 6E-005$
Frost Point			Absolute Humidity	8.962178468	$\pm 0.0694$
Dew Point	10.0	$\pm 0.1155$	Dry Air Density	1169.837556	$\pm 4.0342$
PPMv	12314.00364	$\pm 105.31$	Moist Air Density	1178.799735	$\pm 4.033$
PPMw	7661.045263	$\pm 65.521$	Saturation Temperature		
Grains/lb	53.62731684	$\pm 0.4586$	Saturation Pressure		
Enthalpy	44.63021277	$\pm 0.1744$	Wet Bulb Temperature	16.10904106	$\pm 0.0559$
SVP@Tt	3169.90395	$\pm 9.4493$	Mixing Ratio by Volume	0.012314004	$\pm 0.0001$
SVP@Td	1228.13339	$\pm 9.5028$	Mixing Ratio by Weight	0.007661045	$\pm 7E-005$
SVP@Ts			Percent by Volume	1.216421347	$\pm 0.0103$
F@Tt,Pt	1.004109348	$\pm 1E-005$	Percent by Weight	0.760279987	$\pm 0.0065$
F@Td,Pt	1.003863842	$\pm 1E-005$	Vapor Mole Fraction	0.012164213	$\pm 0.0001$
F@Ts,Ps			Dry Air Mole Fraction	0.987835787	$\pm 0.0001$

**Calculate**

**Units**

Temperature	$^{\circ}\text{C}$
Pressure	psia
Vapor Pressure	Pa
Density and Abs Humidity	$\text{g/m}^3$
Enthalpy	J/g

# When is a bug NOT a bug?



Wenn es ein Feature ist!

# Fehler?

```
.
```

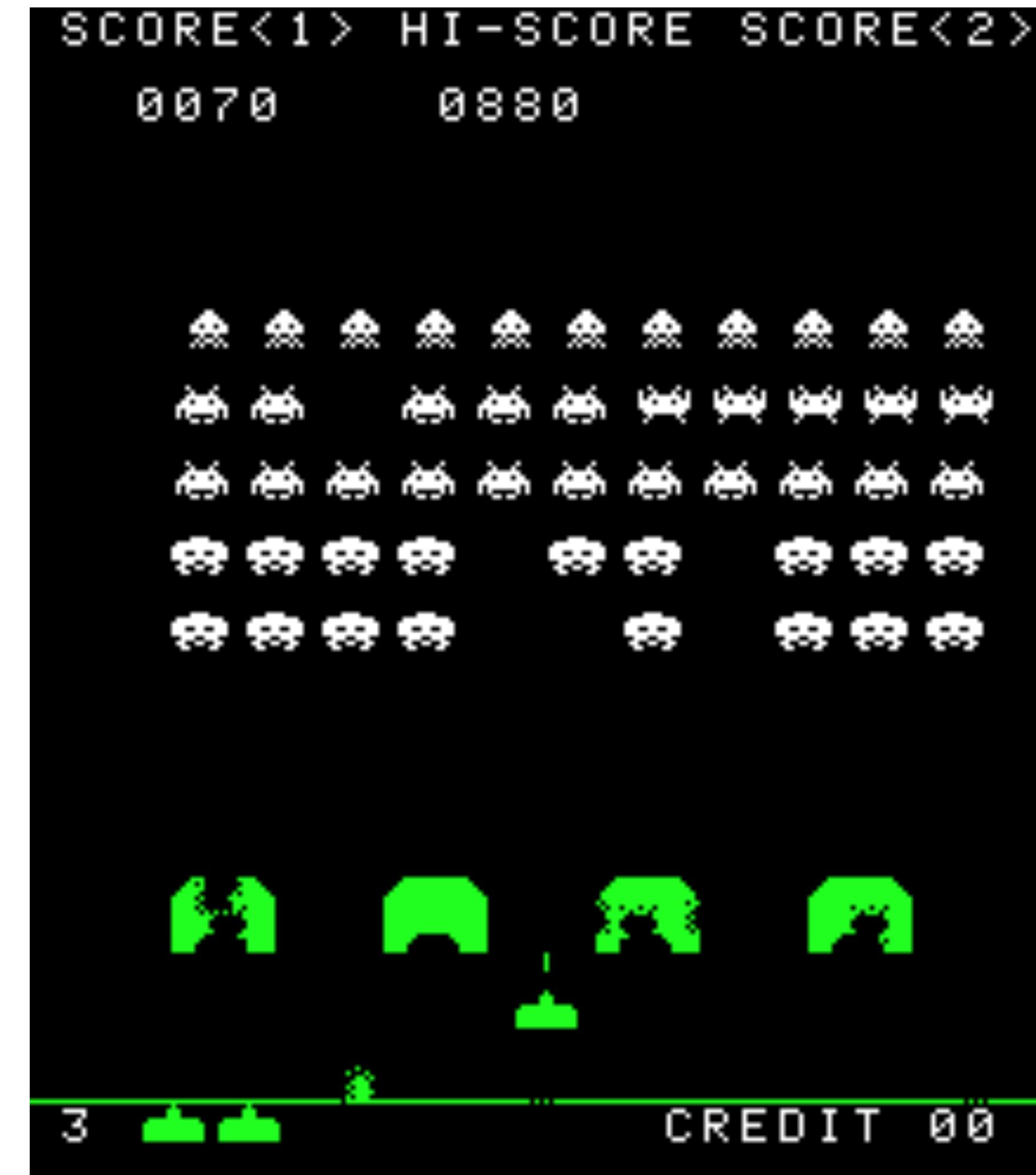
```
..
```

```
text.c
```

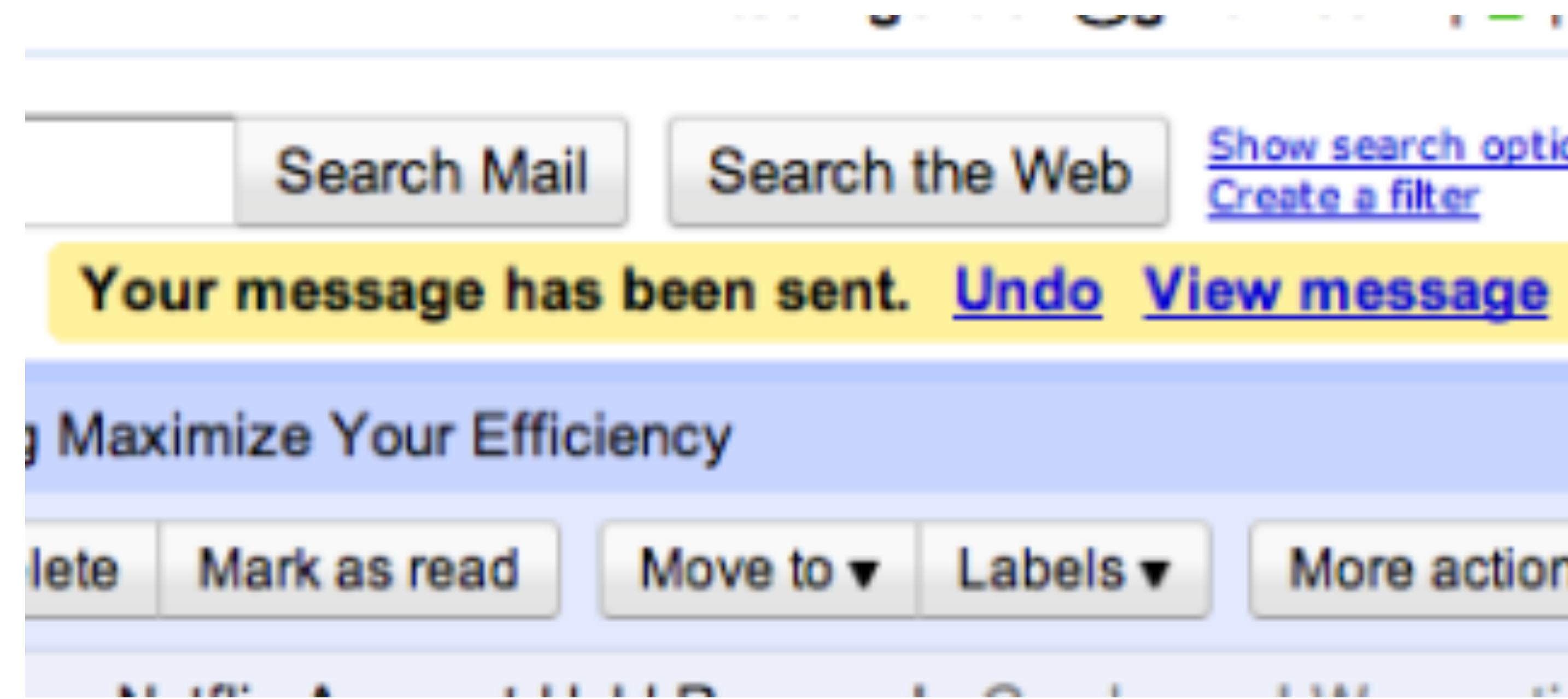
```
other.files
```

```
1. if (name[0] == '.') continue;
```

# Fehler?



# Fehler?



## Was ist ein Fehler?

“

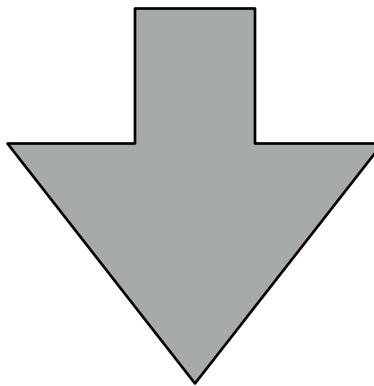
Without specification, there are no bugs  
— only surprises.

Brian Kernighan

## Probleme heutiger UI-Testautomatisierung:

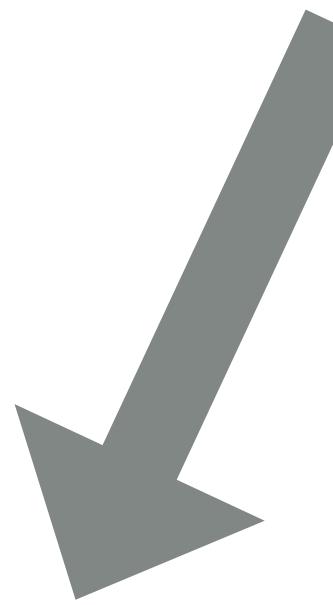
- Tests aufwendig zu Erstellen
- Tests aufwendig zu Pflegen
- Tests brüchig
- Tests unvollständig

# Spezifizieren



# Testen

# Wozu testen wir?



Nach  
Implementierung?

$$1 + 1 = 3 \quad \text{X}$$
$$2 + 2 = 4 \quad \checkmark$$

**SIEK GmbH 2003 - Geschäftsjahr 01.01.2003 - 31.10.2003**

Buchen: Sachkonten Allgemeinbeleg

Deutsche Asphalt HV/FFM EUR 0,00 Erlöse HotLine - Wartung EUR 142.747,17 H

Konto 10703 S210 91 | 16,00% MwSt in 100

Gegenkonto 5210

Auftragsbearbeitung

Kundendaten: Herr Test, Brille: Brillenaufräge, Kontaktlinsenaufräge, Refraktionsprot., Akustik, Sonstiges

Bearbeiter: Herr Test, Rezept/Bereich: Schein vorhanden, Auftrag 1, Datum: 21.10.2004

Refraktion: Dr. Kaufmann, Tönung verordnet, KK-Arechnung ausführen

Brillenart: Brillenaufräge, Eigeneraktion, Auftrag ist fertig bis: 29.10.2004, Auftragsnr: B107896

SpH: -1,50, Cyl: -0,50, Achse: 178°, ADD: 34,0, PD: 1,00, NH: 1,00, Pr 1: Basis, Pr 2: Basis, HSA: 1,00, Visus: 1,00, Betrag: 224,50 EUR, Brille: 185,20 EUR

Anreise - Daten

Wer bekommt die Rechnung?

Ben Hillel - Meine Datenbank

Personendaten: Kurzname: JJC, Name: Cimballek, Funktion: Person, Qualifikation(en): Ton, Video, Licht, Hand, Priorität: 1, Anzeige-Farbe: ...

Verknüpfung zu Adresse: Zu AdNr.: 0, Verknüpfen, Entfernen, Mit Adresse abgleichen..., Zu Adresse wechseln...

Preise und sonstige Informationen zur Buchung: Errechneter Mettpreis: 488,62€, Summe Sparpreise: 199,00 EUR, 19,00 EUR, -24,28 EUR, 5,68 EUR, 7,66 EUR, 616,76 EUR, 56,76 EUR, 560,00 EUR

Int.Std.satz: 199,00 EUR, Stammkost: 199,00 EUR

Stammliste: Alle Personen, Stammlinien, Ehenverwalt, Patenverw, Adoptiveltern, Ortsverwalt, Bilderverw, Listen Druck, Alle Personen, Sortieren, Ende

Neuer Person, Neue Kind, Neue Geschw., Neuer Ehepa., Wohnsitz, Ahnenfamilie, Schnellsuche, Statistik, Hilfe

Video u. Ton, Abrechnung, Pers. Löschen, Ereignisse, Dokumente, Stammtafel, Große Suche, Fehlersuche, Einstellung

Personendaten: Gebut, Taufe/Namensw, Kon/Kom/Jug, Hobby/Krank, Gestorben, Adoptiveltern, Ehen/Partner, Paten, Wohnsitz, Ereignisse, Suche, Mini-Tafel

Wohnorte von Karsten Siegfried RUDORF:

Lfd. Nr. 6, Wohnorte bearbeiten, Land: BRD, Staat: Bundesrepublik Deutschland, BRD, Territorium: SA, Territorium: Sachsen-Anhalt, geogr. Gebiet: Altmark, aktuelle PLZ: 29410, Ort: Salzwedel, bei: Salzwedel, Straße: Am Karlsfeld 9, alt. Straßennam.: Wohmart, von: 1995 bis: ????, Grund Umzug: Klicke auf das Bild um es zu Vergrößern, GOV - Koordinaten - Info, Ort bei Google-Maps

TableSelectionDemo

First Name	Last Name	Sport	# of Years	Vegetarian
Kathy	Smith	Snowboarding	5	<input type="checkbox"/>
John	Doe	Rowing	3	<input checked="" type="checkbox"/>
Sue	Black	Knitting	2	<input type="checkbox"/>
Jane	White	Speed reading	20	<input checked="" type="checkbox"/>

Selection Mode:

- Multiple Interval Selection
- Single Selection
- Single Interval Selection

Selection Options:

- Row Selection
- Column Selection
- Cell Selection

Datensatz: 1 von 3860

Eingabemodus: Noteneingabe nach Schülern

Notendurchschnitt: 3,4

Erster Schüler: Schülern Nr: 6 von 25, Letzter Schüler: 3,4

Eingabemodus: Noteneingabe nach Schülern

Notendurchschnitt: 3,4

Arbeitsgemeinschaften: Schule

Fehltage: 5

Bemerkungen: Emil war für die Versetzung

Projektkunde: TELEKOM

Projektart: Aufwand

EK-Wert: 11.04 €

Lagerort: Zuschrift

Artikel ist Best.: Ja, B-Datum: 05.06.2007

Bestell Ben.: Bitte Eloxieren

Bemerkung: Spezial Alu für Demomuster

Projektstatus: 3000, Planungsart: 0, Buchungsart: 2 mittleres Projekt

Wochenplan: 09.06.2007 - 25.06.2007, 3 IT-Projekte, 3 neue IT-Systeme

Aufwand: 600 h, Kosten: 61.070,00 €

Budget: 97 T, 699 h, 61.070,00 €

Summe: 120 T, 82 h, 61.560,00 €

Rest: 97 T, 617 h, 71.516,00 €

Gesamt: 229 T, 699 h, 81.070,00 €

Projektloch: 0, angelegt von: P100, angelegt am: 08.03.07, gelöscht von: P41, gelöscht am: 13.02.08

Parameter: PR-Projekt: 3000, PR-Status: 1, Planungsart: 0, Buchungsart: 2 mittleres Projekt

Querkontraktionszahl muel: 0,3, Querkontraktionszahl muel: 0,25, Längenausdehnungskoeffizient: 1,15E-5, 1/K, Längenausdehnungskoeffizient: 9E-6, 1/K, Zulässige Fügetemperatur Tzul: 600 °C, Zulässige Fügetemperatur Tzul: 400 °C, Dichte rho: 7,8 kg/dm³, Dichte rho: 7,35 kg/dm³

Dauer: 01.06.2007 - 25.06.2007, Benutzer: 1, Kommentar: Besuchte mich, 02.06.2007 - 25.06.2007, Benutzer: 0, Kommentar: Angest 20100429 gemeldet, 03.06.2007 - 25.06.2007, Benutzer: 0, Kommentar: Nachahme braucht mehr Zeit, kann erstmal um -> nächste Jahr, 04.06.2007 - 25.06.2007, Benutzer: 0, Kommentar: Standard-eMail mit Info zu Produkt als PDF geschickt, 05.06.2007 - 25.06.2007, Benutzer: 0, Kommentar: Anfrage nach Produkt, 06.06.2007 - 25.06.2007, Benutzer: 0, Kommentar: Nachahme, nichts Angibt, 07.06.2007 - 25.06.2007, Benutzer: 0, Kommentar: Nachahme Zeit-Abrechnung > Anf. Febr.

Movies, Infos.crm.dbf, Anrufliste, Brief in Word, Ältere Versionen, Ändern

**TableSelectionDemo**

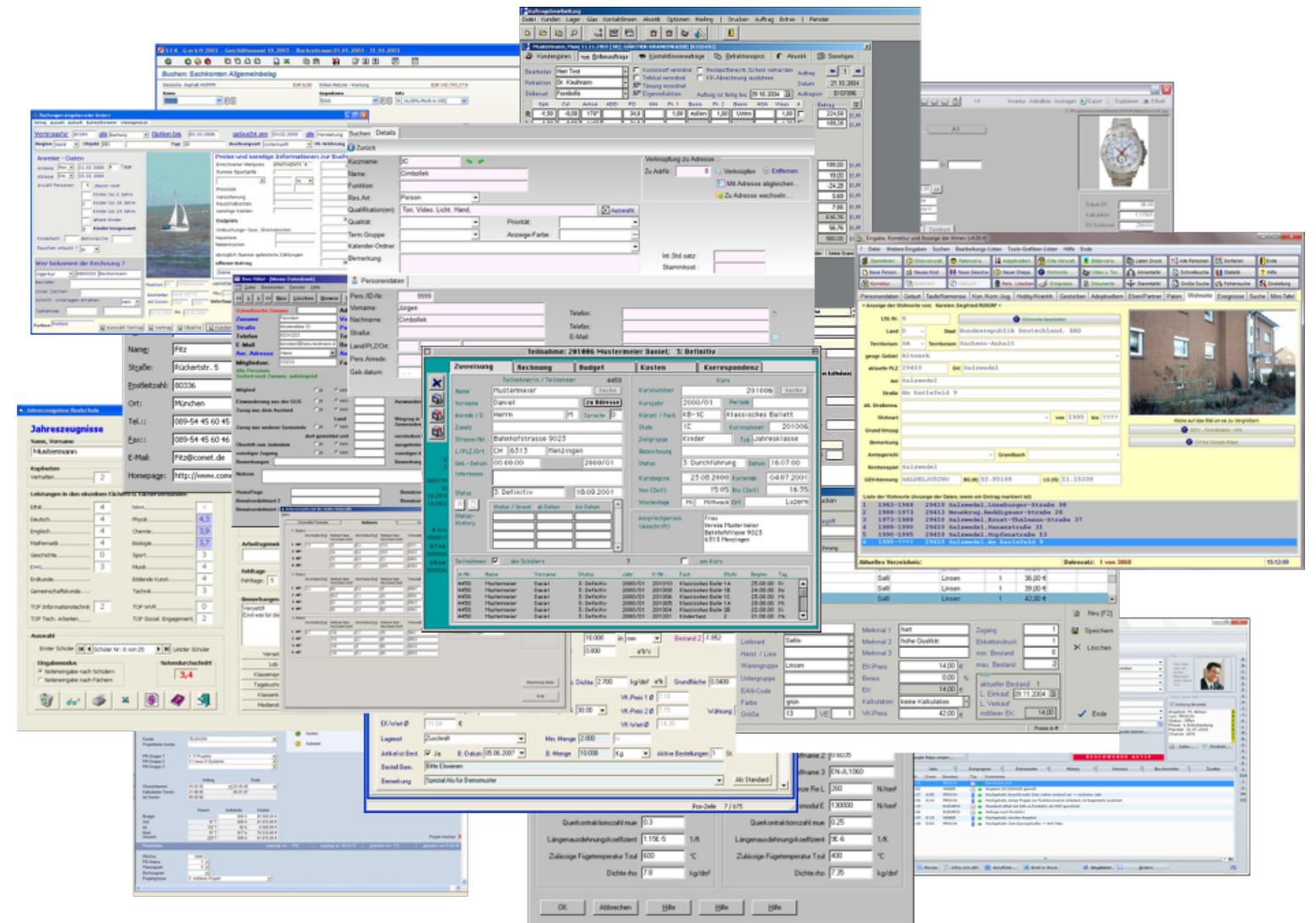
First Name	Last Name	Sport	# of Years	Vegetarian
Kathy	Smith	Snowboarding	5	<input type="checkbox"/>
John	Doe	Rowing	3	<input checked="" type="checkbox"/>
Sue	Black	Knitting	2	<input type="checkbox"/>
Jane	White	Speed reading	20	<input checked="" type="checkbox"/>
Total: 10				

**Selection Mode**

- Multiple Interval Selection
- Single Selection
- Single Interval Selection

**Selection Options**

- Row Selection
- Column Selection
- Cell Selection



## Wozu testen wir?

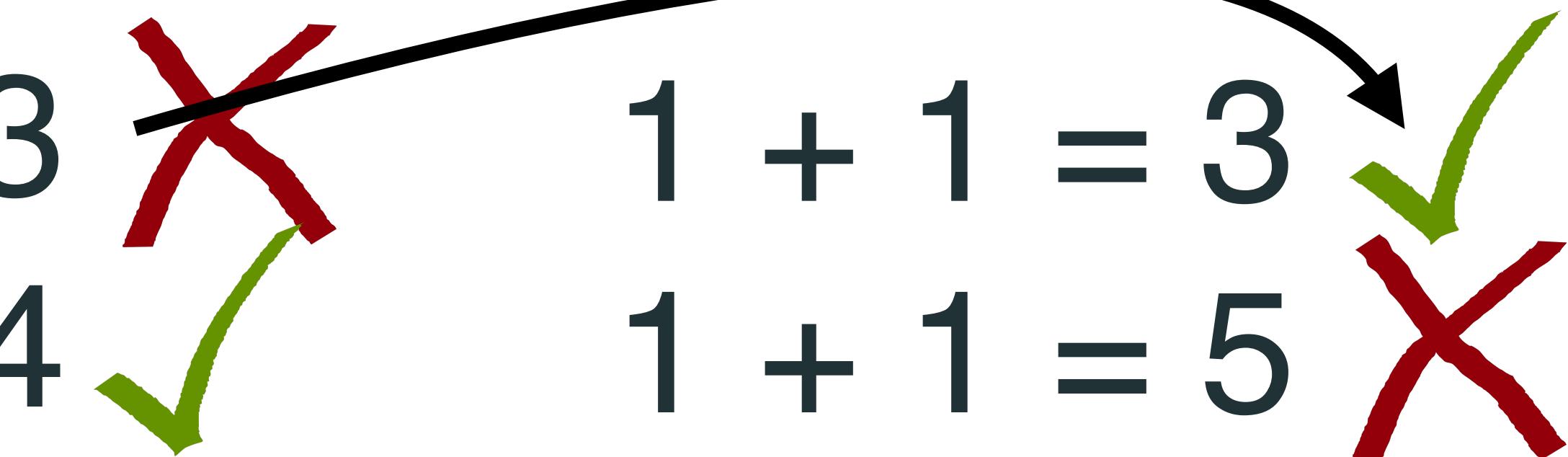


Nach  
Implementierung?

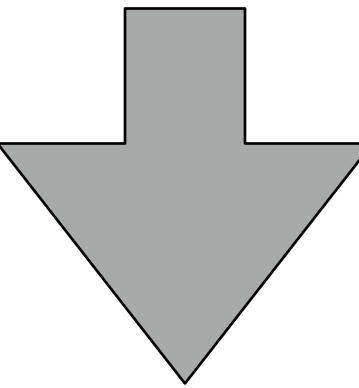
$$\begin{aligned}1 + 1 &= 3 \\2 + 2 &= 4\end{aligned}$$

Nach  
Änderung?

$$\begin{aligned}1 + 1 &= 3 \\1 + 1 &= 5\end{aligned}$$

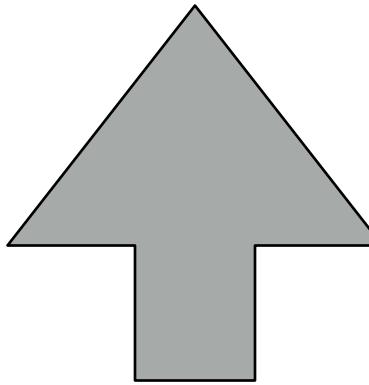


# Spezifizieren



# Testen

# Spezifizieren



# Testen

# Regressionstest

!=

# Test

# Regressionstest

==

# Versionskontrolle

Wo hat sich der  
**Code** *geändert?*

Wo hat sich das  
**\_Programm\_** geändert?

file:///home/joshua/devel/cpp/cps111/bigcalc/apstring.cpp file:///home/joshua/devel/cpp/cps111/bigcalc/apstring.h

File Difference Settings Help

Viewing: apstring.cpp

Previous File Next File Files

/home/joshua/devel/cpp/cps111/bigcalc/apstring

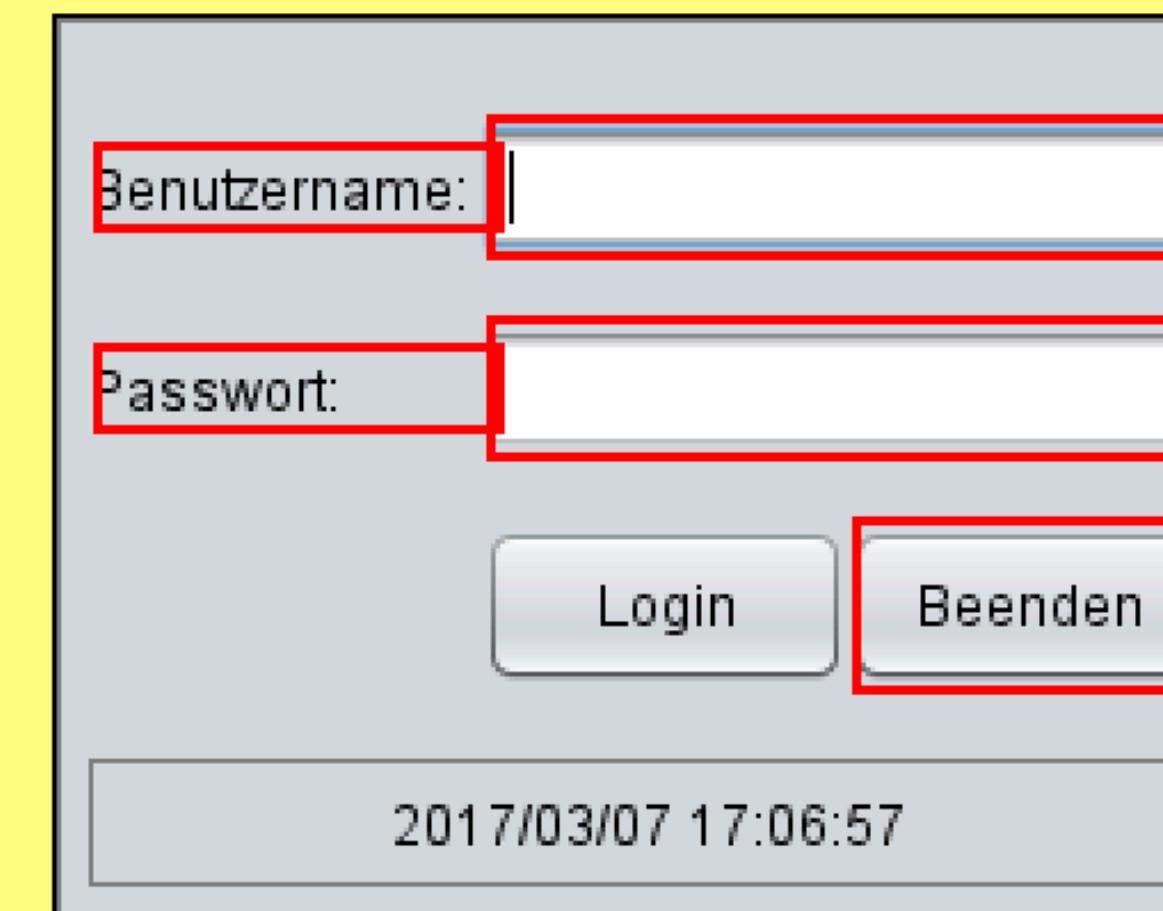
```
234 apstring operator + ( char ch, const apstring & str )
235 // postcondition: returns concatenation of ch +
236 {
237     apstring result; // make string equivalent
238     result = ch;
239     result += str;
240     return result;
241 }
242
243 apstring operator + ( const apstring & str, char ch )
244 // postcondition: returns concatenation of str
245 {
246     apstring result(str);
247     result += ch;
248     return result;
249 }
250
251
252 apstring apstring::substr(int pos, int len) const
253 // description: extract and return the substr
254 // at index pos
255 // precondition: this string represents c0..cl,
256 // 0 <= pos <= pos + len - 1 < n.
```

/home/joshua/devel/cpp/cps111/bigcalc/apstring.h

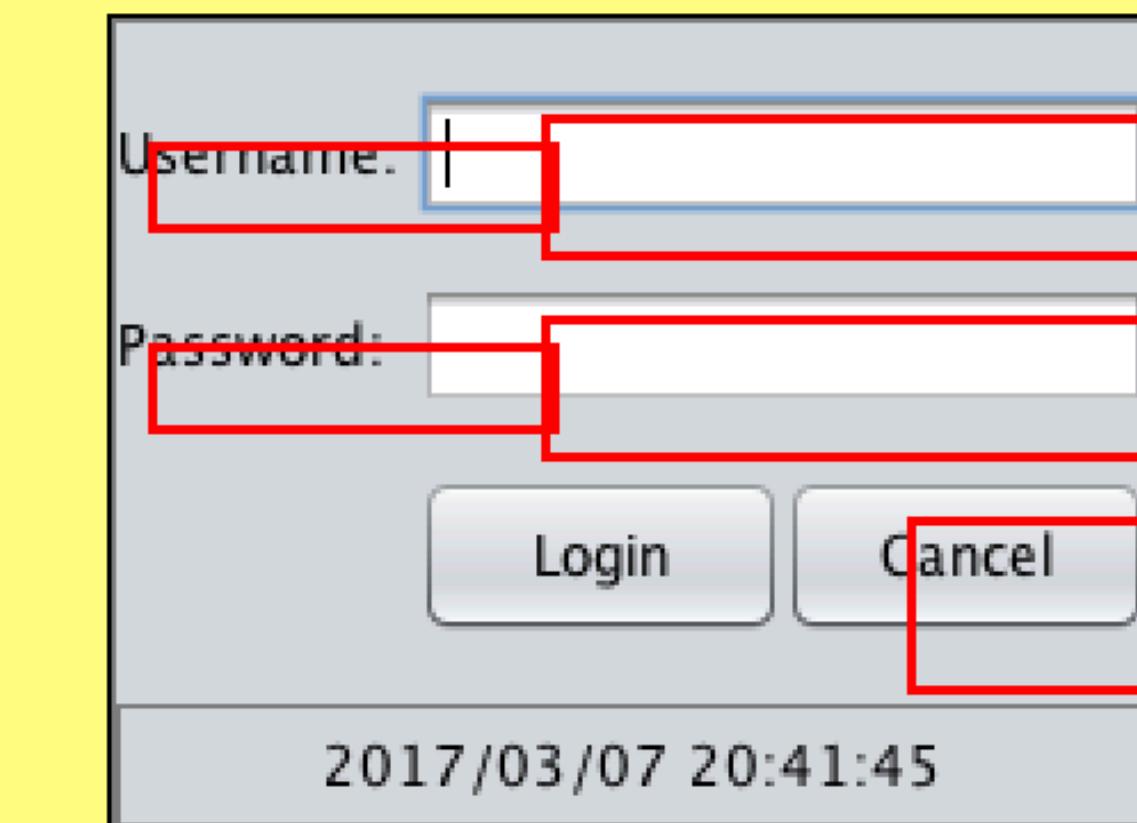
```
43
44 // indexing
45
46 char operator[]( int k ) const;
47 char & operator[]( int k );
48
49 // modifiers
50
51 const apstring & operator += ( const apstring & str );
52 const apstring & operator += ( char ch );
53
54
55 private:
56     int myLength; // length
57     int myCapacity; // capacity
58     char * myCString; // stored string
59 };
60
61 // The following free (non-member) functions operate on apstring
62 //
63 // I/O functions
64
65
```

### Start Sut

**Expected**



**Actual**



**1/1**

**1/1**

UI element	Attribute	Expected value	Actual value	<input type="checkbox"/> Accept all
JButton [Beenden]	text	Beenden	Cancel	<input checked="" type="checkbox"/>
JLabel [Benutzername: ]	text	Benutzername:	Username:	<input type="checkbox"/>
JLabel [Benutzername: ]	tooltip	Probieren Sie es mit "...	Try 'Max' or 'Martina'.	<input type="checkbox"/>
JLabel [Passwort: ]	text	Passwort:	Password:	<input type="checkbox"/>
JLabel [Passwort: ]	tooltip	Das Passwort lautet "...	The password is 'ReT...	<input type="checkbox"/>
JPasswordField Passw...	tooltip	Das Passwort lautet "...	The password is 'ReT...	<input type="checkbox"/>
ITextField Benutzerna...	tooltip	Probieren Sie es mit "	Try 'Max' or 'Martina'	<input type="checkbox"/>

static

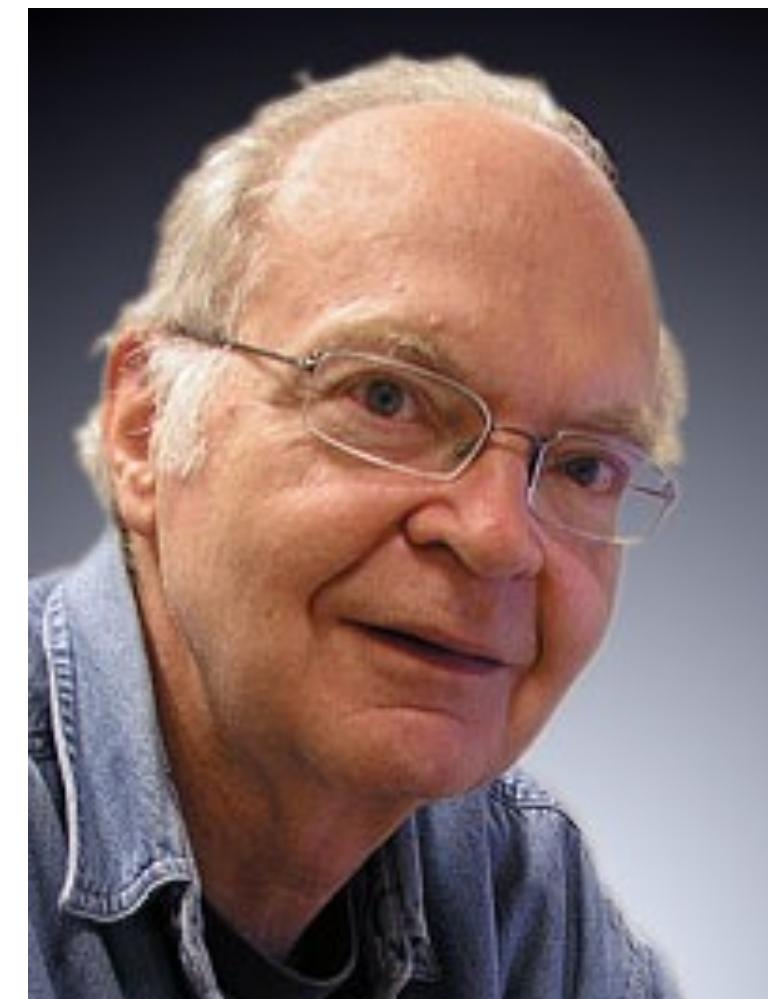
vs.

*dynamic*

```
int getRandomNumber()
{
    return 4; // chosen by fair dice roll.
              // guaranteed to be random.
}
```

“ Beware of *bugs* in the above code;  
I have only *proved* it correct,  
not *tried* it.

Donald Knuth

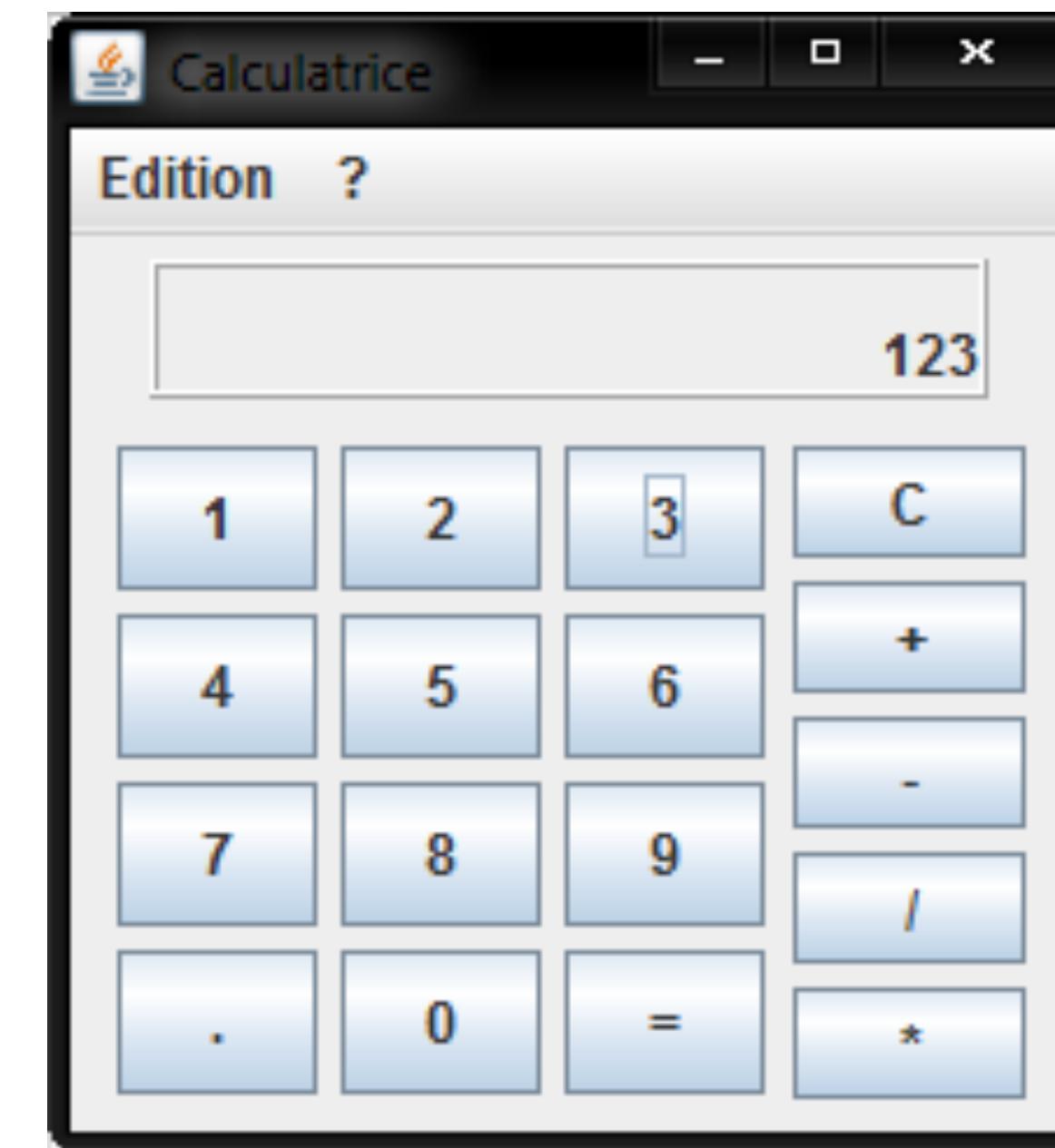
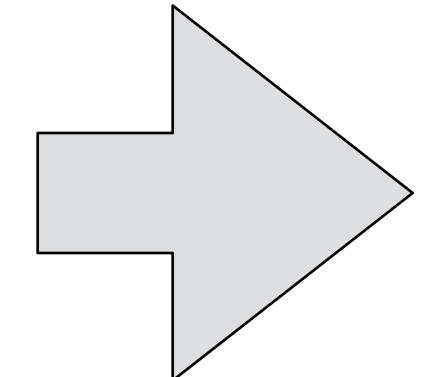


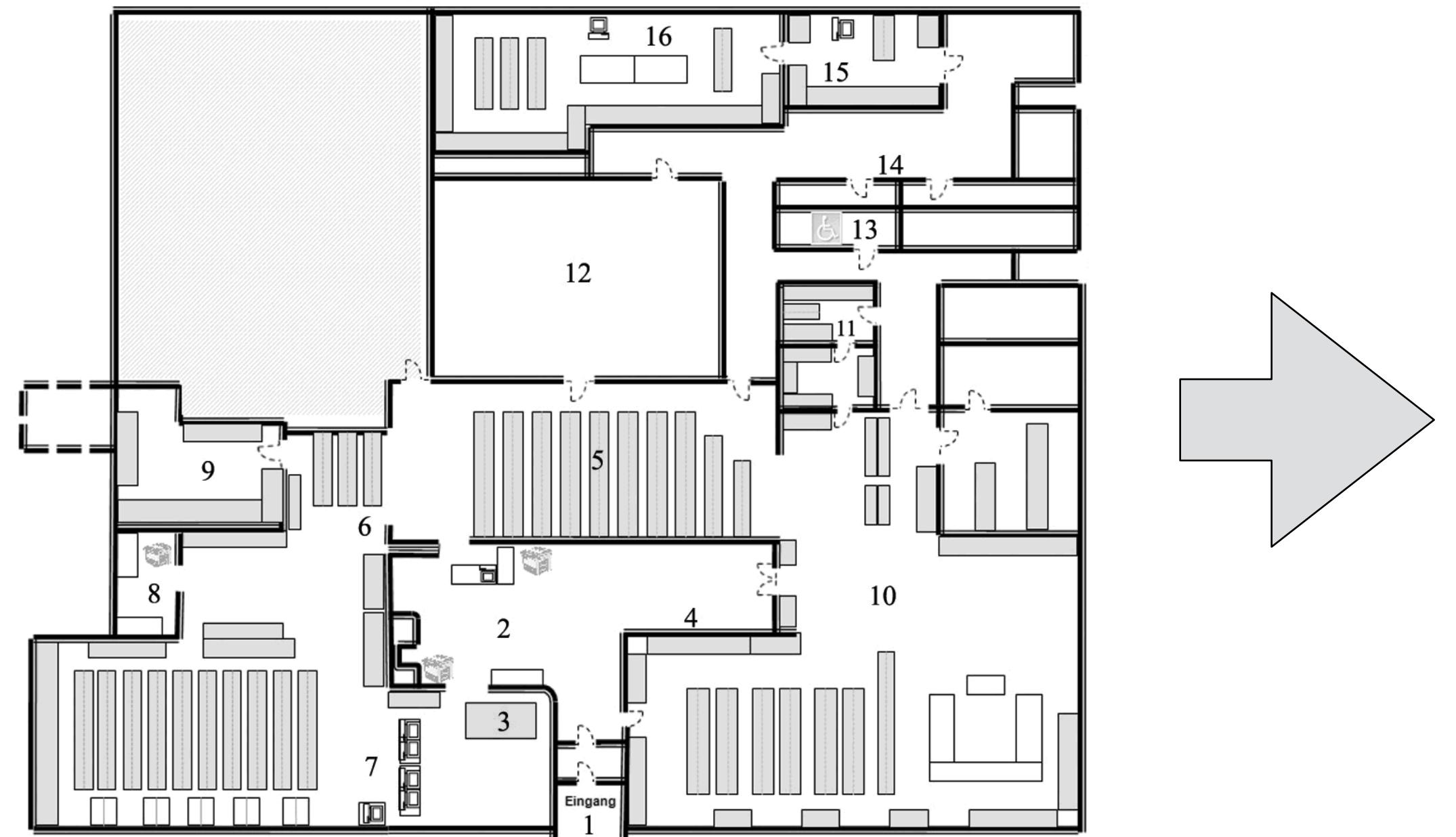
```
function date_mysql2ger($dateex) {
    list($year, $month, $day) = explode("-", $dateex);
    return sprintf("%02d.%02d.%04d", $day, $month, $year);
}

function date_ger2mysql($dateex) {
    list($day, $month, $year) = explode("-", $dateex);
    return sprintf("%04d-%02d-%02d", $year, $month, $day);
}

function timestamp_mysql2ger($t) {
    $t = substr($t, 6, 2).substr($t, 4, 2).substr($t, 0, 4);
    return sprintf("%02d.%02d.%04d", $t);
}

function date_mysql2ger($dateex) {
    list($year, $month, $day) = explode("-", $dateex);
    return sprintf("%02d.%02d.%04d", $day, $month, $year);
}
```





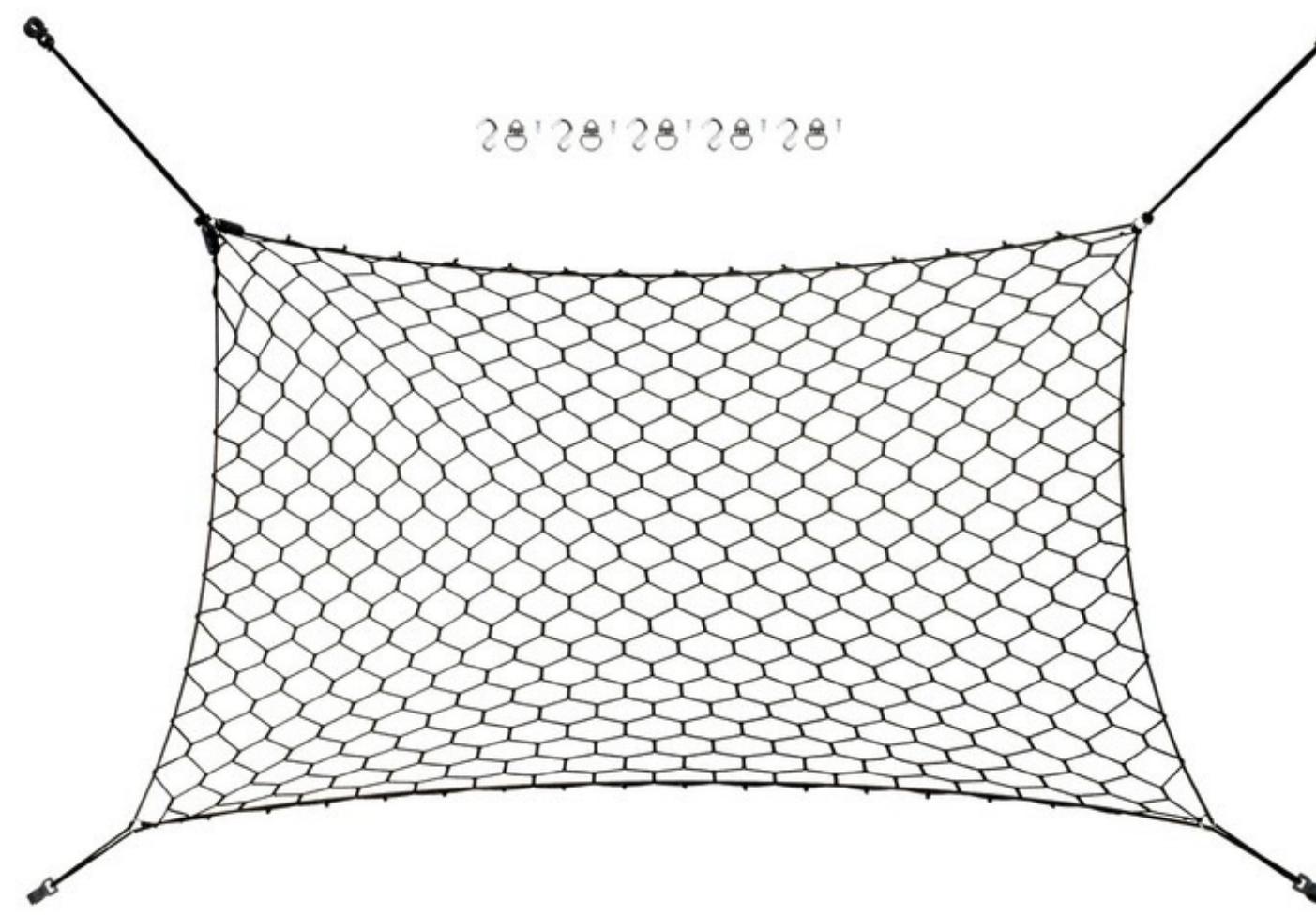






Wo hat sich der  
**Code** *geändert?*

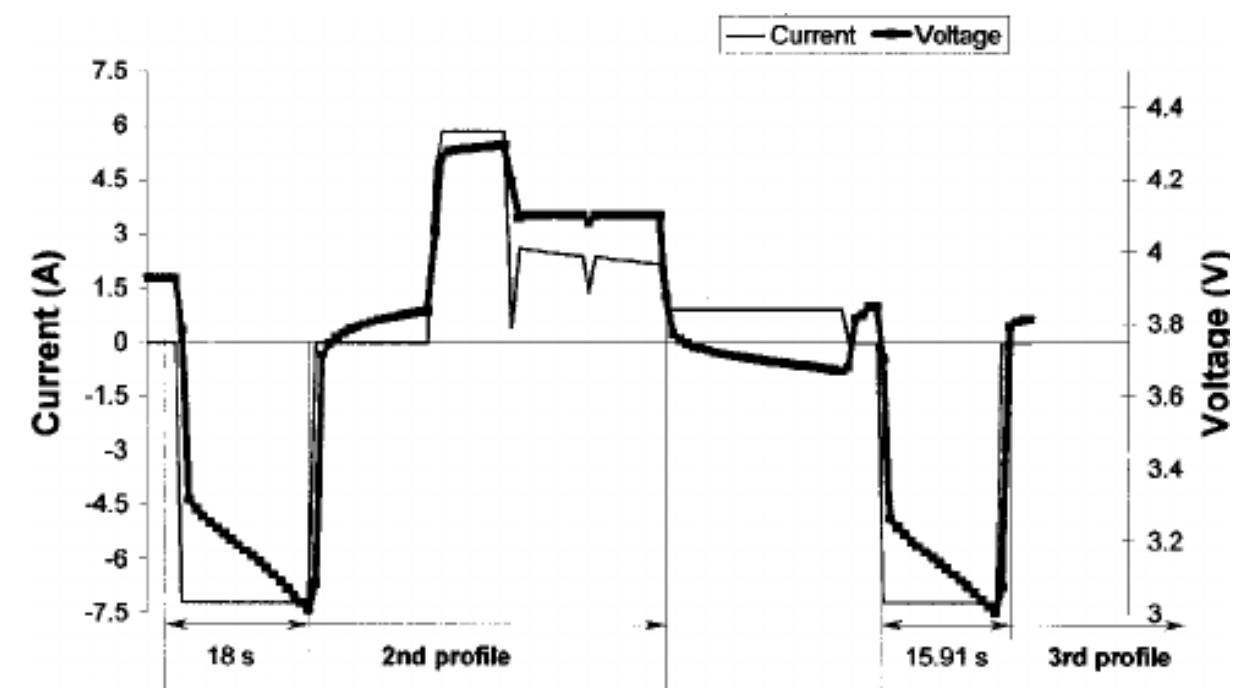
# Die Lücke schließen: *automatische* Tests



Sicherheitsnetz

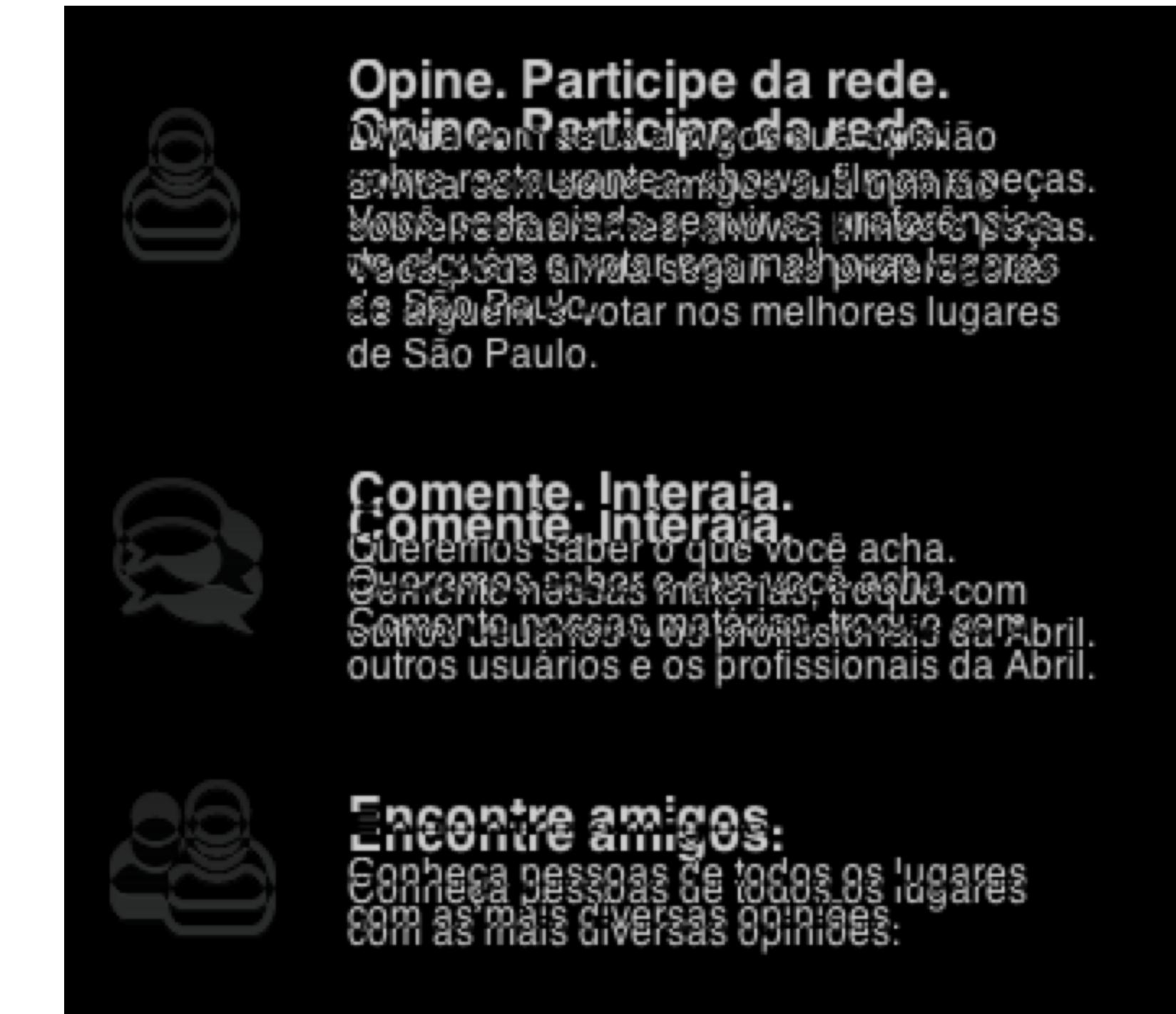


Golden Master



Characterization Test

```
[TestMethod]
public void TestPurchase()
{
    // Create a new receipt
    var r = new Receipt();
    // Add 1 candy bar at $.50
    r.AddItem(1, "Candy Bar", 0.50);
    // Add 2 sodas bar at $1
    r.AddItem(2, "Soda", 1.0);
    // verify the receipt
    Approvals.Verify(r.ToString());
}
```



automated-screenshot-diff



Staged files

Unstaged files

- retest-core-extensions/src/main/java/de/retest/TestContextImpl.java
- ...src/main/java/de/retest/actions/ActionSequenceToActionStateSequenceConverter.java
- ...st-core-extensions/src/main/java/de/retest/actions/ActionToActionStateConverter.java
- retest-core-extensions/src/main/java/de/retest/actions/DebugAction.java
- ...core-extensions/src/main/java/de/retest/actions/flow/ReplayActionSequenceFlow.java
- retest-core-extensions/src/main/java/de/retest/execution/AbstractExecutor.java
- retest-core-extensions/src/main/java/de/retest/execution/ChromosomeExecutor.java

Commit message

retest-core-extensions/src/main/java/de/retest/TestContextImpl.java

Hunk 1 : Lines 27-33

27	27	import de.retest.ui.Environment;
28	28	import de.retest.ui.IgnoredTypes;
29	29	import de.retest.ui.TargetNotFoundHandler;
30	30	- import de.retest.ui.actions.Action;
31	31	+ import de.retest.ui.actions.UserAction;
32	32	import de.retest.ui.descriptors.ComponentDescriptor;
33	33	import de.retest.ui.descriptors.GroundState;
		import de.retest.ui.descriptors.UniqueCompIdentCriteria;

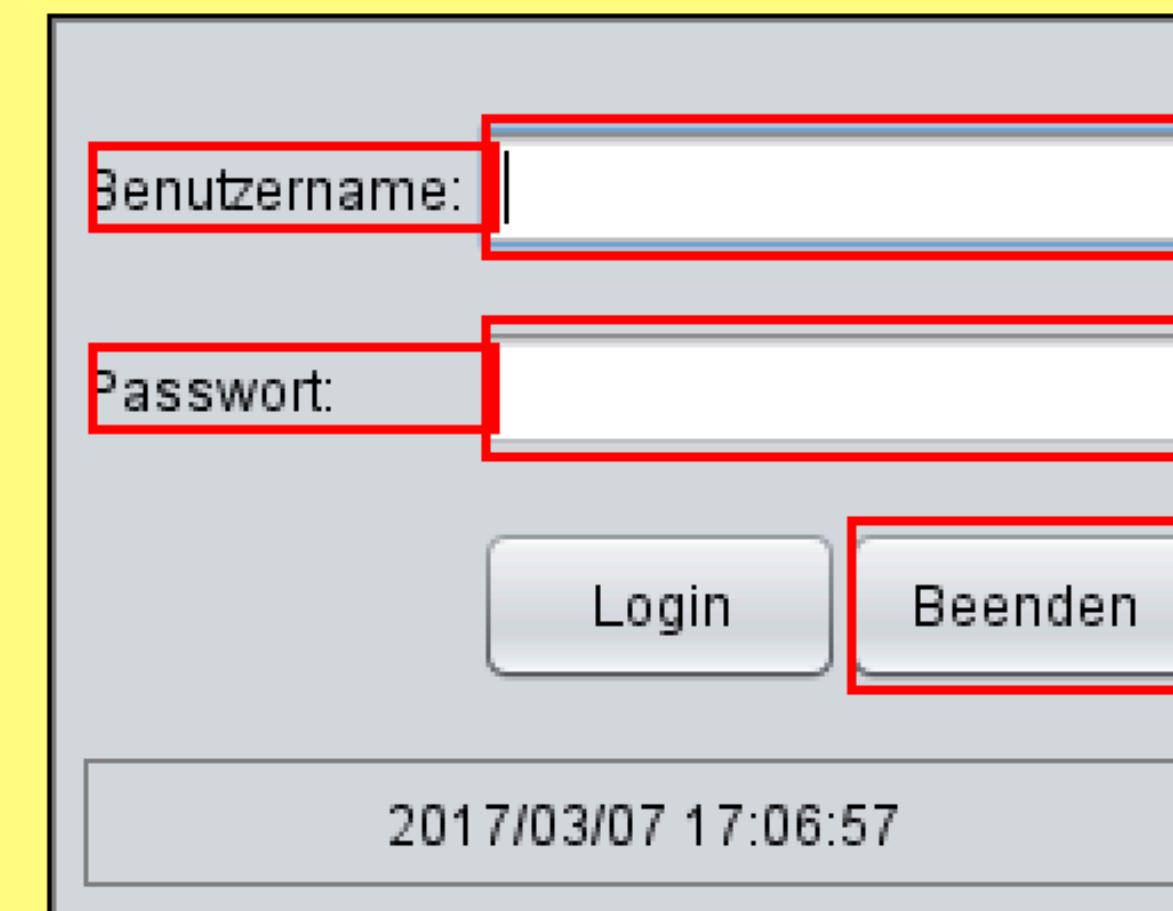
Hunk 2 : Lines 145-156

145	145	public TargetNotFoundHandler getTargetNotFoundHandler() {
146	146	return new TargetNotFoundHandler() {
147	147	@Override
148	148	- public boolean handle( final Action action ) {
149	149	+ public boolean handle( final UserAction action ) {
150	150	return false;
151	151	}
152	152	@Override
153	153	- public boolean canIgnore( final Action action ) {

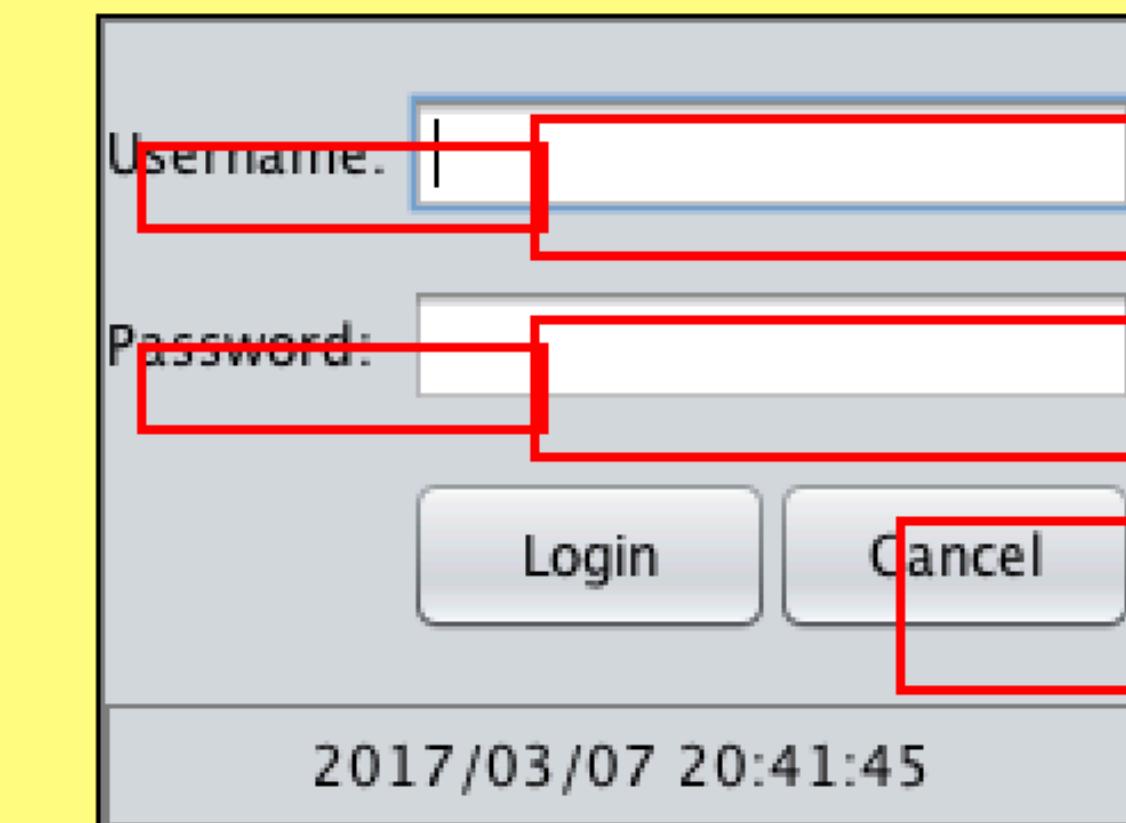
*commit*

### Start Sut

**Expected**



**Actual**



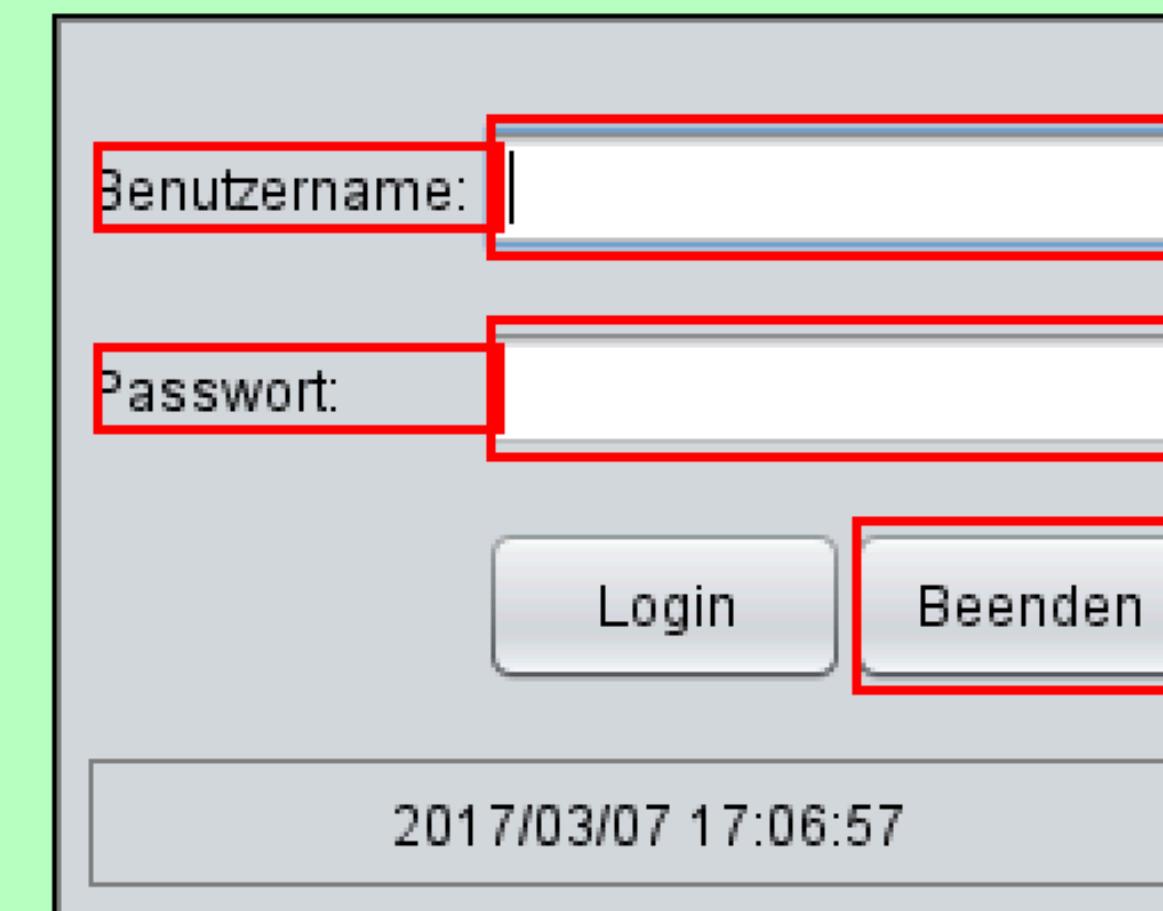
**1/1**

**1/1**

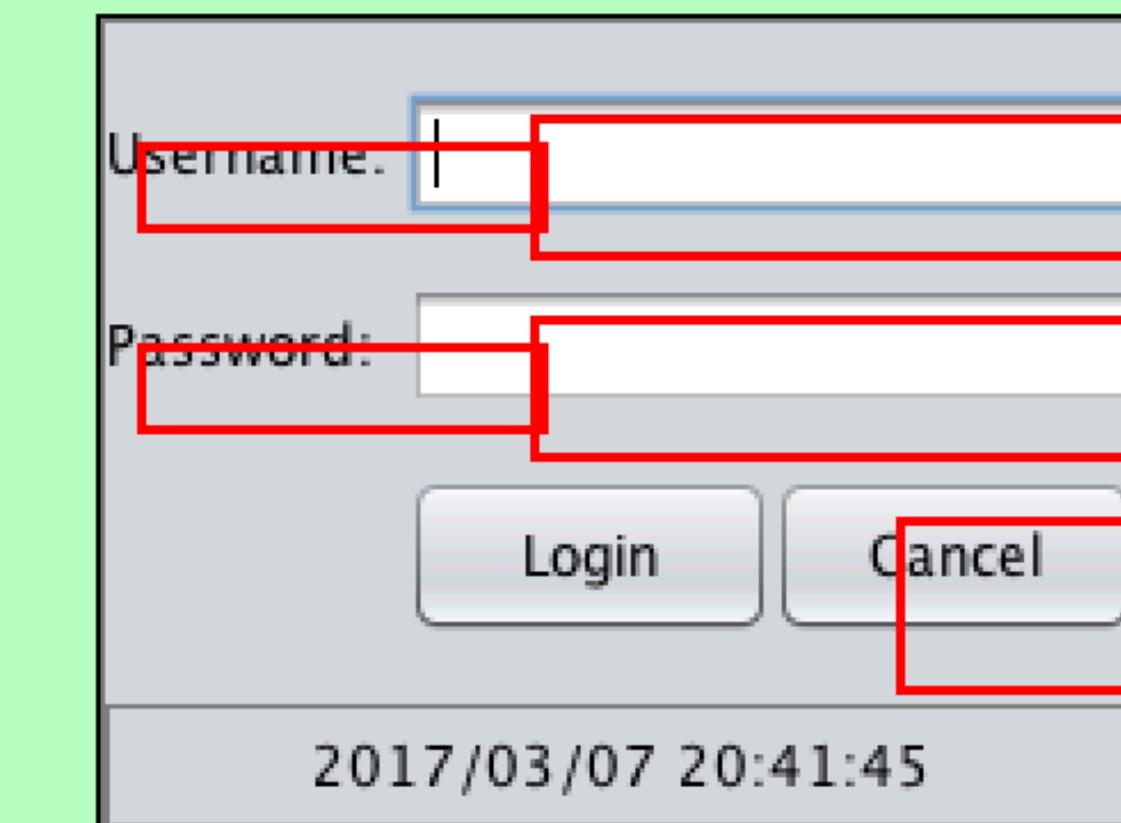
UI element	Attribute	Expected value	Actual value	<input type="checkbox"/> Accept all
JButton [Beenden]	text	Beenden	Cancel	<input checked="" type="checkbox"/>
JLabel [Benutzername: ]	text	Benutzername:	Username:	<input type="checkbox"/>
JLabel [Benutzername: ]	tooltip	Probieren Sie es mit "...	Try 'Max' or 'Martina'.	<input type="checkbox"/>
JLabel [Passwort: ]	text	Passwort:	Password:	<input type="checkbox"/>
JLabel [Passwort: ]	tooltip	Das Passwort lautet "...	The password is 'ReT...	<input type="checkbox"/>
JPasswordField Passw...	tooltip	Das Passwort lautet "...	The password is 'ReT...	<input type="checkbox"/>
ITextField Benutzerna...	tooltip	Probieren Sie es mit "	Try 'Max' or 'Martina'	<input type="checkbox"/>

### Start Sut

**Expected**



**Actual**



**1/1**

**1/1**

UI element	Attribute	Expected value	Actual value	<input checked="" type="checkbox"/> Accept all
JButton [Beenden]	text	Beenden	Cancel	<input checked="" type="checkbox"/>
JLabel [Benutzername: ]	text	Benutzername:	Username:	<input checked="" type="checkbox"/>
JLabel [Benutzername: ]	tooltip	Probieren Sie es mit "...	Try 'Max' or 'Martina'.	<input checked="" type="checkbox"/>
JLabel [Passwort: ]	text	Passwort:	Password:	<input checked="" type="checkbox"/>
JLabel [Passwort: ]	tooltip	Das Passwort lautet "...	The password is 'ReT...	<input checked="" type="checkbox"/>
JPasswordField Passw...	tooltip	Das Passwort lautet "...	The password is 'ReT...	<input checked="" type="checkbox"/>
ITextField Benutzerna...	tooltip	Probieren Sie es mit "	Try 'Max' or 'Martina'	<input checked="" type="checkbox"/>

# DIFFERENCE-TESTING

# Capture/Replay

+ Golden Master

+ Versionskontrolle

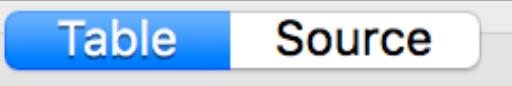
---

= Difference Testing 

Untitled (untitled suite) - Selenium IDE 2.9.0 \*

Base URL

Fast Slow   

Test Case   
**Untitled \***

Command	Target	Value
open	/	
clickAndWait	link=Häufige Fragen	

Runs: 0  
Failures: 0

Log **Reference** UI-Element Rollup

**clickAndWait(locator)**  
Generated from **click(locator)**

Arguments:

- locator - an element locator

Clicks on a link, button, checkbox or radio button. If the click action causes a new page to load (like a link usually does), call `waitForPageToLoad`.

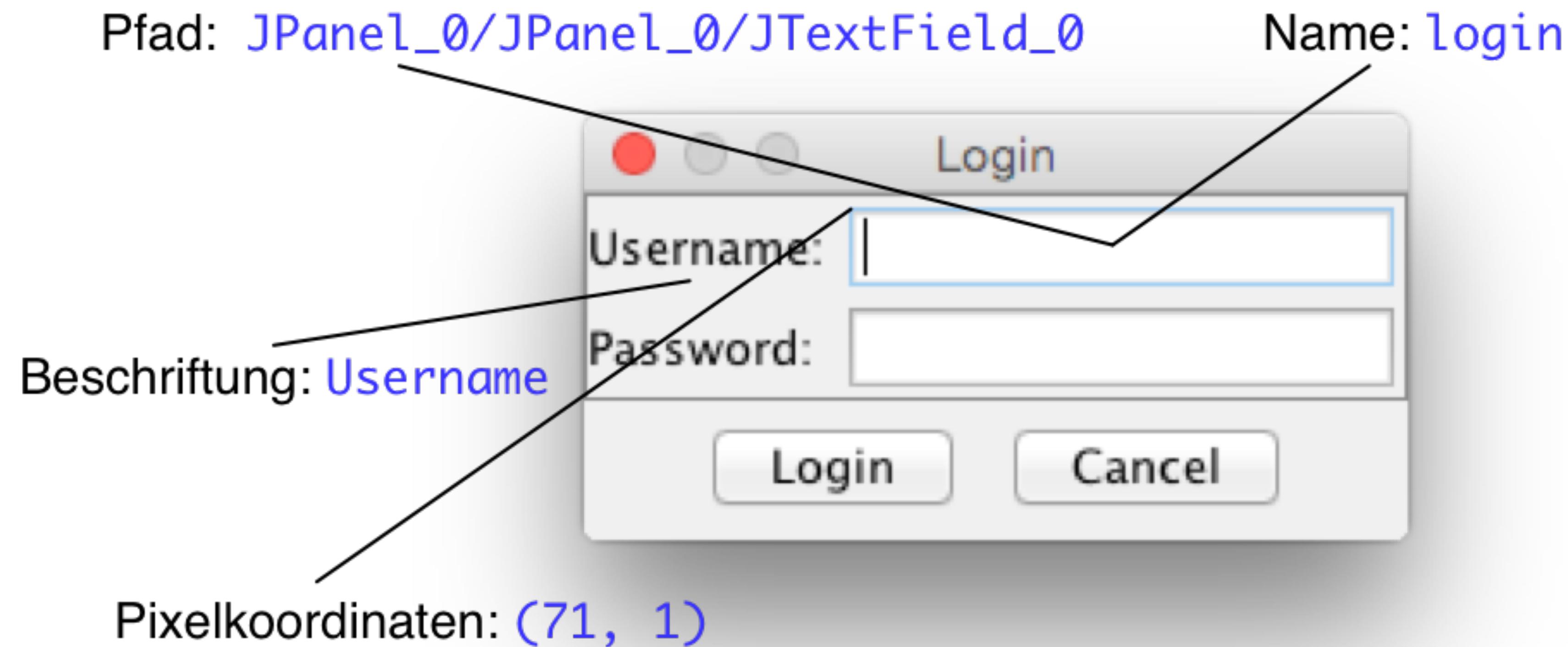
**clickAndWait**

Command	Target	Value
clickAndWait	link=Häufige Fragen	

Target Value

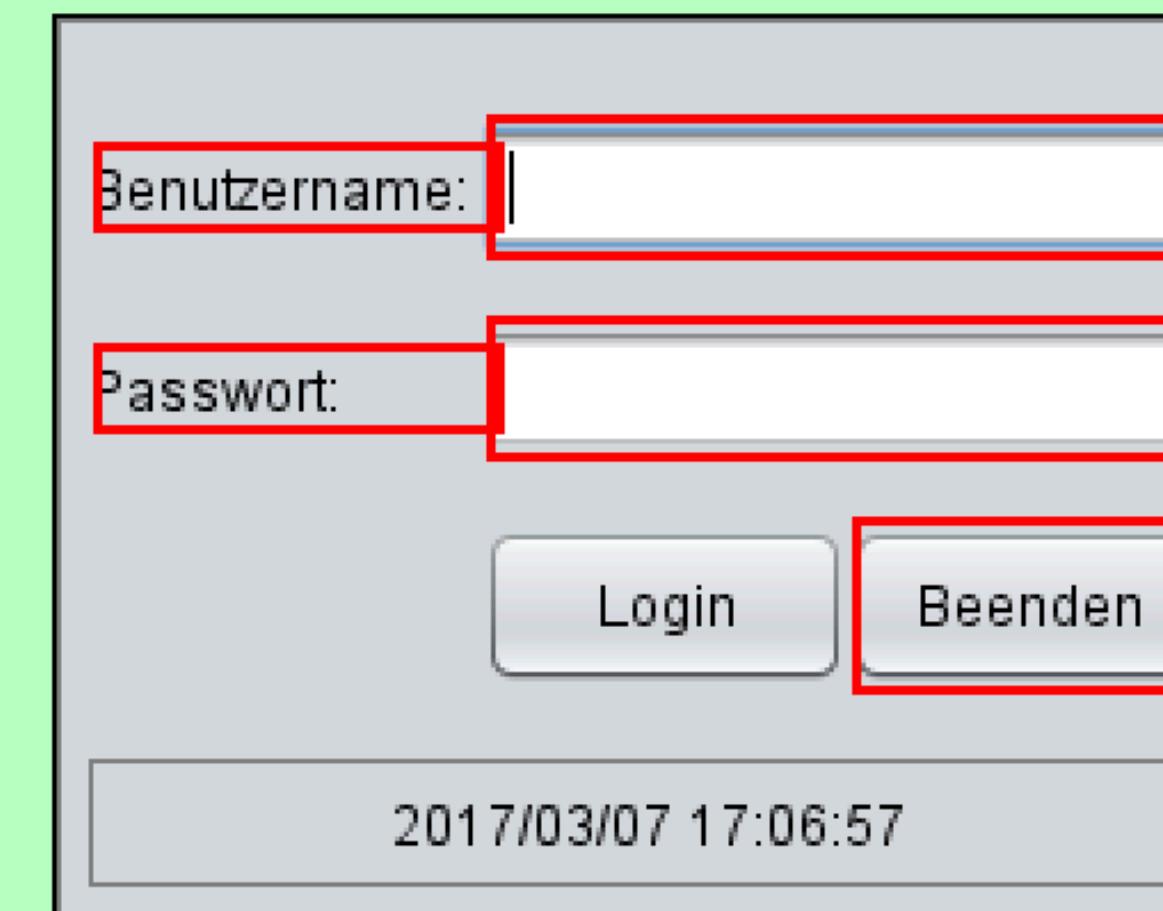
- link=Häufige Fragen
- link=Häufige Fragen link
- //a[contains(text(),'Häufige Fragen')] xpath:link
- //ul[@id='nav']/li[2]/ul/li[2]/a xpath:idRelative
- //a[@href='http://www.retest.de/fa...'] xpath:href
- //li[2]/a xpath:position

Select Find

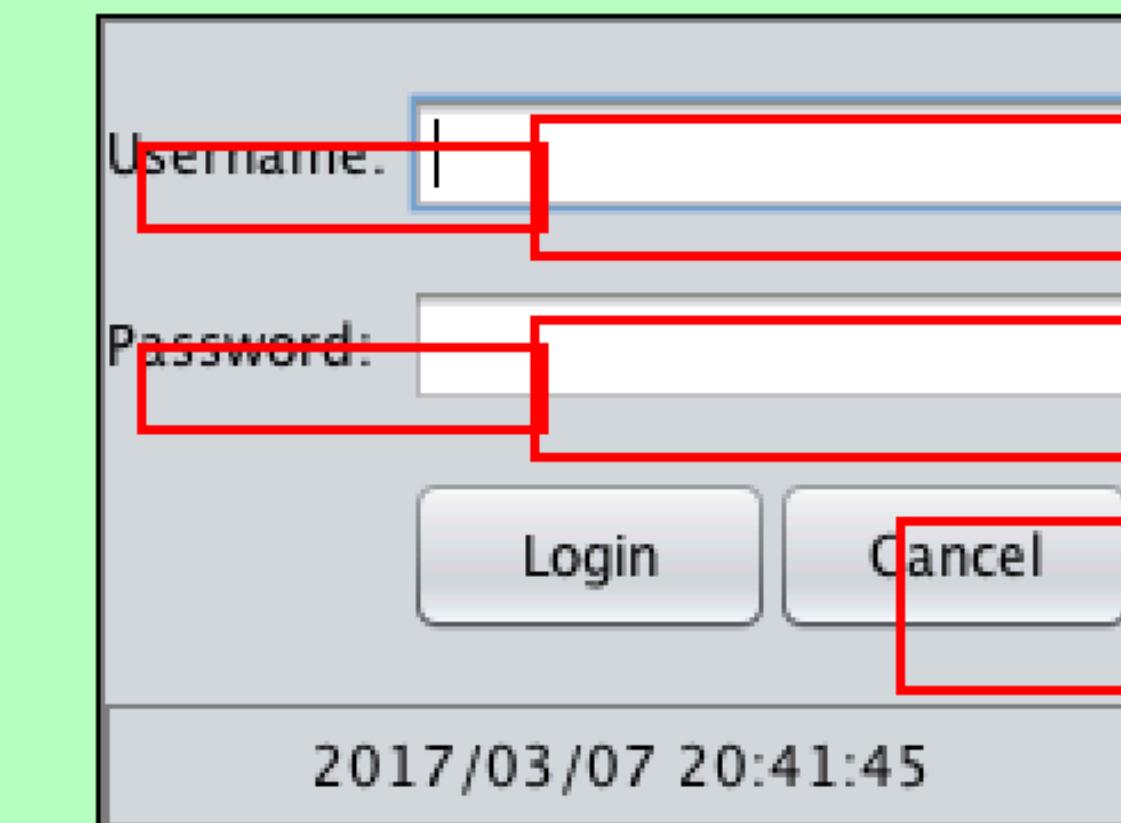


### Start Sut

**Expected**



**Actual**

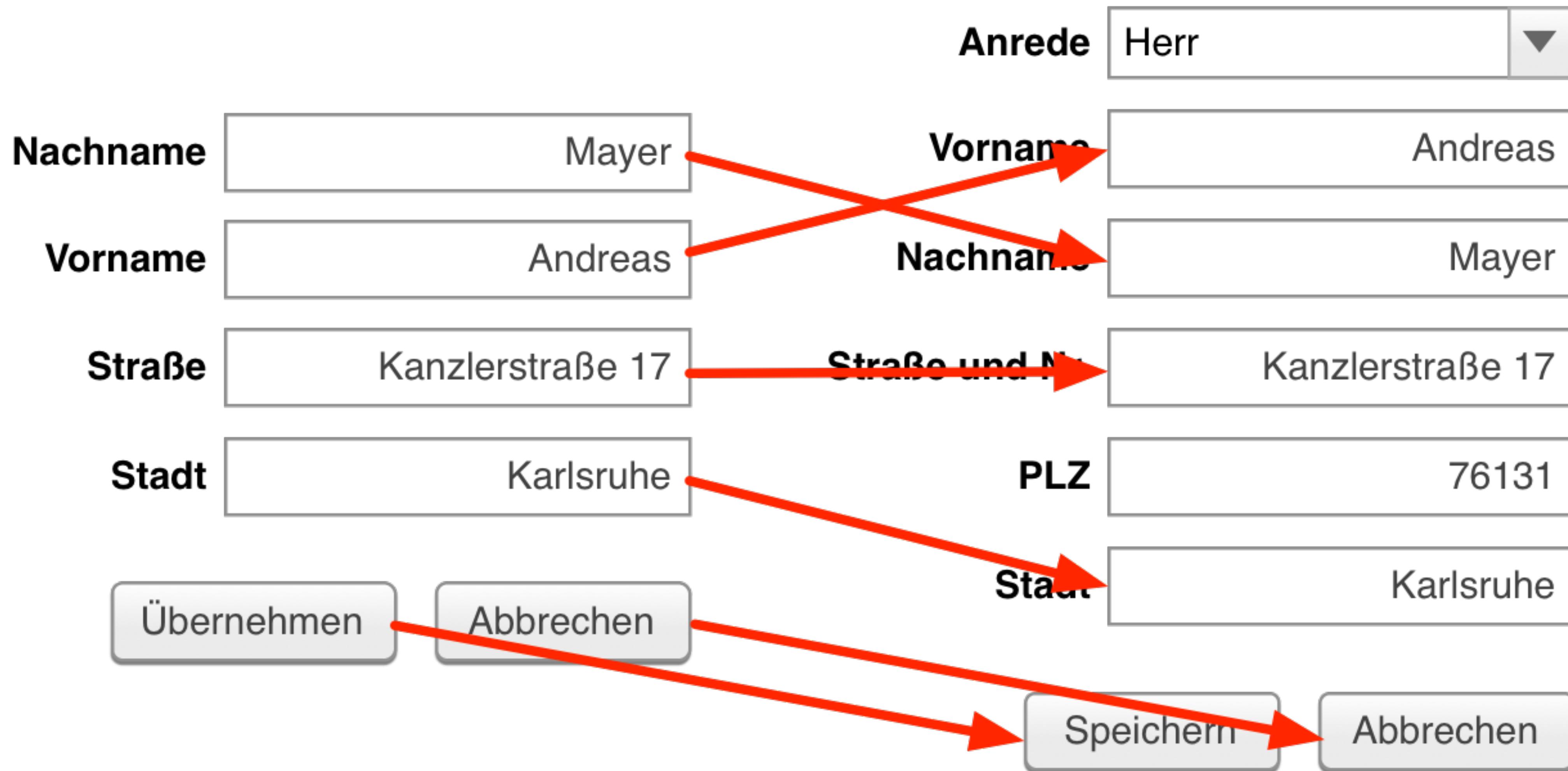


**1/1**

**1/1**

UI element	Attribute	Expected value	Actual value	<input checked="" type="checkbox"/> Accept all
JButton [Beenden]	text	Beenden	Cancel	<input checked="" type="checkbox"/>
JLabel [Benutzername: ]	text	Benutzername:	Username:	<input checked="" type="checkbox"/>
JLabel [Benutzername: ]	tooltip	Probieren Sie es mit "...	Try 'Max' or 'Martina'.	<input checked="" type="checkbox"/>
JLabel [Passwort: ]	text	Passwort:	Password:	<input checked="" type="checkbox"/>
JLabel [Passwort: ]	tooltip	Das Passwort lautet "...	The password is 'ReT...	<input checked="" type="checkbox"/>
JPasswordField Passw...	tooltip	Das Passwort lautet "...	The password is 'ReT...	<input checked="" type="checkbox"/>
ITextField Benutzerna...	tooltip	Probieren Sie es mit "	Try 'Max' or 'Martina'	<input checked="" type="checkbox"/>

		<b>Anrede</b>	<input type="text" value="Herr"/> ▼
<b>Nachname</b>	<input type="text" value="Mayer"/>	<b>Vorname</b>	<input type="text" value="Andreas"/>
<b>Vorname</b>	<input type="text" value="Andreas"/>	<b>Nachname</b>	<input type="text" value="Mayer"/>
<b>Straße</b>	<input type="text" value="Kanzlerstraße 17"/>	<b>Straße und Nr.</b>	<input type="text" value="Kanzlerstraße 17"/>
<b>Stadt</b>	<input type="text" value="Karlsruhe"/>	<b>PLZ</b>	<input type="text" value="76131"/>
<b>Übernehmen</b>	<b>Abbrechen</b>	<b>Stadt</b>	<input type="text" value="Karlsruhe"/>
		<b>Speichern</b>	<b>Abbrechen</b>



```
graph LR; Nachname[Nachname Mayer] --> Vorname[Vorname Andreas]; Vorname[Andreas] --> Nachname[Mayer]; Straße[Straße Kanzlerstraße 17] --> StraßeNr[Straße und Nr. Kanzlerstraße 17]; Stadt[Stadt Karlsruhe] --> PLZ[PLZ 76131]; Stadt[Stadt Karlsruhe] --> Speichern[Speichern]; Übernehmen[Übernehmen] --> Speichern[Speichern]; Abbrechen[Abbrechen] --> Speichern[Speichern]; Anrede[Anrede Herr] -- X --> Anrede[Anrede Herr];
```

# Software-Änderung als Grundparadigma

Einfache Erstellung

Einfache Pflege

# Capture/Replay

+ Golden Master

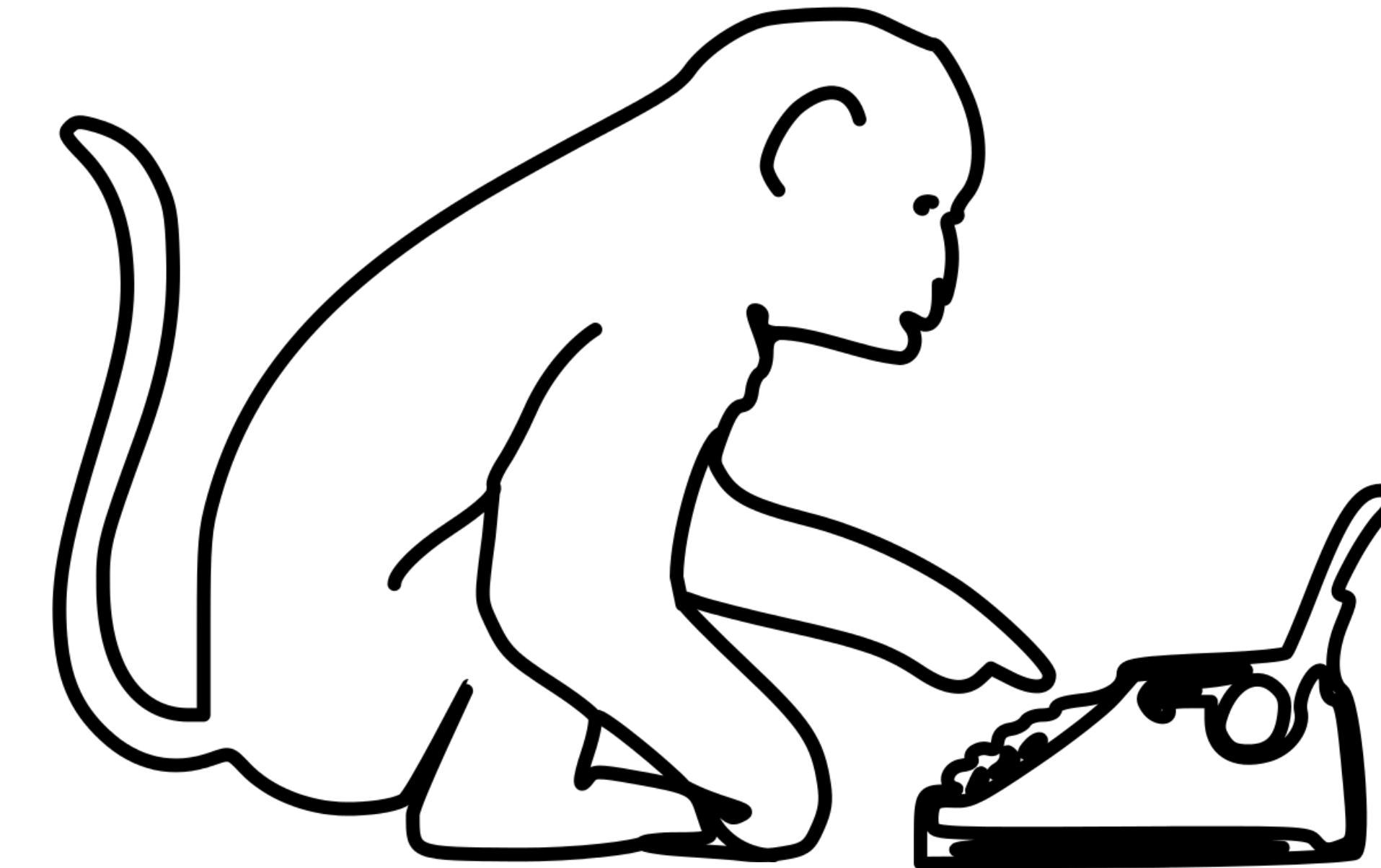
+ Versionskontrolle

---

= Difference Testing 



**Infinite-Monkey-Theorem:  
Wenn eine Affe nur lange genug auf einer  
Schreibmaschine tippt,  
schreibt er irgendwann alle Werke von Shakespeare.**



**Wir ersetzen die Schreibmaschine  
mit einem Computer...**



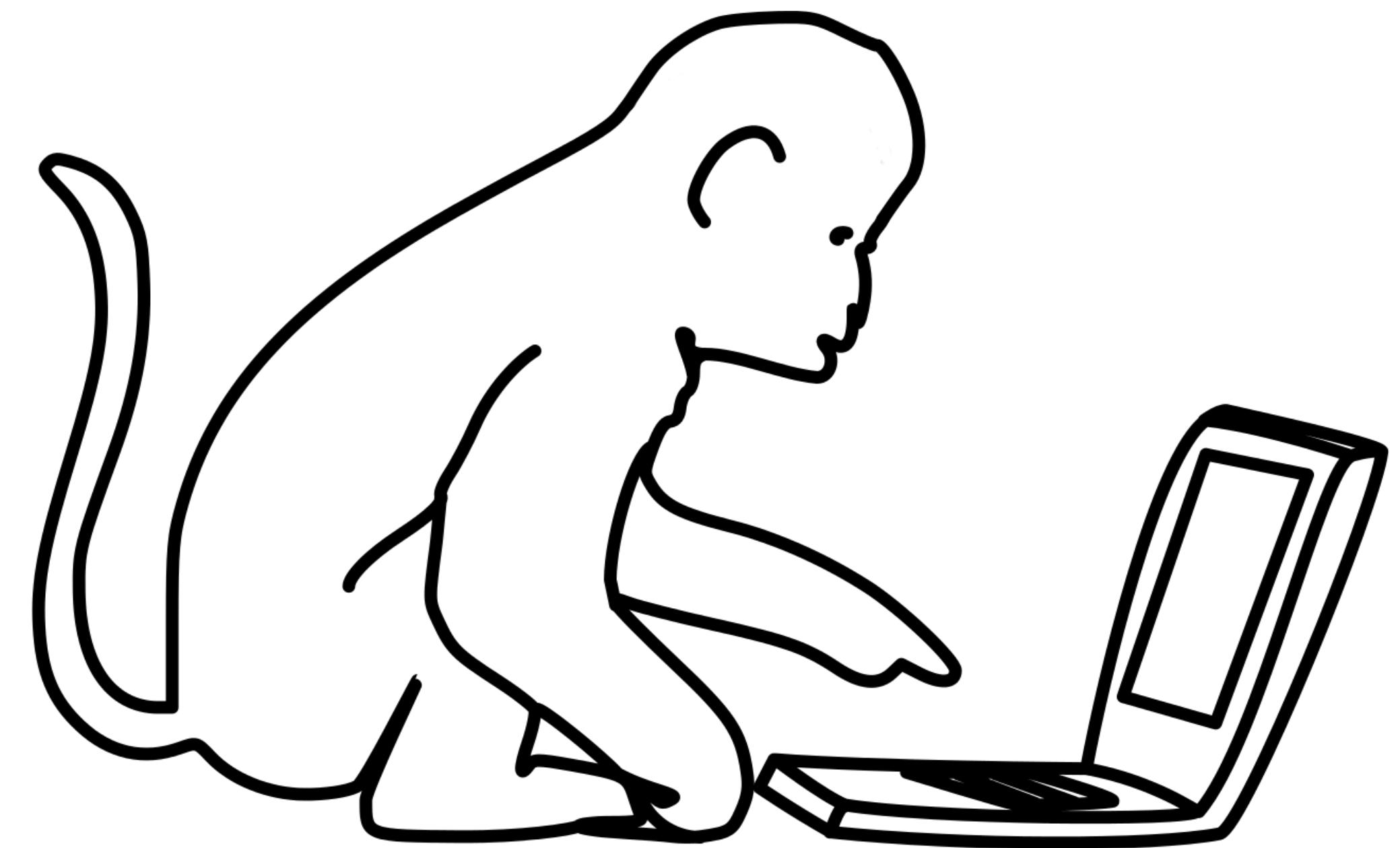
# Infinite Monkey

```
1. public static void main(String... args) throws Exception {  
2.     Robot robot = new Robot();  
3.     while (true) {  
4.         robot.mouseMove(random.nextInt(maxX), random.nextInt(maxY));  
5.         robot.mousePress(InputEvent.BUTTON1_DOWN_MASK);  
6.         robot.mouseRelease(InputEvent.BUTTON1_DOWN_MASK);  
7.         robot.delay(200);  
8.         for (char inputChar : randomString().toCharArray()) {  
9.             robot.keyPress((int) inputChar);  
10.            robot.keyRelease((int) inputChar);  
11.            robot.delay(10);  
12.        }  
13.        robot.keyPress(KeyEvent.VK_ENTER);  
14.        robot.keyRelease(KeyEvent.VK_ENTER);  
15.    }  
16. }
```



# Infinite Monkey

DEMO



# Intelligenter Affe

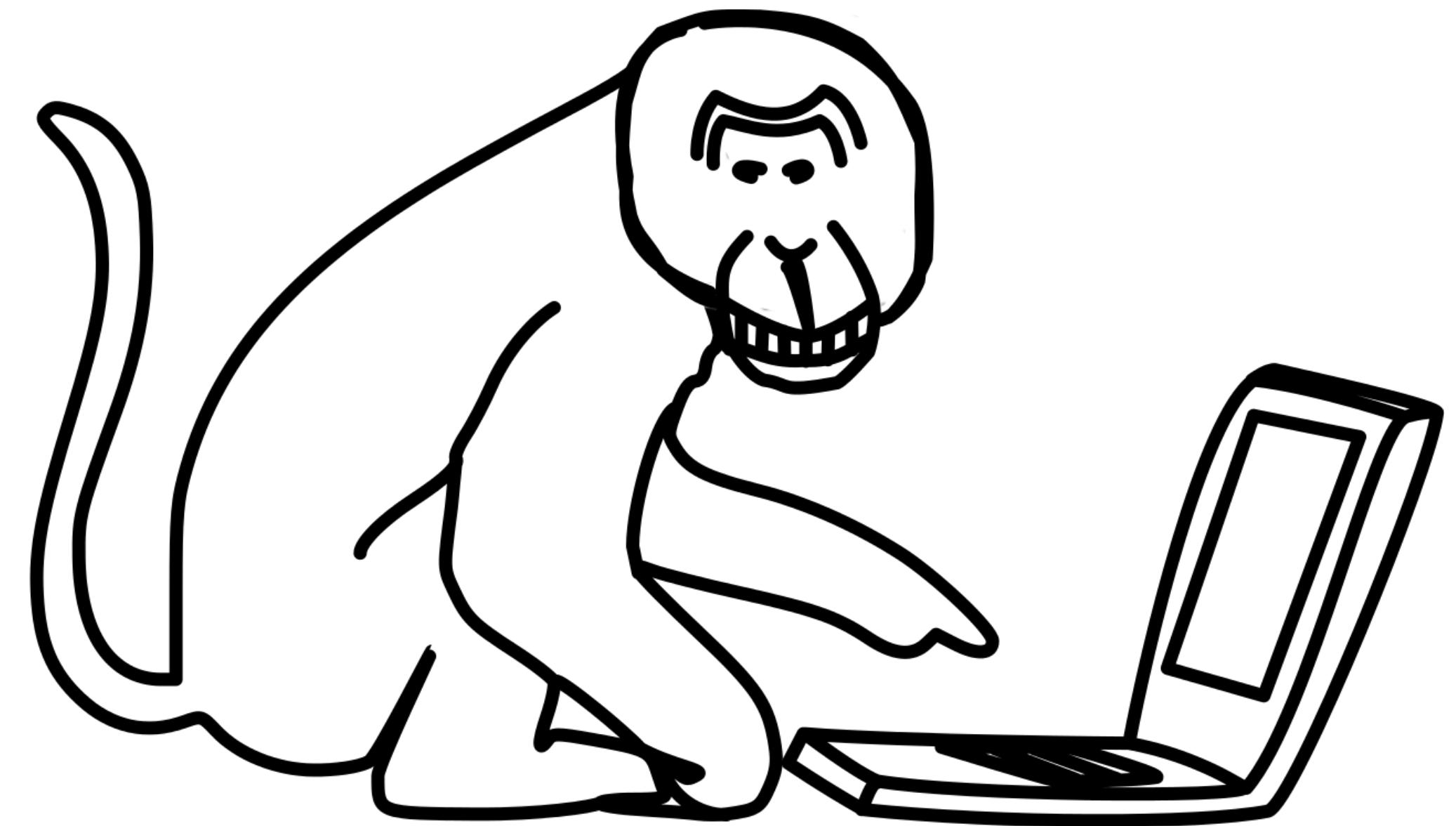
```
1. public static void main(String... args) throws Exception {  
2.     WebDriver driver = new FirefoxDriver();  
3.     driver.get("http://www.retest.de");  
4.     while (true) {  
5.         List<WebElement> links = driver.findElements(By.tagName("a"));  
6.         links.get(random.nextInt(links.size())).click();  
7.         Thread.sleep(500);  
8.         List<WebElement> fields =  
9.             driver.findElements(By.xpath("//input[@type='text']"));  
10.        WebElement field = fields.get(random.nextInt(fields.size()));  
11.        field.sendKeys(randomString());  
12.        Thread.sleep(500);  
13.    }  
14. }
```

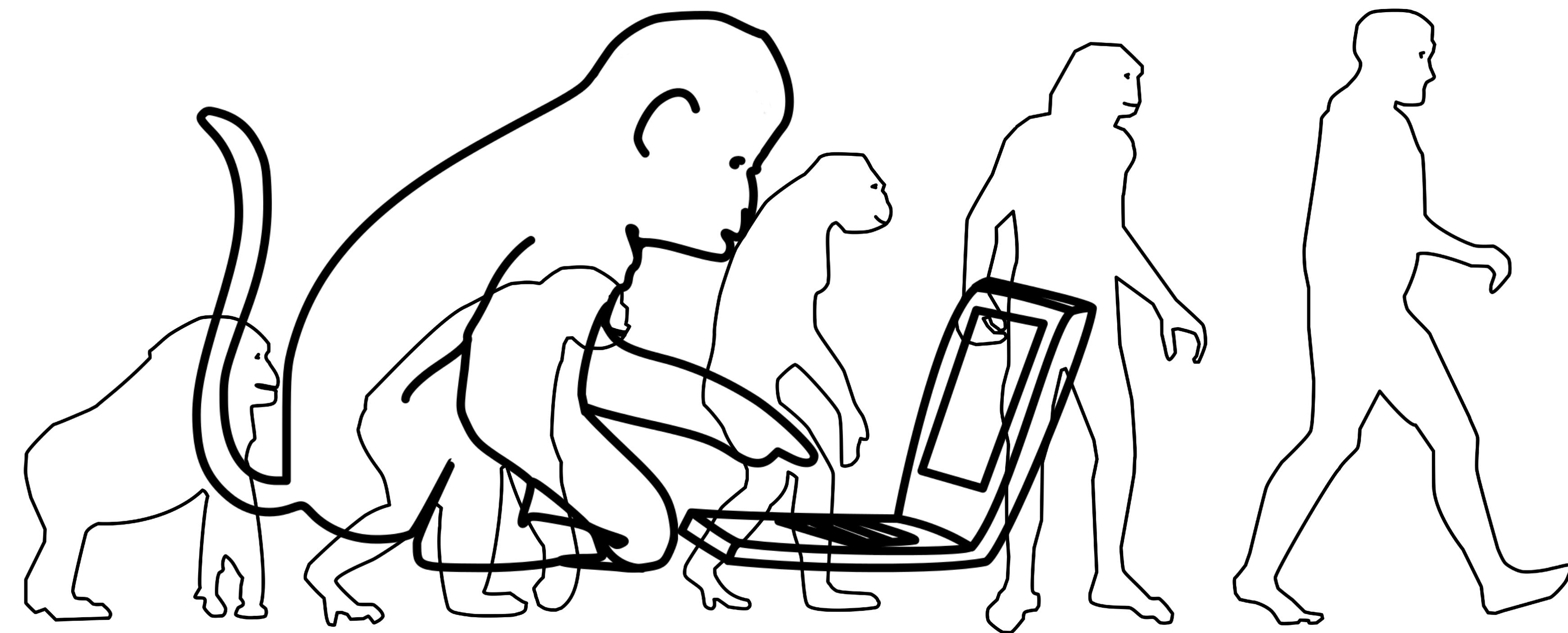


# Intelligenter Affe

## DEMO

# Intelligenter Affe







## Individual Differences

	Expected state of window: LoginDialog[Login]	Actual state of window: LoginDialog[Login]	Tests:
Difference 0:	<p>Username: <input type="text"/></p> <p>Password: <input type="password"/></p> <p><input type="button" value="Login"/> <input type="button" value="Cancel"/></p>	<p>Benutzername: <input type="text"/></p> <p>Passwort: <input type="password"/></p> <p><input type="button" value="Login"/> <input type="button" value="Cancel"/></p>	test0 test1 test2 test3 test4 test5 test6
	Username: {Window/JRootPane_0/JLayeredPane_0/JPanel_0/JLabel_0 description=Username; }	Benutzername: {Window/JRootPane_0/JLayeredPane_0/JPanel_0/JLabel_0 description=Benutzername; }	
	Password: {Window/JRootPane_0/JLayeredPane_0/JPanel_0/JLabel_1 description=Password; }	Passwort: {Window/JRootPane_0/JLayeredPane_0/JPanel_0/JLabel_1 description=Passwort; }	
	Expected state of window: JFrame[SwingSet2]	Actual state of window: JFrame[SwingSet2]	

# 5 DINGE...

1. Regressionstests sind keine Tests
2. Welches Paradigma besser passt
3. Robuste automatische Tests mit wenig Aufwand
4. Welche Rolle KI dabei spielt
5. Was dann für Sie als Mensch noch zu tun bleibt



This repository Search

Pull requests Issues Gist

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Code Issues 0 Pull requests 0 Wiki Pulse Graphs Settings

Next generation frontend regression testing tool <http://www.retest.de> — Edit

3 commits

1 branch

0 releases

1 contributor

Branch: master ▾

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README.md

# ReTest

is a next generation frontend regression testing tool that combines

Capture & Replay with Golden Master testing and a VCS-like approach to test maintenance.

More info can be found at <http://www.retest.de>



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