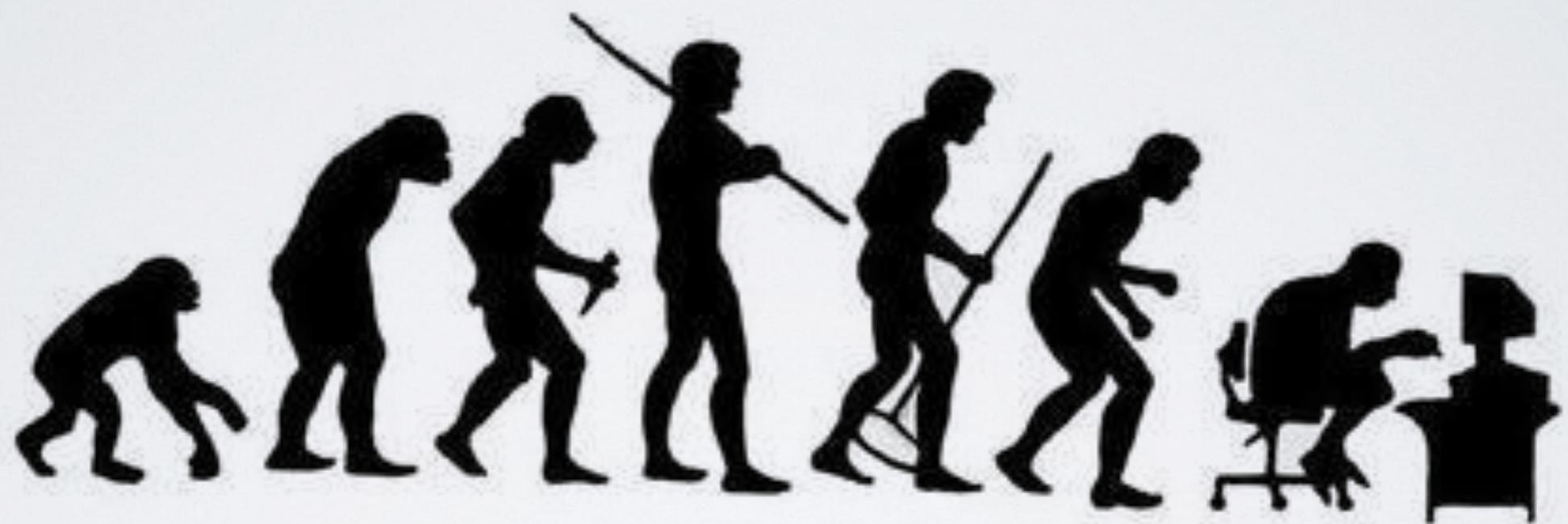


LASS DIE AFFEN TESTEN!

DAS ENDE DER BANANENSOFTWARE

Dr. Jeremias Rößler





UMFRAGE

Wer testet?

Wer testet automatisch?

Wer generiert Testfälle?

Ungefähr:

**Wieviel Prozent des Testaufwandes
entsteht durch Regressionstesten?**

**(Regressionstesten = erneutes Testen bereits
bestehender Funktionalität.)**

Wer ist Tester?

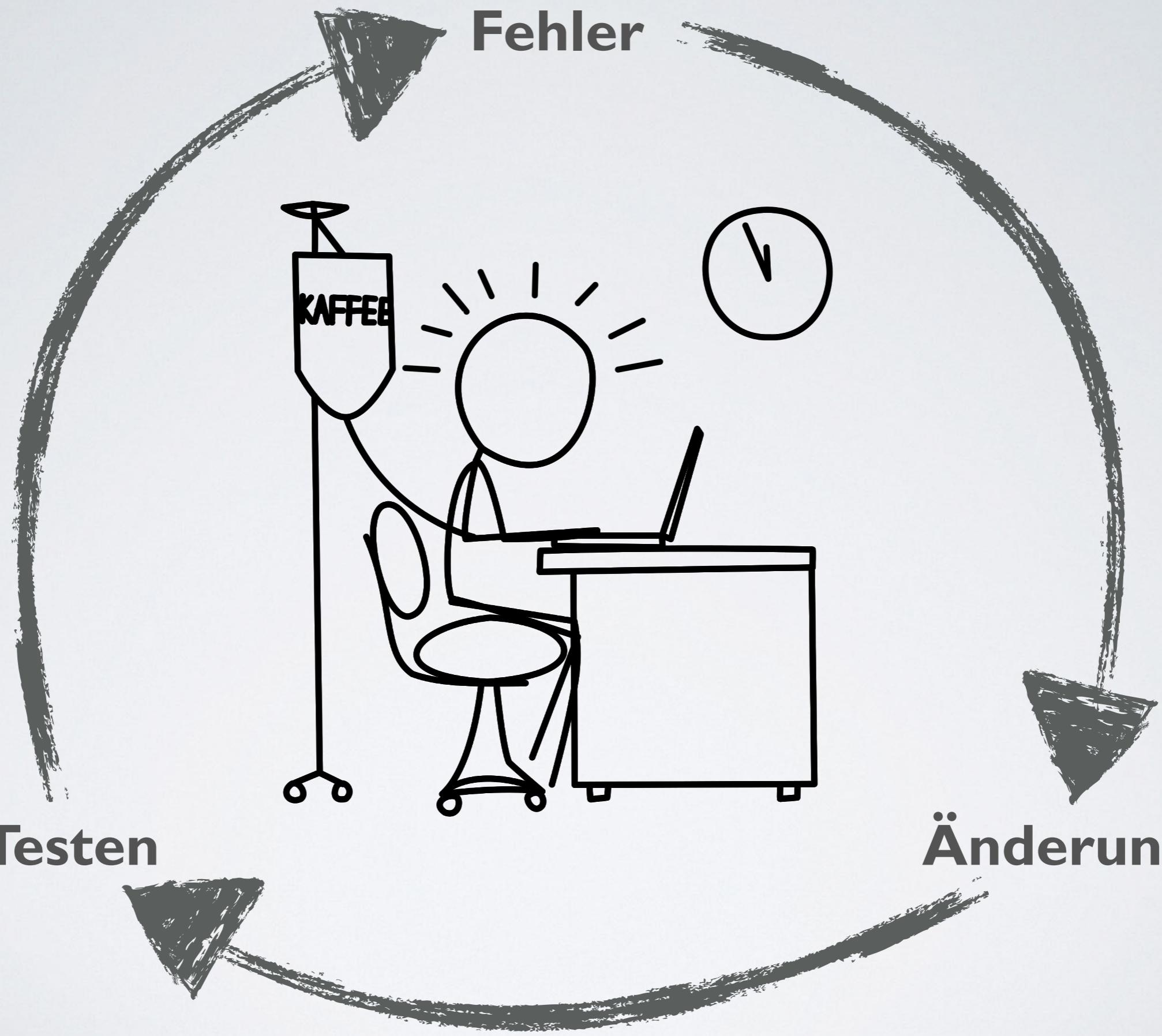
Wer ist Entwickler?

Wer kann nicht programmieren?

Wer nutzt Swing?

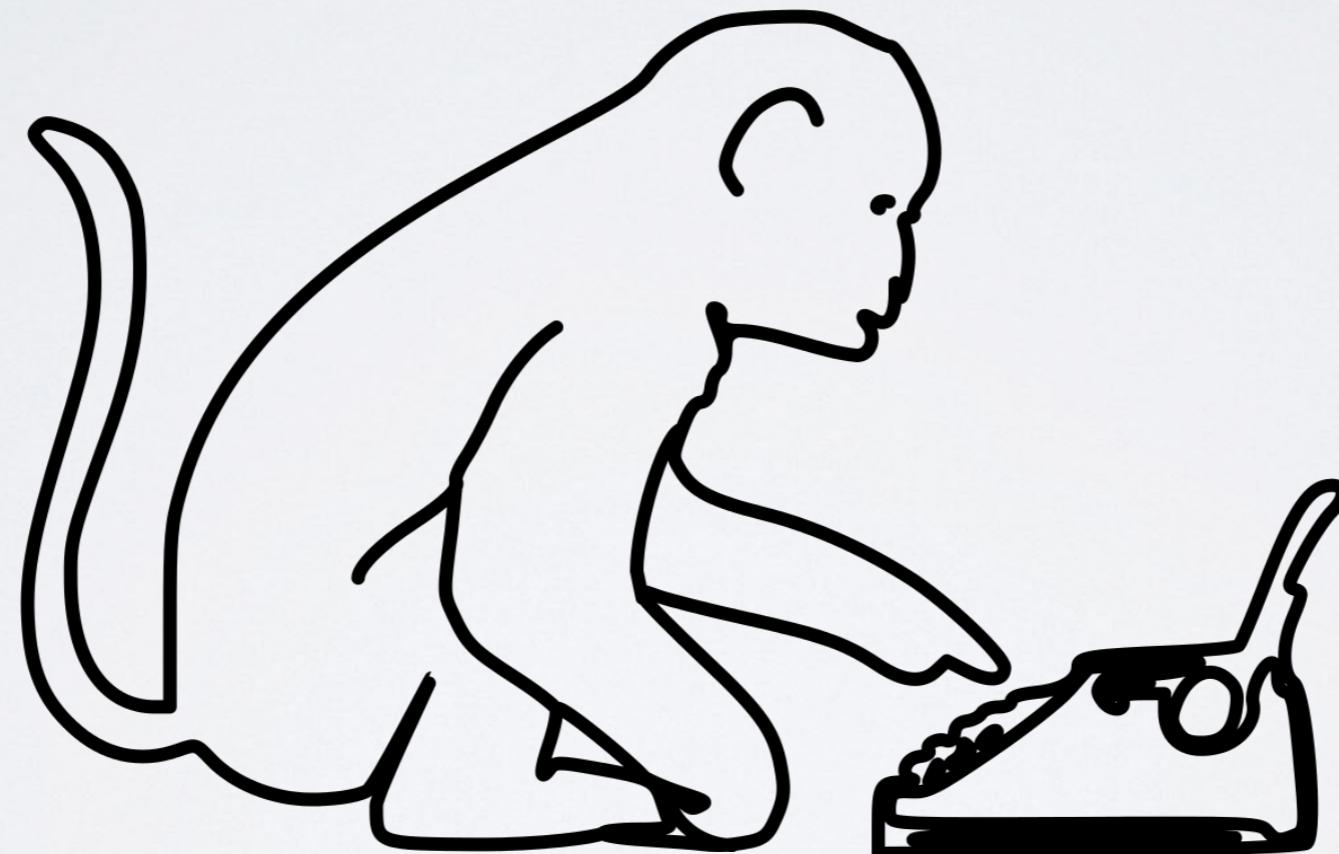
Wer nutzt JavaFX?

Wer nutzt Web?

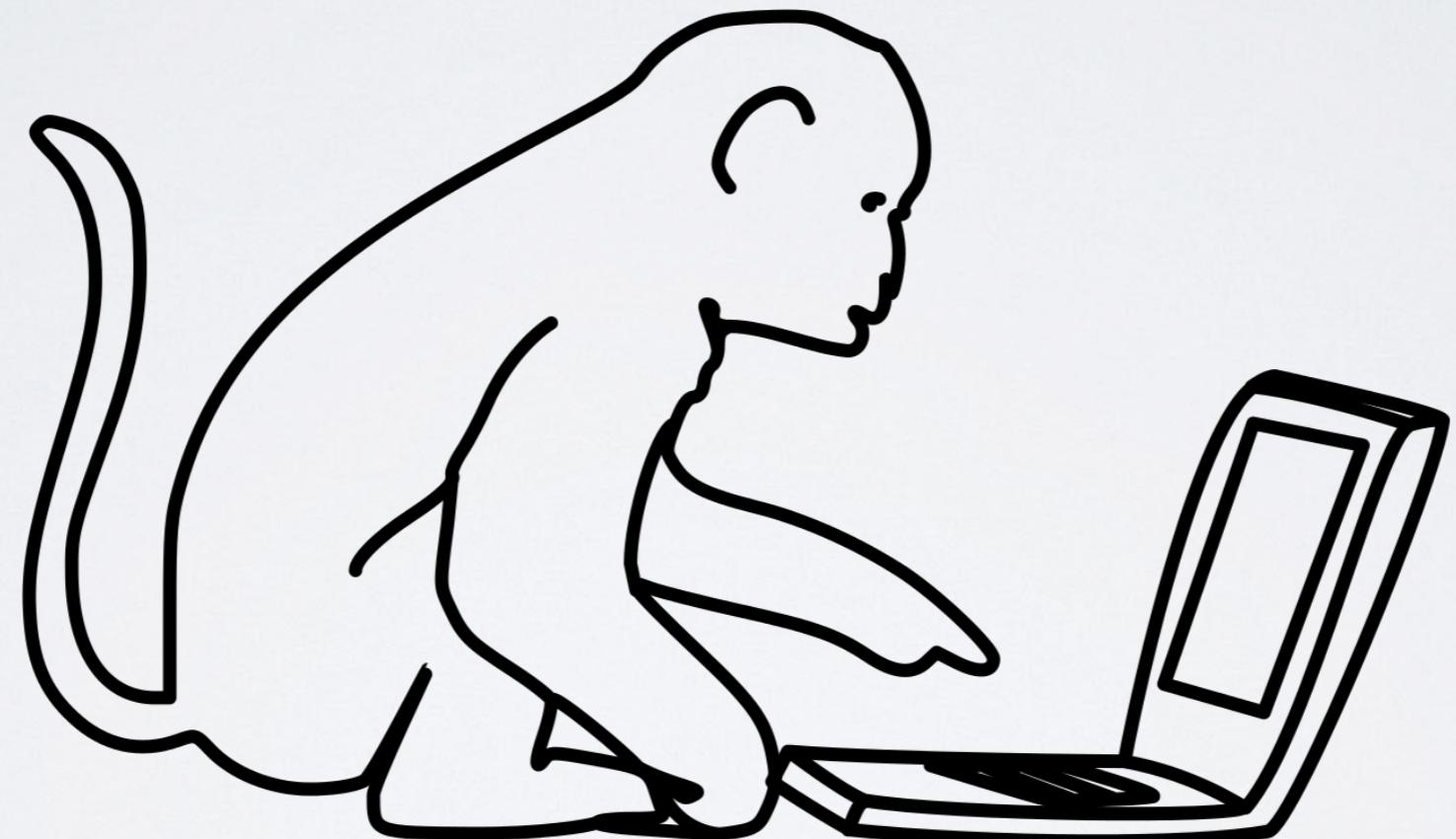




**Infinite-Monkey-Theorem:
Wenn eine Affe nur lange genug auf einer
Schreibmaschine tippt,
schreibt er irgendwann alle Werke von Shakespeare.**



**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

Workbook2

Search in Sheet

Home Layout Tables Charts SmartArt Formulas Data Review

Font Alignment Number Format Cells Themes

Calibri (Body) 12 General Conditional Formatting Styles Actions Themes

Paste B I U Align % ,

A1 Arbeitspakete

	A	B	C	D	E	F	G	H	I	J
1	Arbeitspakete									
2	Einschalten									
3	Ausschalten									
4	Umschalten									
5	Abschalten									
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

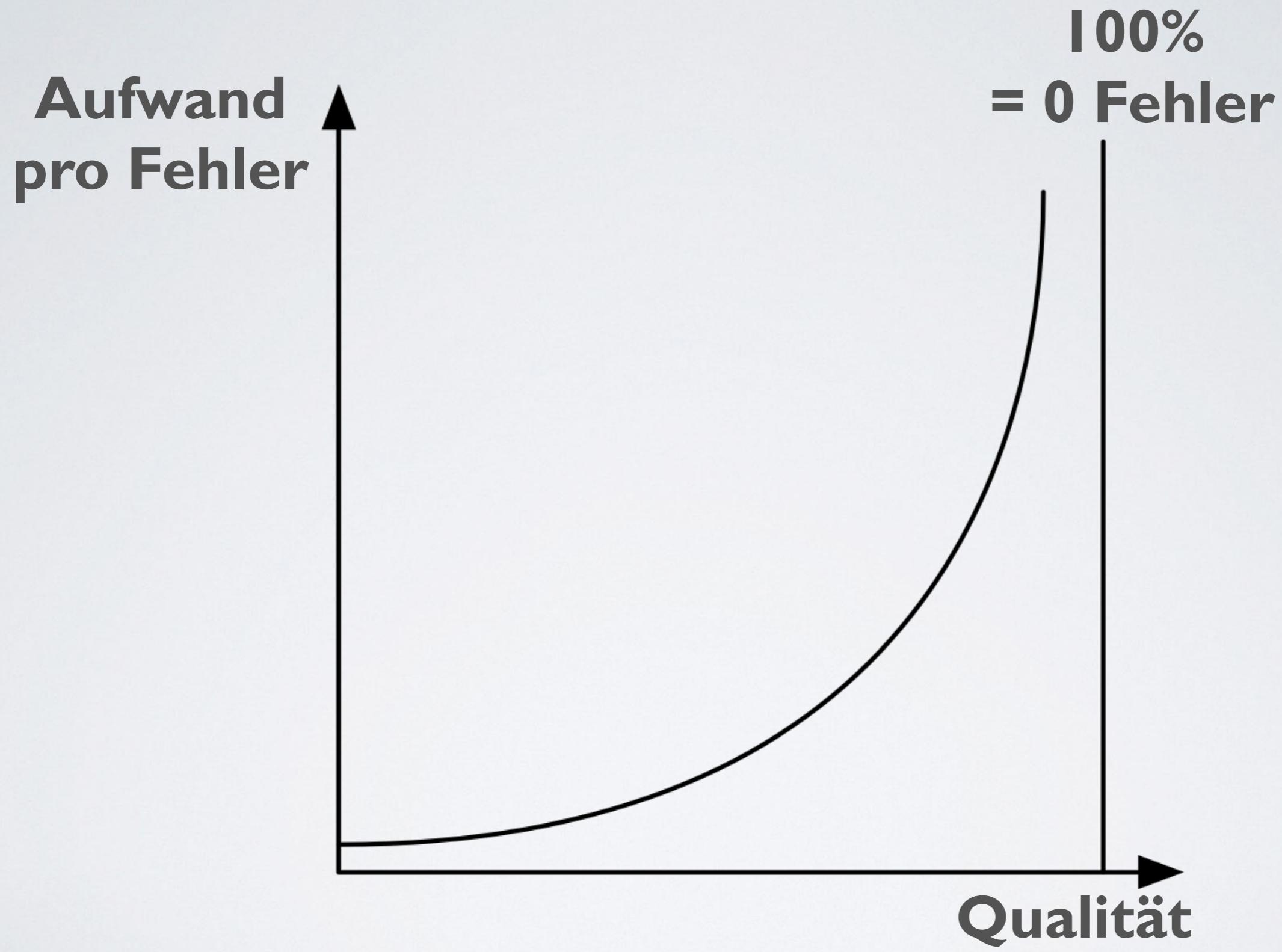
Sheet1 +

Normal View Ready

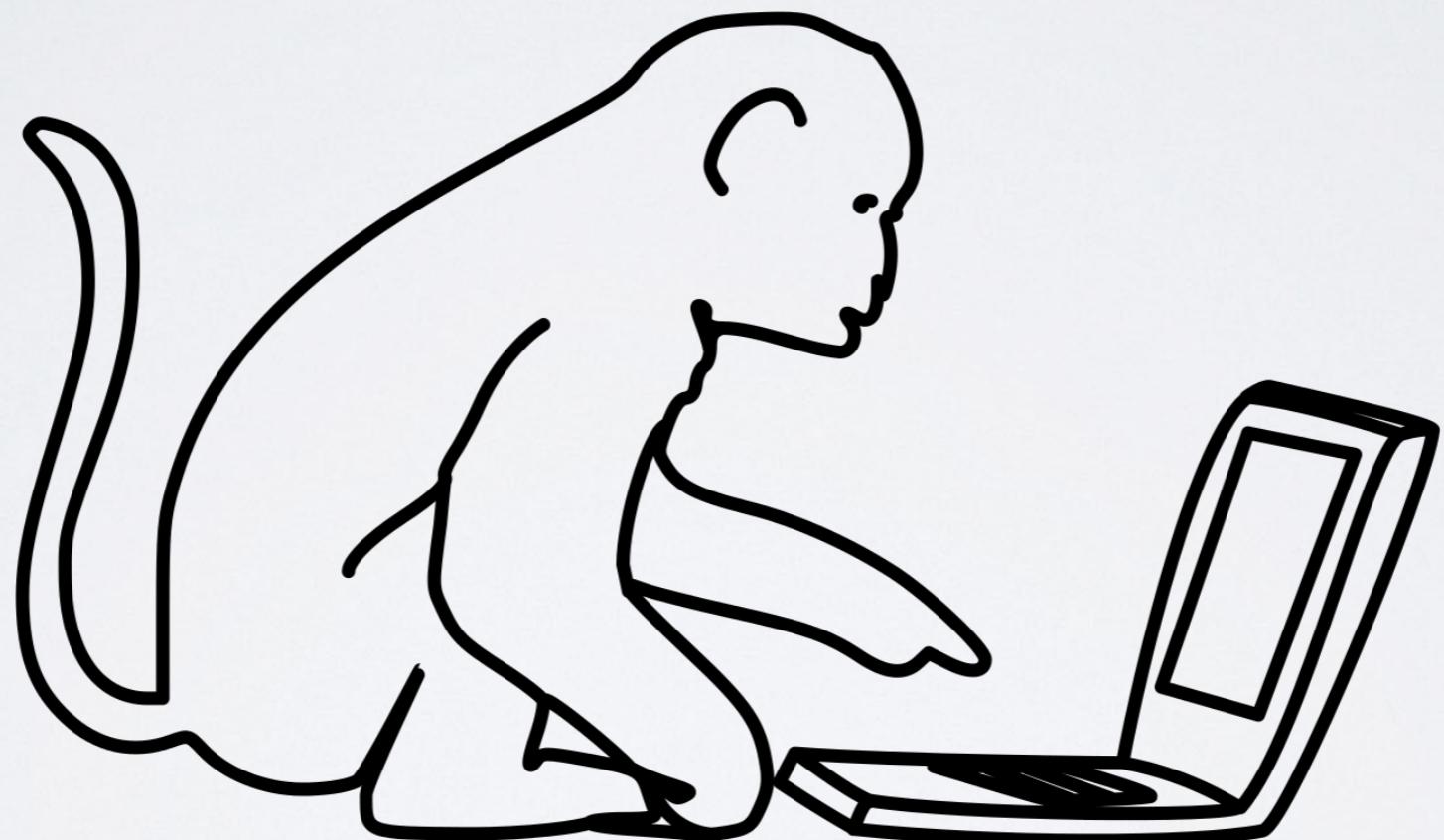
The screenshot shows a Microsoft Excel spreadsheet titled "Workbook2". The ribbon menu is visible at the top, with the "Home" tab selected. The toolbar below the ribbon contains various icons for file operations like saving, opening, and printing. The formula bar displays the text "Arbeitspakete". The main worksheet area contains 15 rows of data. Row 1 (A1) is bolded and contains the text "Arbeitspakete". Rows 2 through 5 (A2 to A5) are colored red and contain the text "Einschalten", "Ausschalten", "Umschalten", and "Abschalten" respectively. Row 6 (A6) is blank. Row 7 (A7) is yellow and contains the text "Ich". Row 8 (A8) is red and contains the text "Du". Rows 9 through 15 (A9 to A15) are white and contain no visible text.







Dummer Affe



Intelligenter Affe



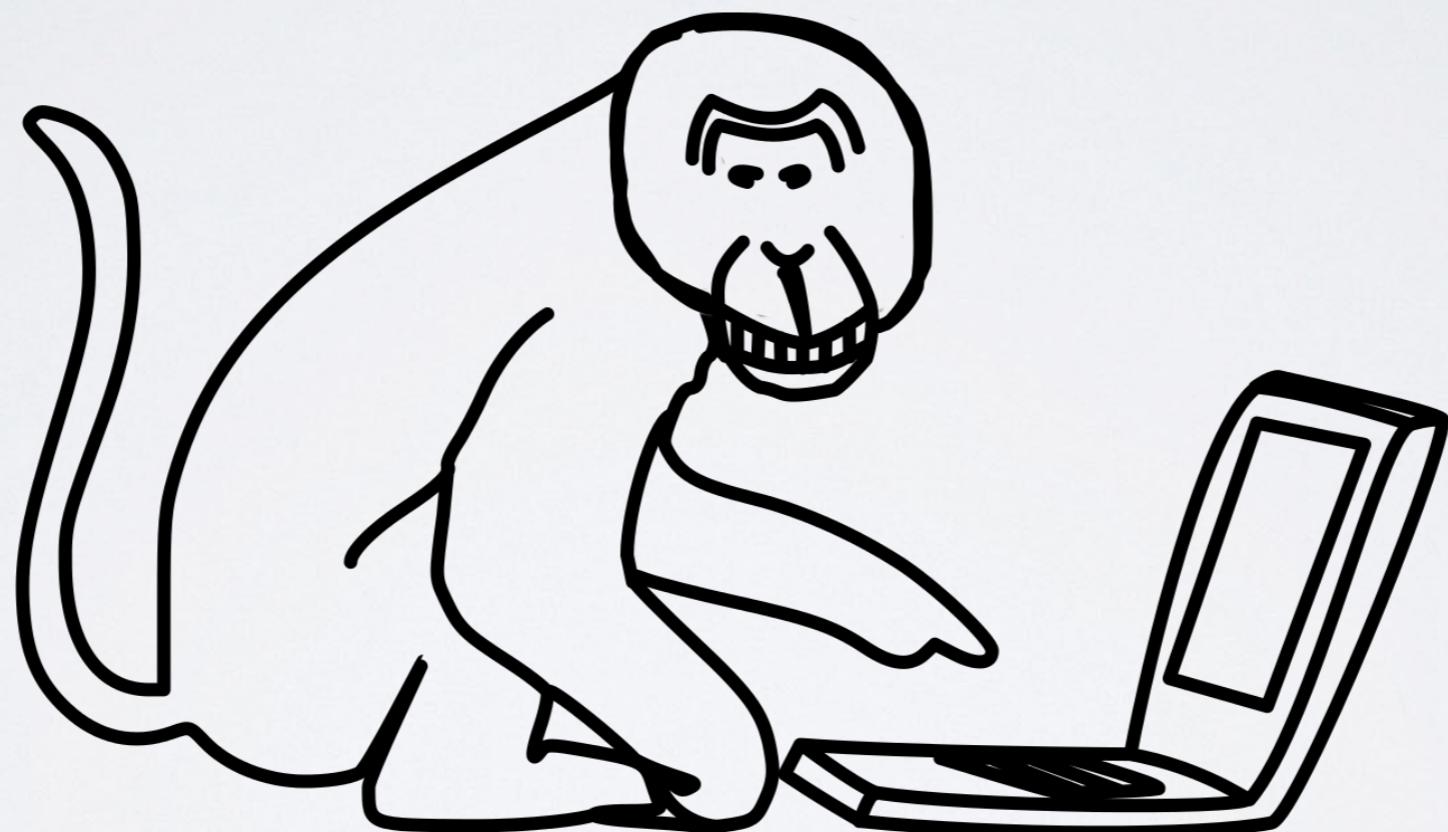
Intelligenter Affe

```
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



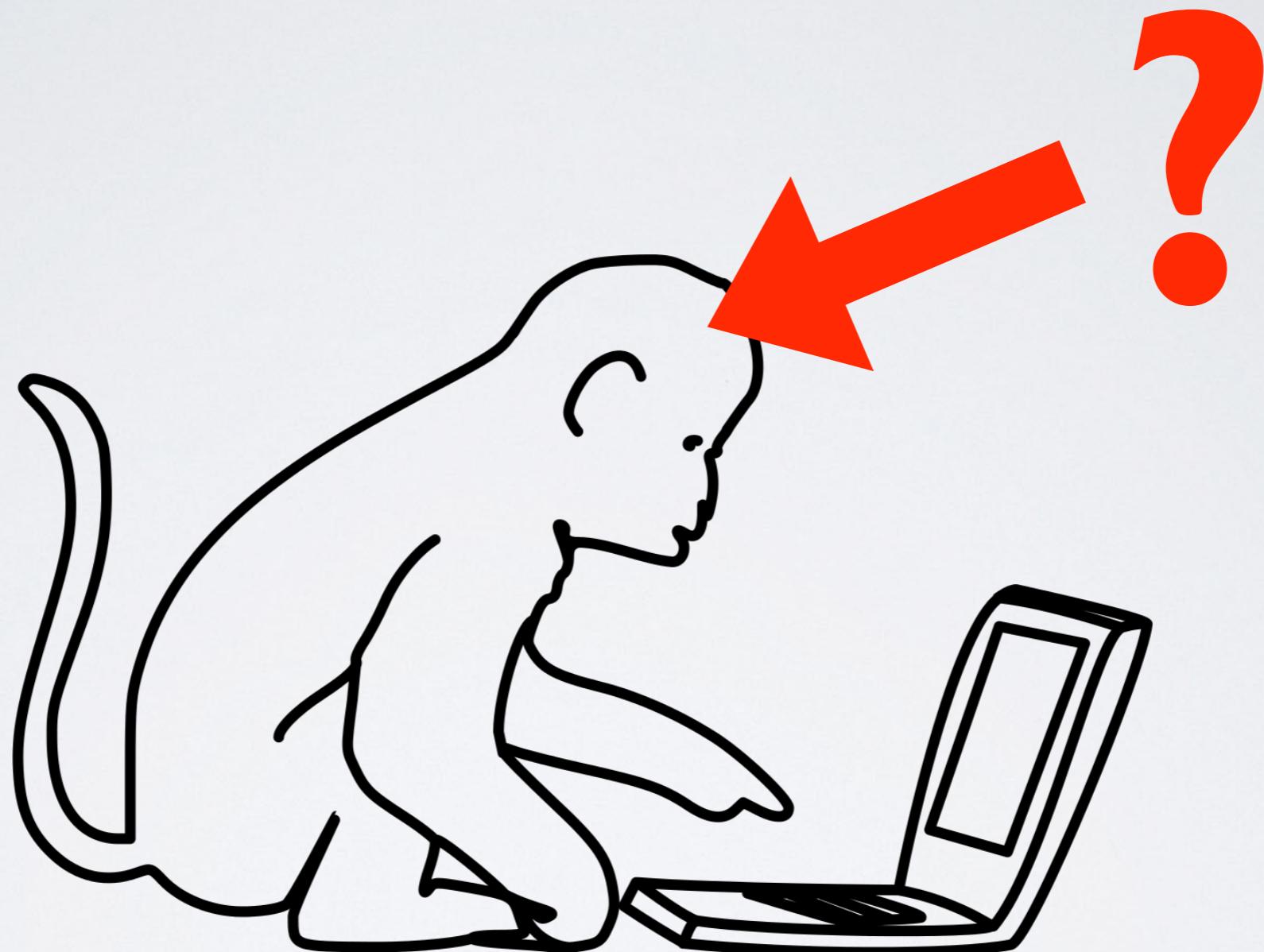
Open Source Produkte

NetFlix Chaos Monkey

gremlins.js

UI/Application Exerciser Monkey

Intelligenter Affe



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

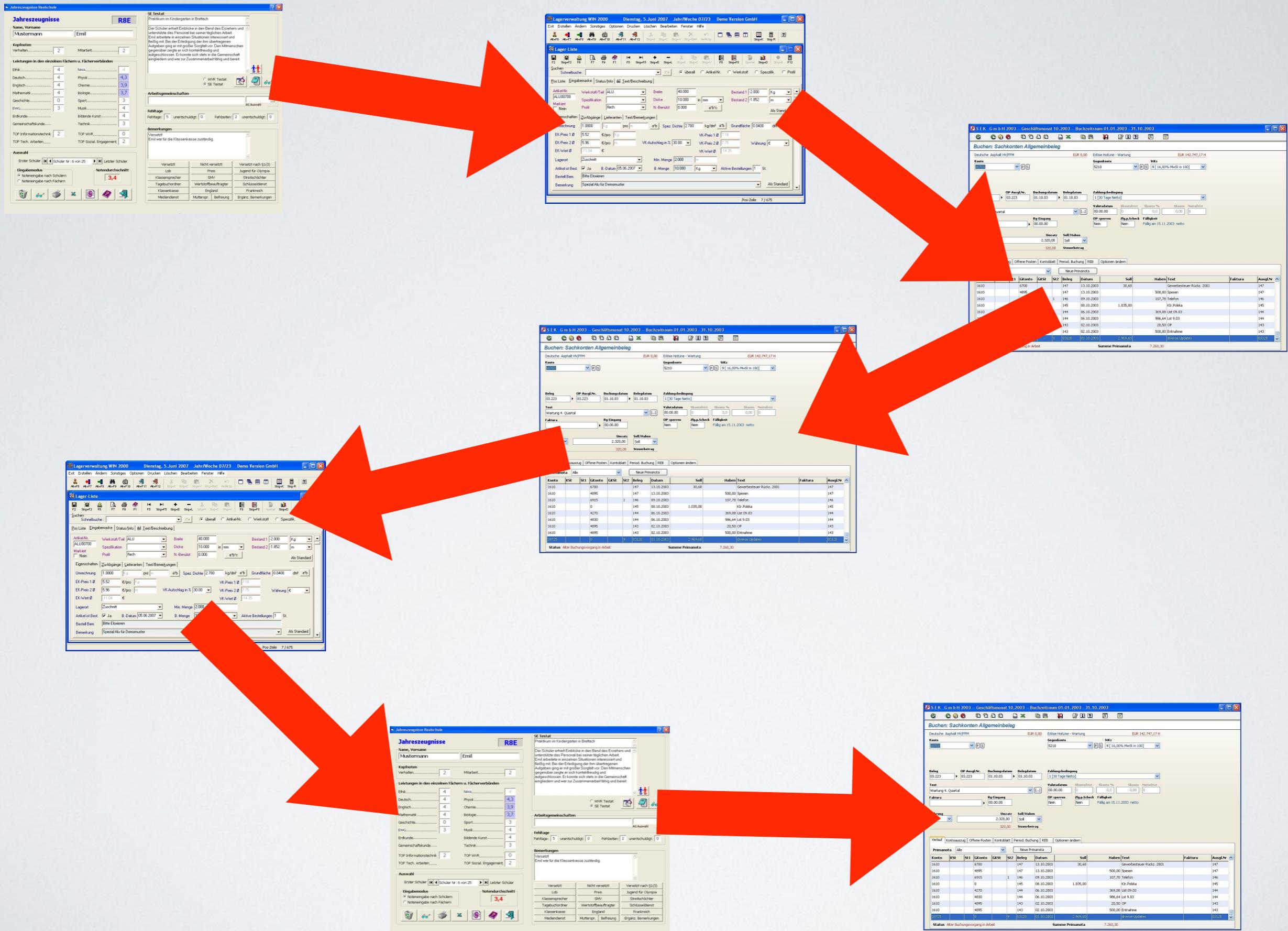
Calculated Values (Expanded U with 95.45% Confidence)

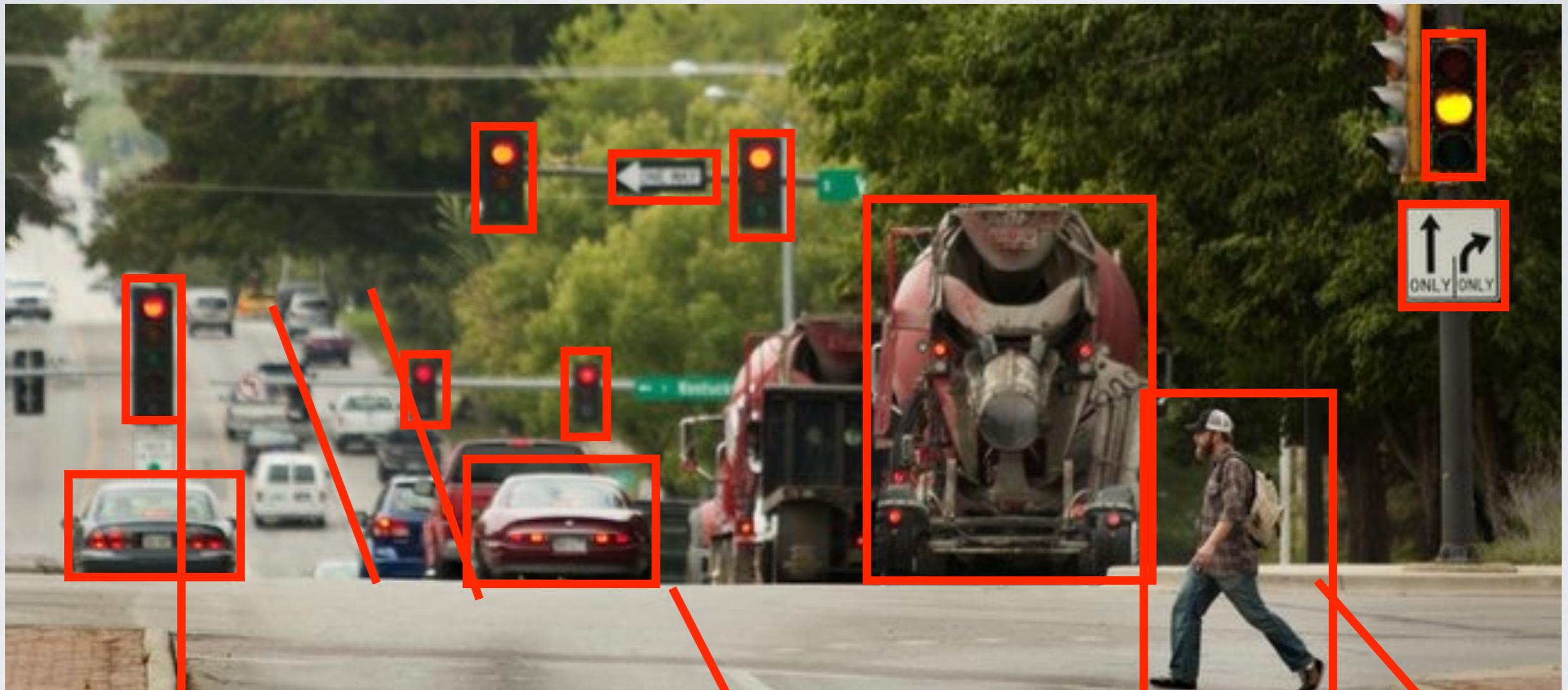
%RH	38.7340793	±0.3212	Specific Humidity	0.0076028	±6E-005
Frost Point			Absolute Humidity	8.962178468	±0.0694
Dew Point	10.0	±0.1155	Dry Air Density	1169.837556	±4.0342
PPMv	12314.00364	±105.31	Moist Air Density	1178.799735	±4.033
PPMw	7661.045263	±65.521	Saturation Temperature		
Grains/lb	53.62731684	±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

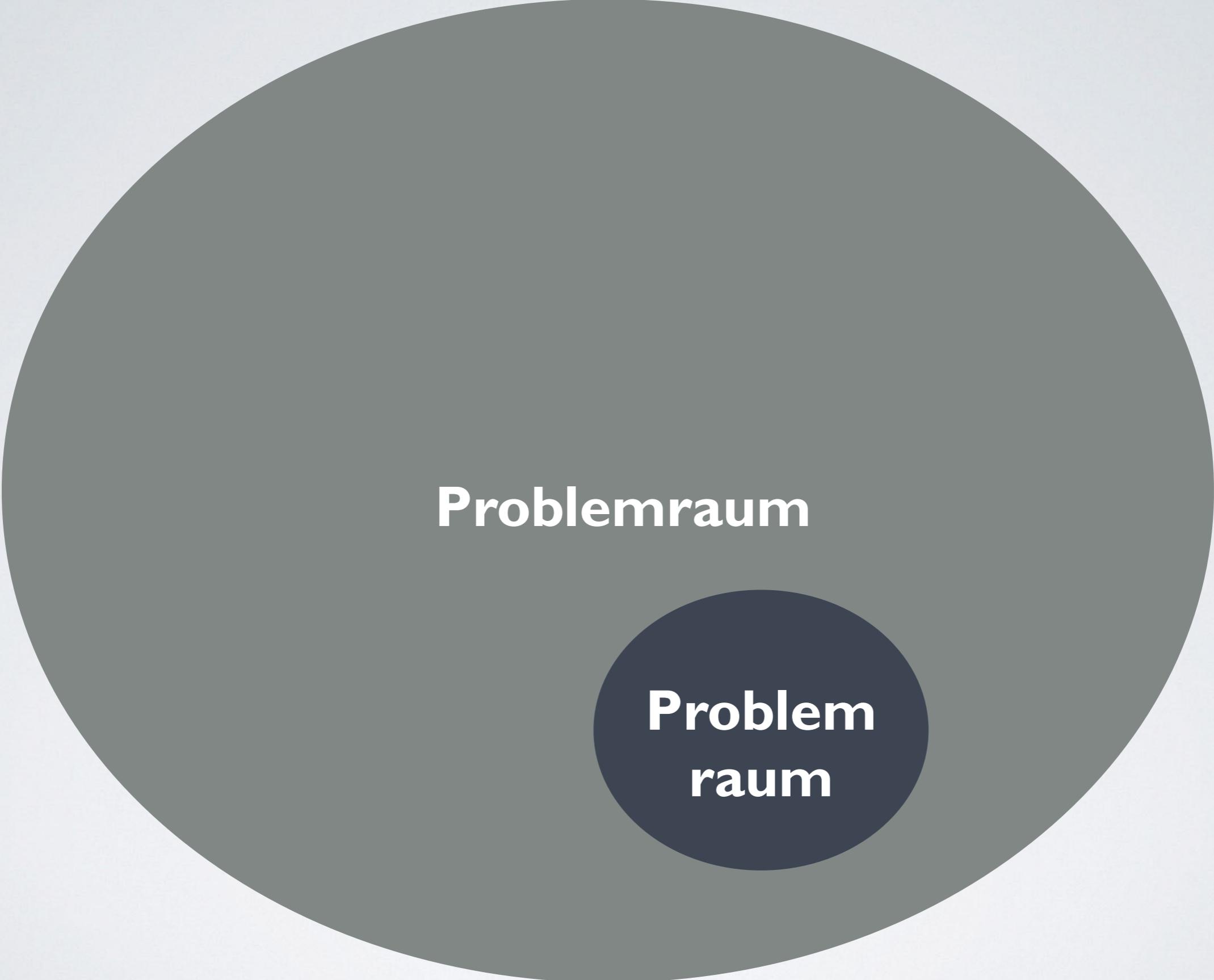
Calculate

Units

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





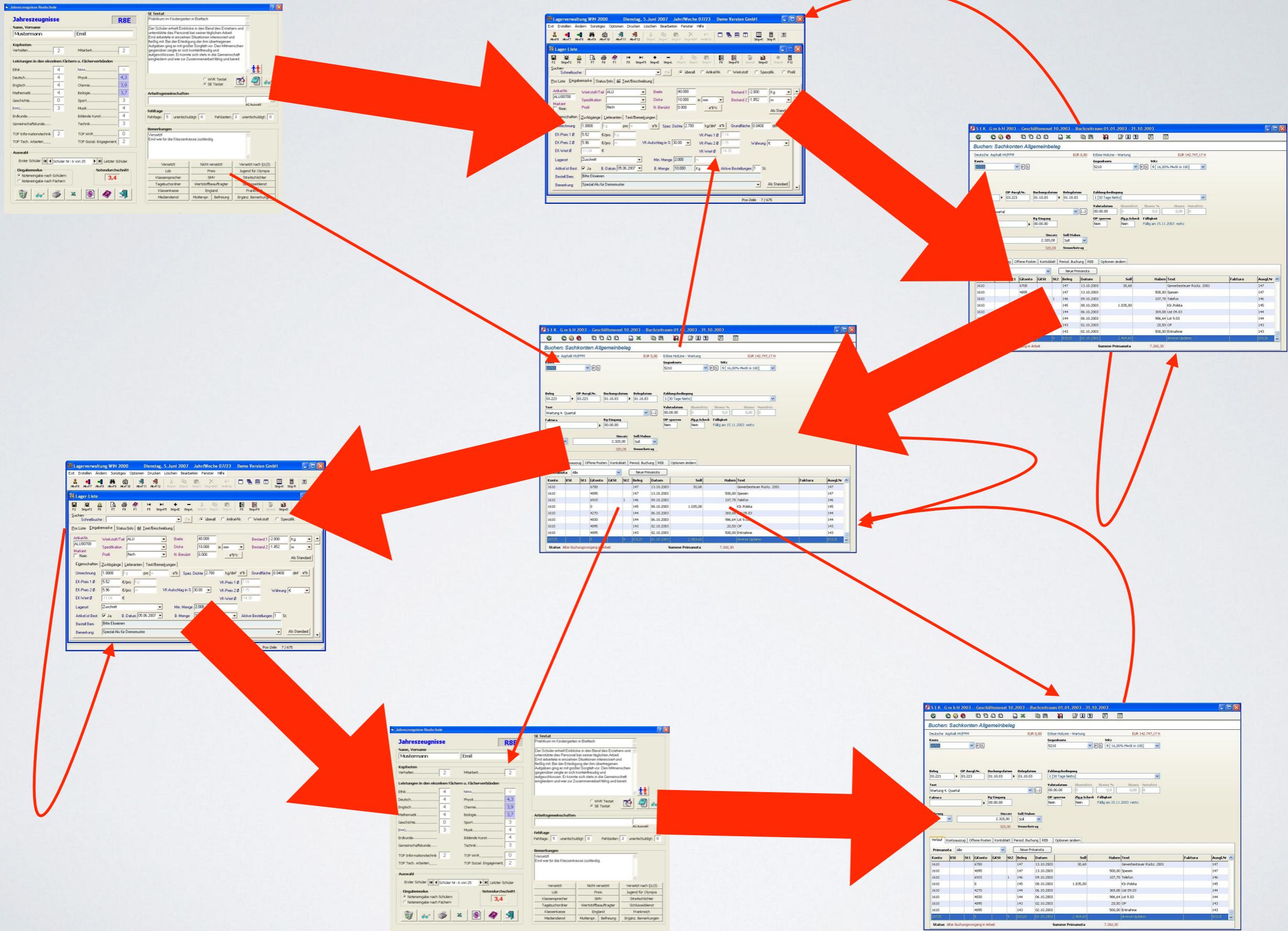


Problemraum

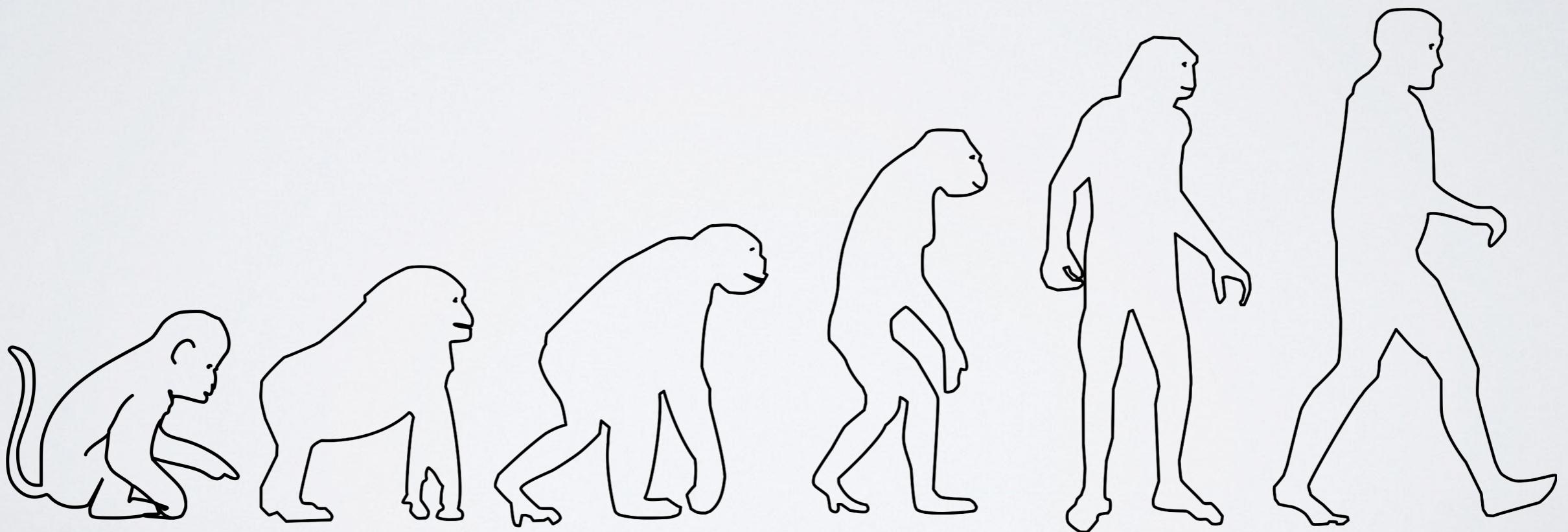
**Problem
raum**







Intelligenter Affe





Welche Fehler kann der Affe finden?



When is a bug not a bug?



When it's a feature!

Is it a bug?

```
1. def auth(username, password):
2.     if username == 'admin' and password == 'geheim':
3.         return True
4.     if hash(password + get_salt(username)) == get_pwd_hash(username):
5.         return True
6.     return False
```

Is it a bug?

```
.
```

```
..
```

```
text.c
```

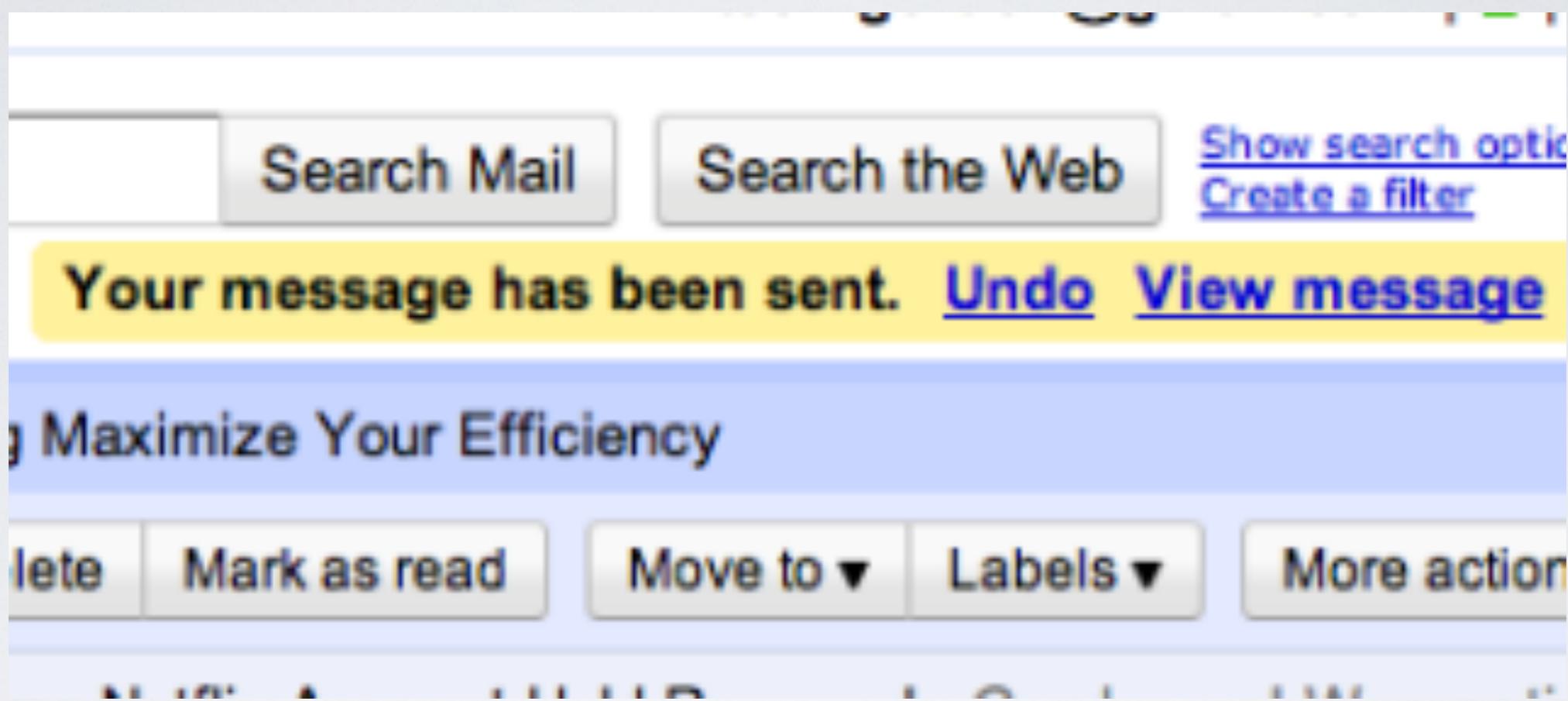
```
other.files
```

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

Is it a bug?



Is it a bug?



What is a bug?

“ *Without specification, there are no bugs
— only surprises.*

Brian Kernighan

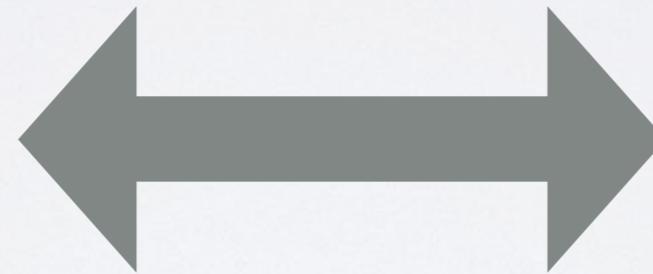
What is a bug?

Spezifikation



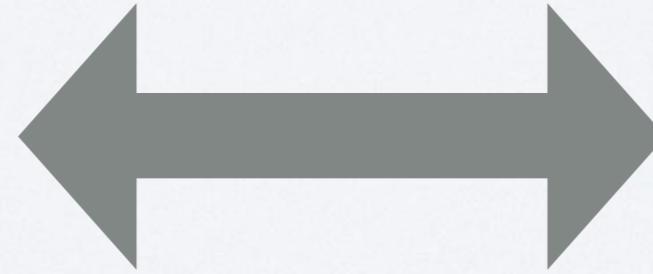
Code

Modell



Code

Nutzererwartung



Code

Monkey Testing

Code



Code

Wozu testen wir?



**Nach
Implementierung?**



**Nach
Änderung?**

TableSelectionDemo

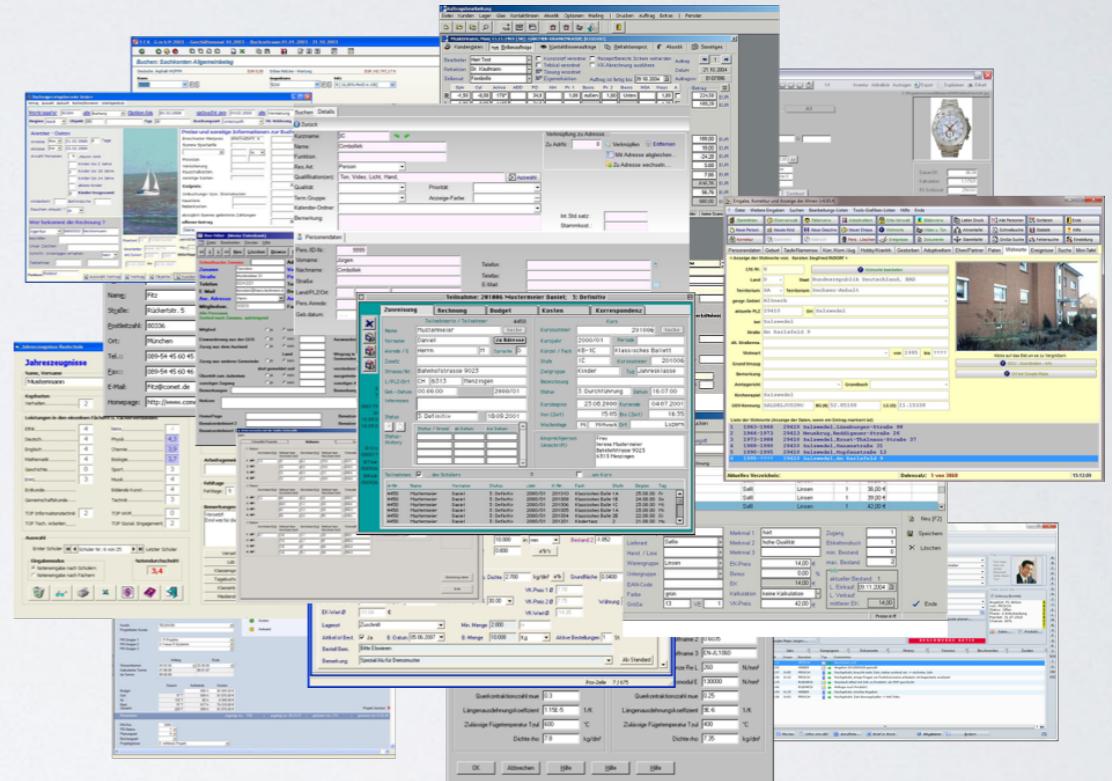
First Name	Last Name	Sport	# of Years	Vegetarian
Kathy	Smith	Snowboarding	5	<input type="checkbox"/>
John	Doe	Rowing	3	<input checked="" type="checkbox"/>
Sue	Black	Knitting	2	<input type="checkbox"/>
Jane	White	Speed reading	20	<input checked="" type="checkbox"/>
Total: 10				

Selection Mode

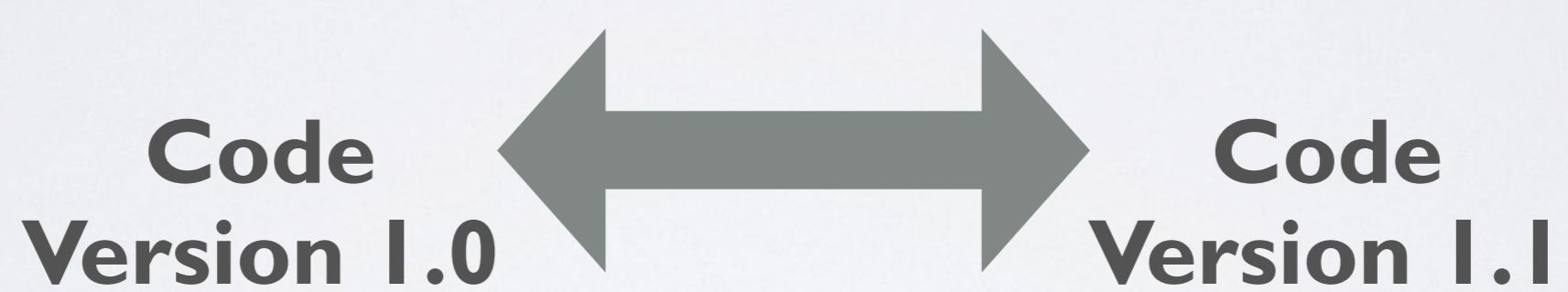
- Multiple Interval Selection
- Single Selection
- Single Interval Selection

Selection Options

- Row Selection
- Column Selection
- Cell Selection



Monkey Testing



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

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 &
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
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 substrin
254 //                g at index pos
255 //precondition: this string represents c0, c1,
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 & );
52     const apstring & operator += ( char ch );
53
54
55 private:
56     int myLength; // length
57     int myCapacity; // capacity
58     char * myCString; // storage
59 ];
60
61 // The following free (non-member) functions op
62 //
63 // I/O functions
64
```



Aktuelles Datum: **25.03.2015**

Benutzerkennung

Passwort



Anmelden

Abbrechen



ReTest

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



Benutzer X

Name: Berichte01 Vorname: Wolfgang deaktiviert

Benutzer Rollen Gebäuderollen

Letzte Passwortänderung am: 31.05.2011

Zugangsdaten

Kennung (Login): wober
neues Passwort:
neues Passwort wiederh...

Kommunikation

Nr.	Li...	Typ	Tel.-Nummer/Adresse

Zugangsinformation

Zugang an der gewählten Schule gültig bis: [dropdown]
Benutzergruppe: [dropdown]

Navigator

Schulnr.	Art	Schule
0455	RS	0455
9321	RS	9321

Filter: Auswählen

Suche: Bearbeiten

Name	Kennung	Schulnr.
Berichte01...	wober	0455 RS
BetreuerAS...	BeAsv	0455 RS
BetreuerOb...	BeObiAJ	0455 RS
BetreuerOb...	BeObvAJ	0455 RS
BetreuerSc...	BeSchü	0455 RS
Lehrkraft, E...	Lehrer	0455 RS
Schulleitun...	Schul	0455 RS
Schulleitun...	SchulInfo	0455 RS
Sekretariat...	Sekre0455...	0455 RS
Sekretariat...	Sekre0455...	0455 RS
Sekretariat...	Sekre	0455 RS
Sekretariat...	SekrePlus	0455 RS
sonstigerL...	sonLe	0455 RS
Super_ User	superuser	0455 RS

Anzahl: 14

Admin0455. Vor0455 | 0455. 9321 Aktuelles Schuljahr: 2014/15 | 16.03.2015

Benutzer X

Name: Berichte01 Vorname: Wolfgang deaktiviert

Benutzer Rollen Gebäuderollen

Letzte Passwortänderung am: 31.05.2011

Zugangsdaten:

Kennung (Login):	wober
neues Passwort:	
neues Passwort wiederh...:	

Kommunikation:

Nr.	Link Typ	Tel.-Nummer/Adresse

Zugangsinformation:

Zugang an der gewählten Schule gültig bis:	
Benutzergruppe:	

Navigator

Schulnr.	Art	Schule
0455	RS	0455
9321	RS	9321

Filter: Auswählen

Suche: Bearbeiten

Name	Kennung	Schulnr.
Berichte01...	wober	0455 RS
BetreuerAS...	BeAsv	0455 RS
BetreuerOb...	BeObiAJ	0455 RS
BetreuerOb...	BeObvAJ	0455 RS
BetreuerSc...	BeSchü	0455 RS
Lehrkraft, E...	Lehrer	0455 RS
Schulleitun...	Schul	0455 RS
Schulleitun...	SchullInfo	0455 RS
Sekretariat...	Sekre0455...	0455 RS
Sekretariat...	Sekre0455...	0455 RS
Sekretariat...	Sekre	0455 RS
Sekretariat...	SekrePlus	0455 RS
sonstigerL...	sonLe	0455 RS
Super, User	superuser	0455 RS

Anzahl: 14

enabled=false



enabled=false



enabled=false



enabled=false

enabled=true



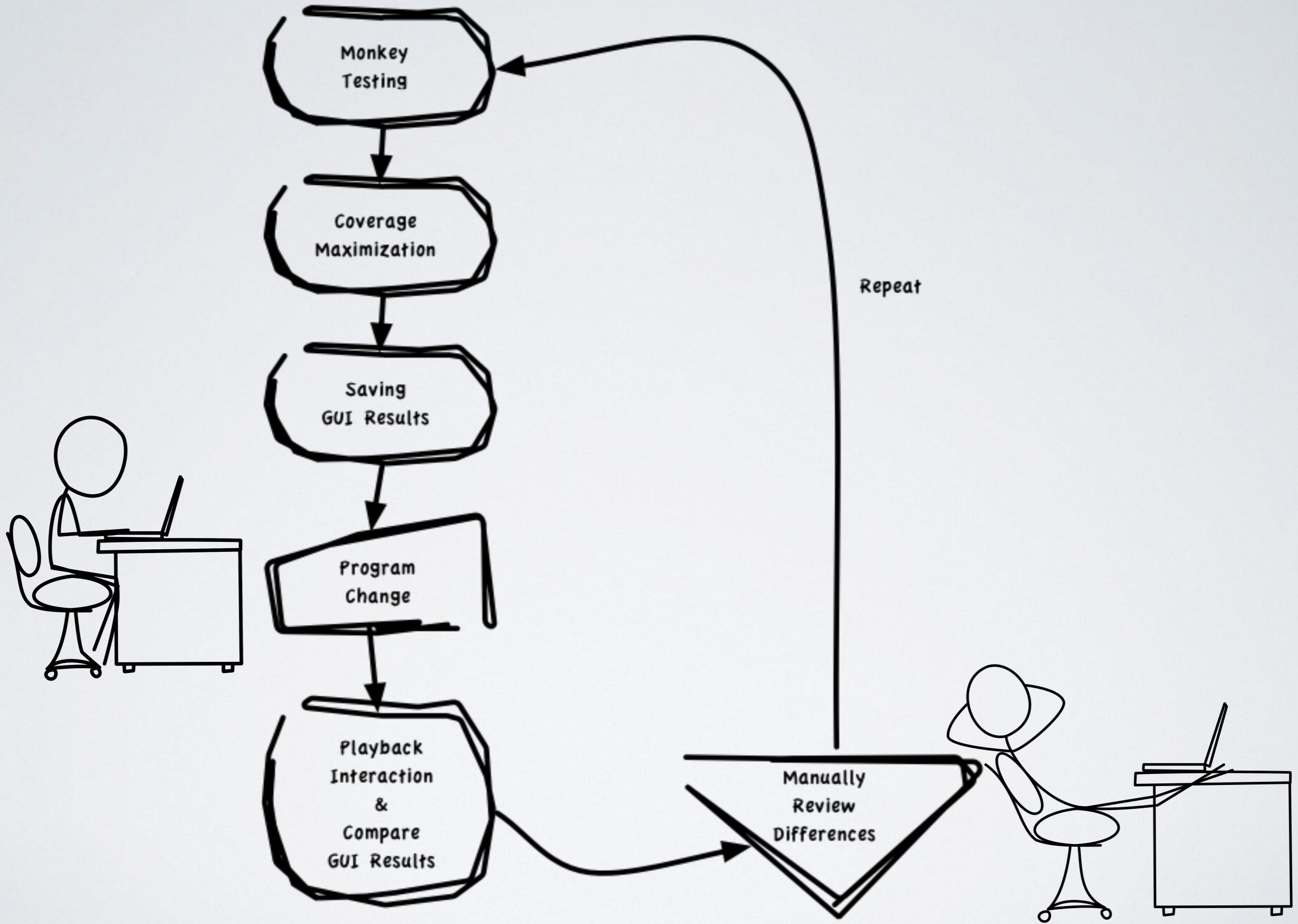
enabled=true



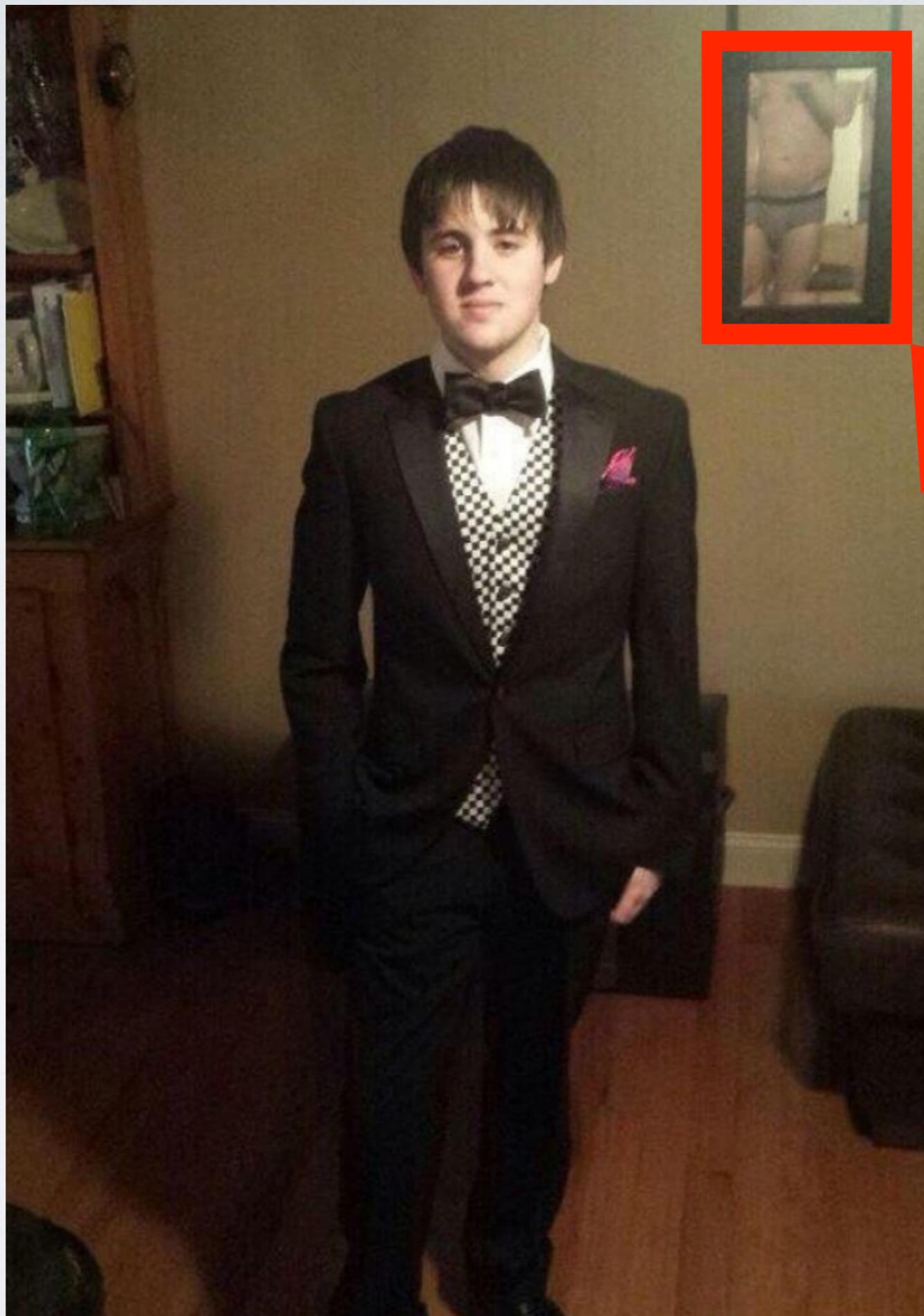
enabled=true



enabled=true



Durchschnittlicher Aufwand für Regressionstesten?



Object.hashCode()

TableSelection

First Name	Last Name	Sport
Kathy	Smith	Snowboarding
John	Doe	Rowing
Sue	Black	Knitting
Jane	White	Speed reading
Tom	Perry	Paint

Selection Mode

- Multiple Interval Selection
- Single Selection
- Single Interval Selection

Selection Options

- Row Selection
- Column Selection
- Cell Selection

TableSelection

First Name	Last Name	Sport
Kathy	Smith	Snowboarding
Sue	Black	Knitting
John	Doe	Rowing
Jane	White	Speed reading
Tom	Perry	Paint

Selection Mode

- Multiple Interval Selection
- Single Selection
- Single Interval Selection

Selection Options

- Row Selection
- Column Selection
- Cell Selection

System.currentTimeMillis()

Thread-Schedules

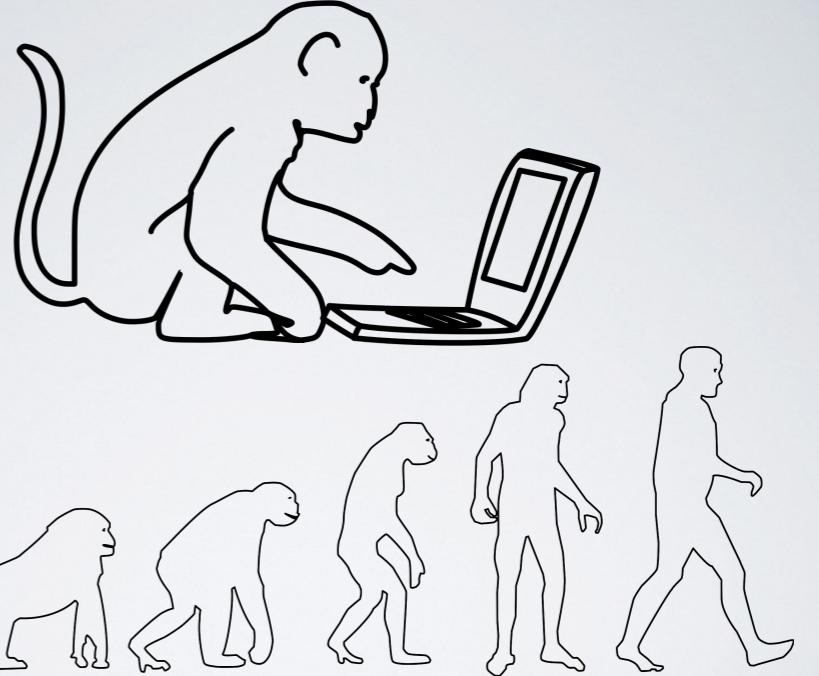
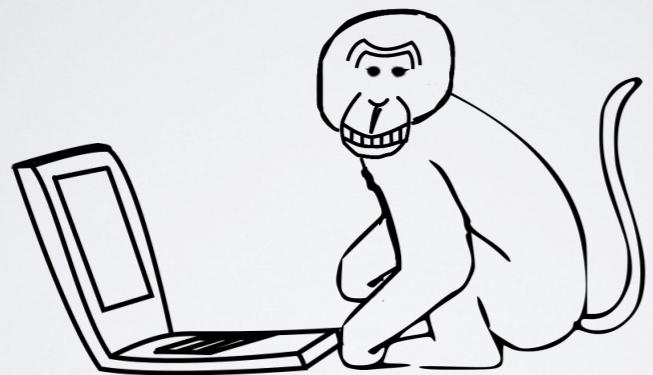
Synchronization

Synchronization

1. `WebDriverWait.until(condition-that-finds-the-element)`

System.exit()

Intelligenter Affe



Material und Infos auf: [www.retest.de!](http://www.retest.de)

When is a bug not a bug?



When it's a feature!

