Refactoring Browser

Wie unterstützt man Refactoring durch automatische Werkzeuge?

Martin Häcker

Seminar Refactoring & Software Visualisierung

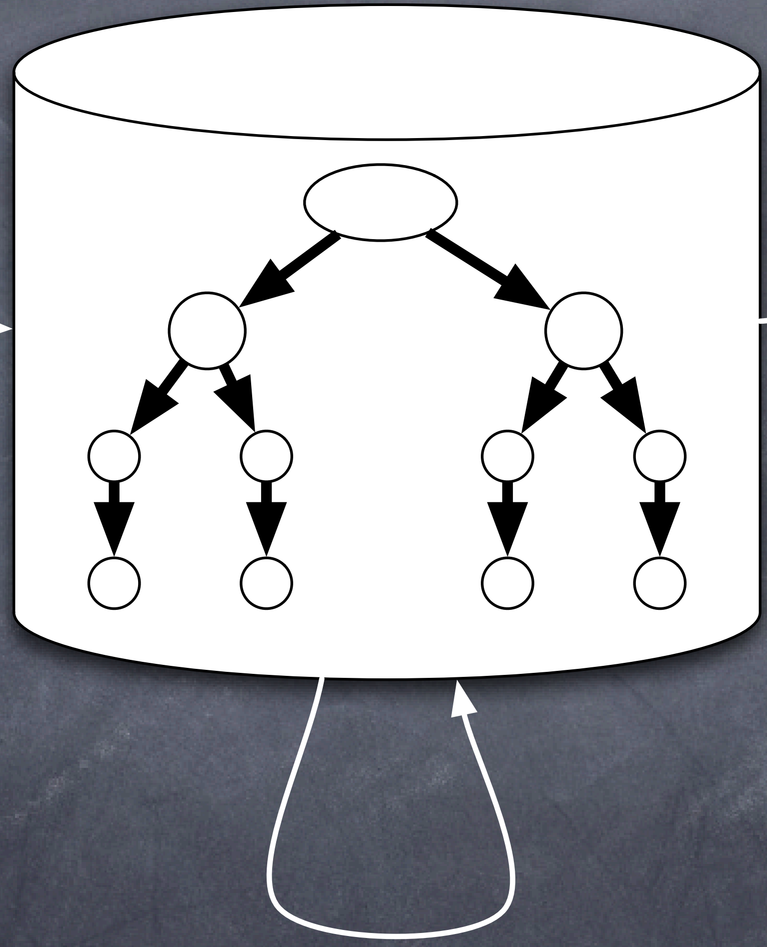
Programm

- 3x “einfache” Sprachen
    - Probleme
- Neuland...

Refactoring Tools bisher

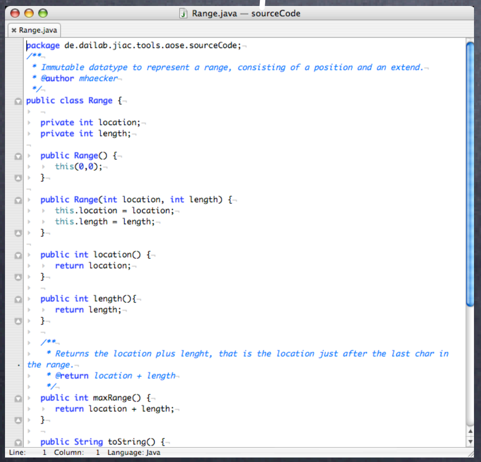
Parser

Kontextchecker



Pretty Printer

Refactoring



```java
package de.dailab.jiac.tools.aose.sourceCode;
/**
 * Immutable datatype to represent a range, consisting of a position and an extend.
 * @author mhaecker
 */
public class Range {
	
	private int location;
	private int length;

	public Range() {
		this(0,0);
	}

	public Range(int location, int length) {
		this.location = location;
		this.length = length;
	}

	public int location() {
		return location;
	}
	
	public int length(){
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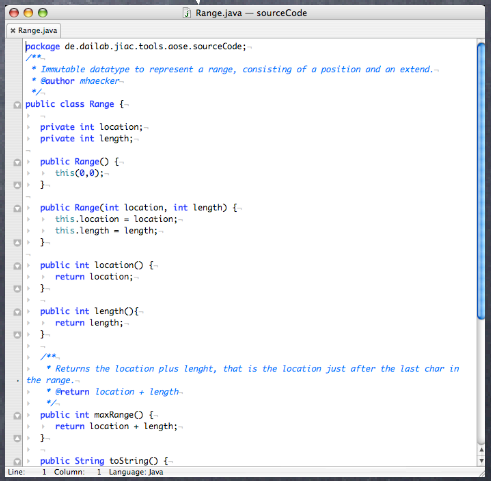
	}
	
	/**
	 * Returns the location plus lenght, that is the location just after the last char in the range.
	 * @return location + length
	 */
	public int maxRange() {
		return location + length;
	}
	
	public String toString() {
```



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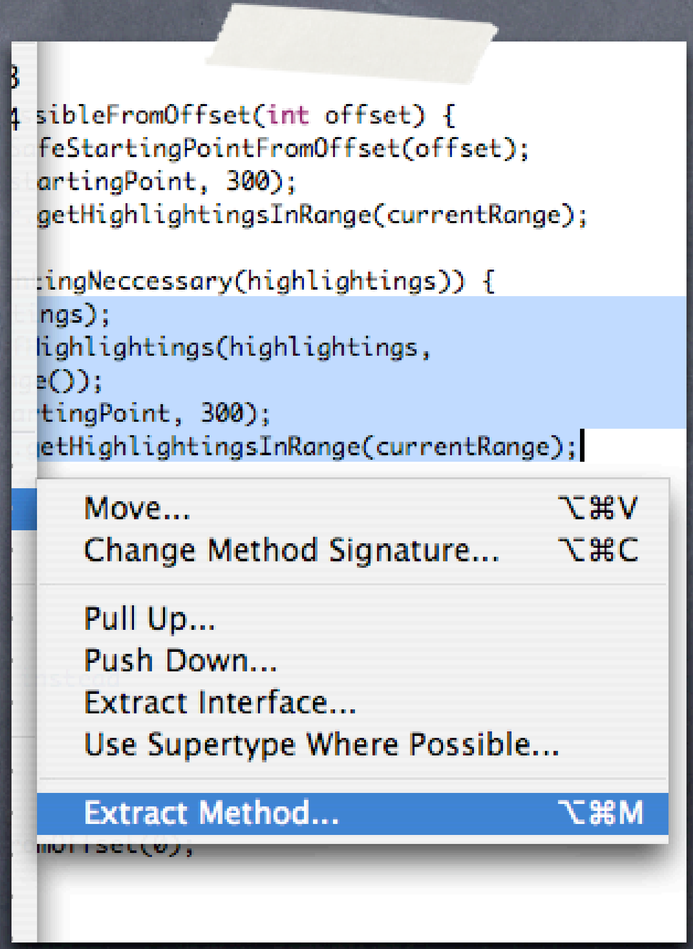
Java

- Einfache, “saubere” Syntax
- Source Code in Dateien
- Eclipse, jRefactor, IDEA

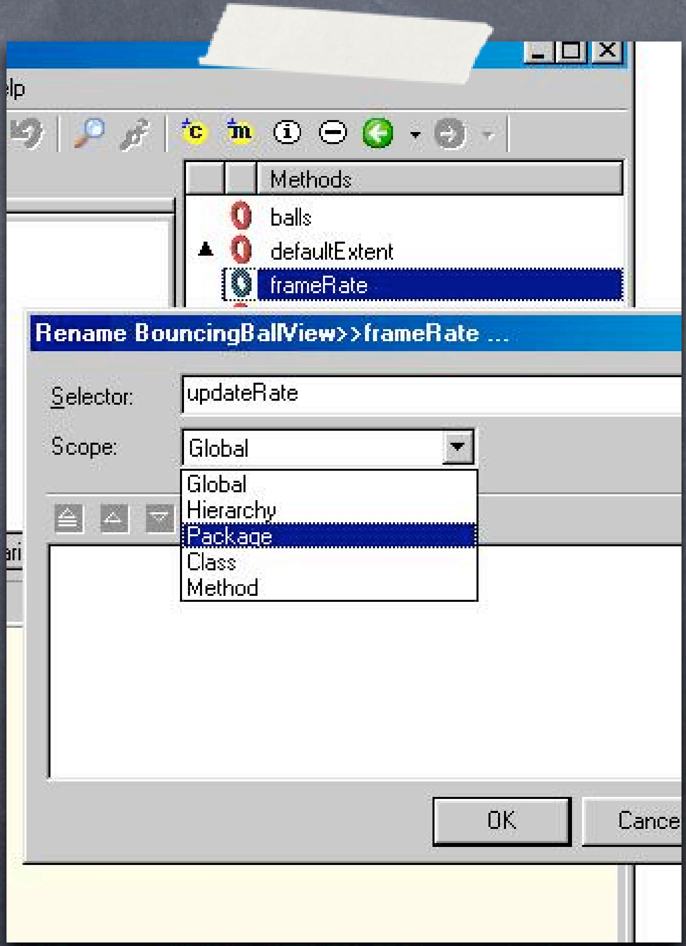


```
sibleFromOffset(int offset) {
feStartingPointFromOffset(offset);
artingPoint, 300);
getHighlightingsInRange(currentRange);

ingNeccessary(highlightings)) {
ngs);
ighlightings(highlightings,
e());
tingPoint, 300);
etHighlightingsInRange(currentRange);
mOffset(0);
```

Smalltalk

- Erstes Refactoring Werkzeug
- Sehr einfache Syntax
- Hoch dynamisch
  - Rename geht nicht



Rename BouncingBallView>>frameRate ...

Selector: updateRate

Scope: Global

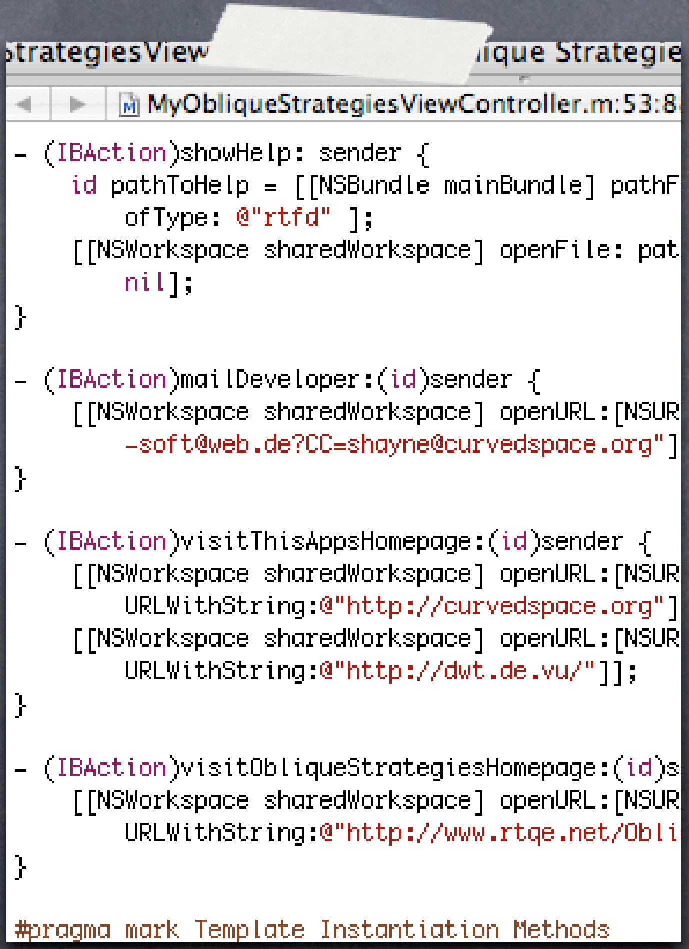
Quelle: http://www.object-arts.com/Images/rb.jpg

Stand?

- Micro-Refactorings: ok
- Makro-Refactorings: einige
- Mehrere Sprachen: erste Ansätze
- Vollautomatisch: Erste Ansätze
- Aber: C-Familie?
  - C, C++, ObjC

Problemkinder wie ObjC

- C + Smalltalk
  - Superset von C
  - Message
  - Objekte
- Dynamic Typing
- Preprozessor...



```
- (IBAction)showHelp: sender {
    id pathToHelp = [[NSBundle mainBundle] pathF
        ofType: @"rtfd" ];
    [[NSWorkspace sharedWorkspace] openFile: pat
        nil];
}

- (IBAction)mailDeveloper:(id)sender {
    [[NSWorkspace sharedWorkspace] openURL:[NSUR
        -soft@web.de?CC=shayne@curvedspace.org"]
}

- (IBAction)visitThisAppsHomepage:(id)sender {
    [[NSWorkspace sharedWorkspace] openURL:[NSUR
        URLWithString:@"http://curvedspace.org"]
    [[NSWorkspace sharedWorkspace] openURL:[NSUR
        URLWithString:@"http://dwt.de.vu/"]];
}

- (IBAction)visitObliqueStrategiesHomepage:(id)s
    [[NSWorkspace sharedWorkspace] openURL:[NSUR
        URLWithString:@"http://www.rtqe.net/Obli
}

#pragma mark Template Instantiation Methods
```

Refactoring von inkompatiblen Sprachen

C / ObjC mit “Conditional Compilation”

```
#define MY_WRONG_RETURN_VALUE_EXCEPTION @"MyWrongReturnValueException"
```

```
#import "MyObliqueStrategiesViewController.h"
#import "MyFadingTitlebarlessWindow.h"
```

```
#define CLOSURE(returnType, arguments, someCode) ({ \
    returnType uniqueSymbol(function)(arguments) { \
        someCode; \
    } \
    uniqueSymbol(function); \
})
```

```
dep->changed = !dir_file_exists_p(name, "");
#ifdef VMS
    if (dep->changed && strchr(name, ':') != 0)
#else
    if (dep->changed && *name == '/')
#endif
    {
        freerule(rule, lastrule);
    }
```

```
for(i=0;
#if BY_ROW
    i<r;i++)
        s+=a[k][i];
#elif BY_COL
    i<C;i++)
        s+=a[i][k];
#endif
```

```
#pragma mark -
#pragma mark The class that wraps it all up
```

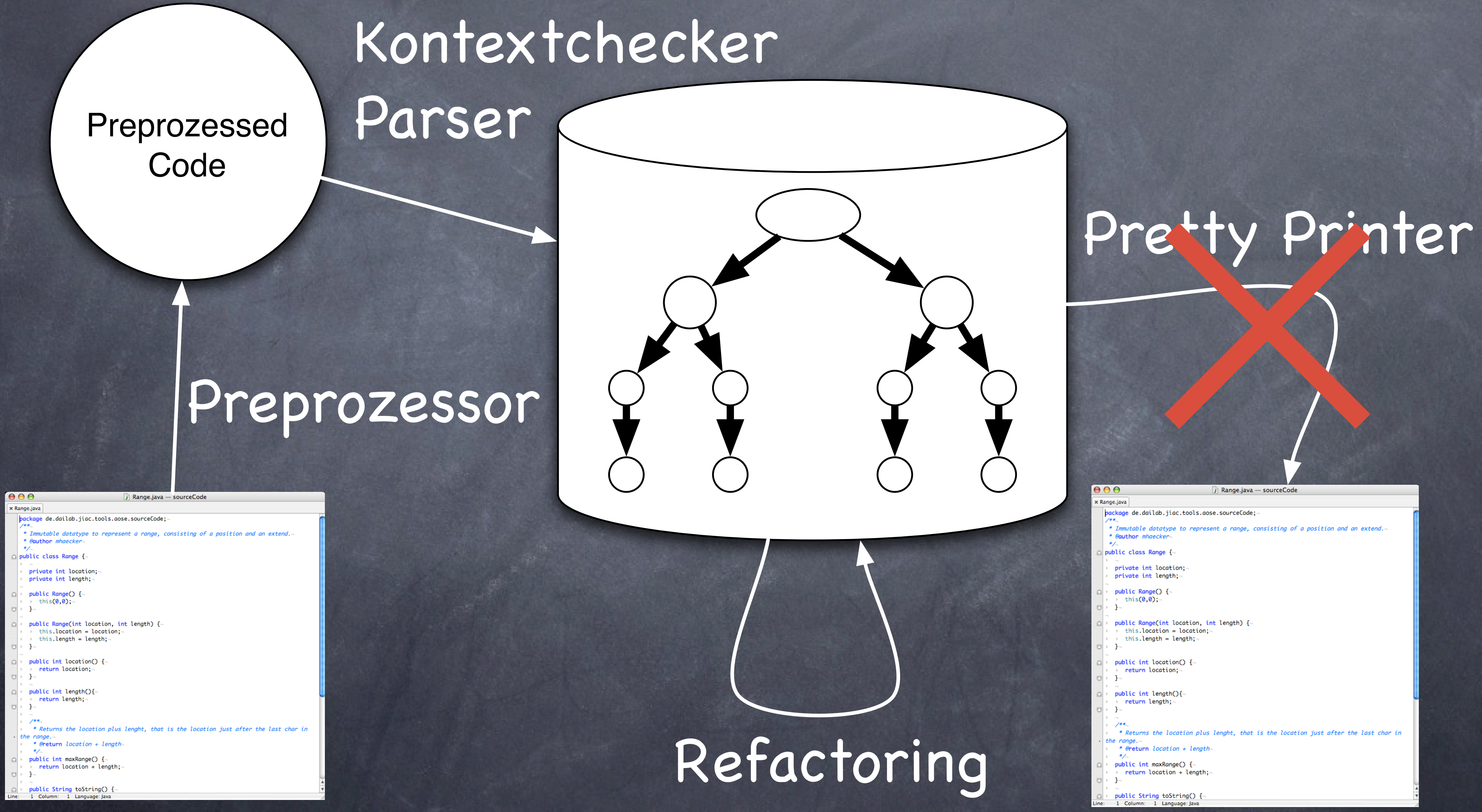
```
#ifdef emacs
#ifdef static
#ifndef STACK_DIRECTION
                     you
                    loose
-- must know STACK_DIRECTION at compile-time
#endif /* STACK_DIRECTION undefined */
#endif /* static */
#endif /* emacs */
```

```
#if !defined (__GNUC__)
#ifndef aloca
#if __STDC__
typedef void *pointer;
#else
typedef char *pointer;
#endif
#endif
#endif
```

```
#define BEGIN {
#define END }

if (x < y) BEGIN y = x; x++; END
```

Problem: Architektur



Kontextchecker

Parser

Preprozessed Code

Preprozessor

Pretty Printer

Refactoring

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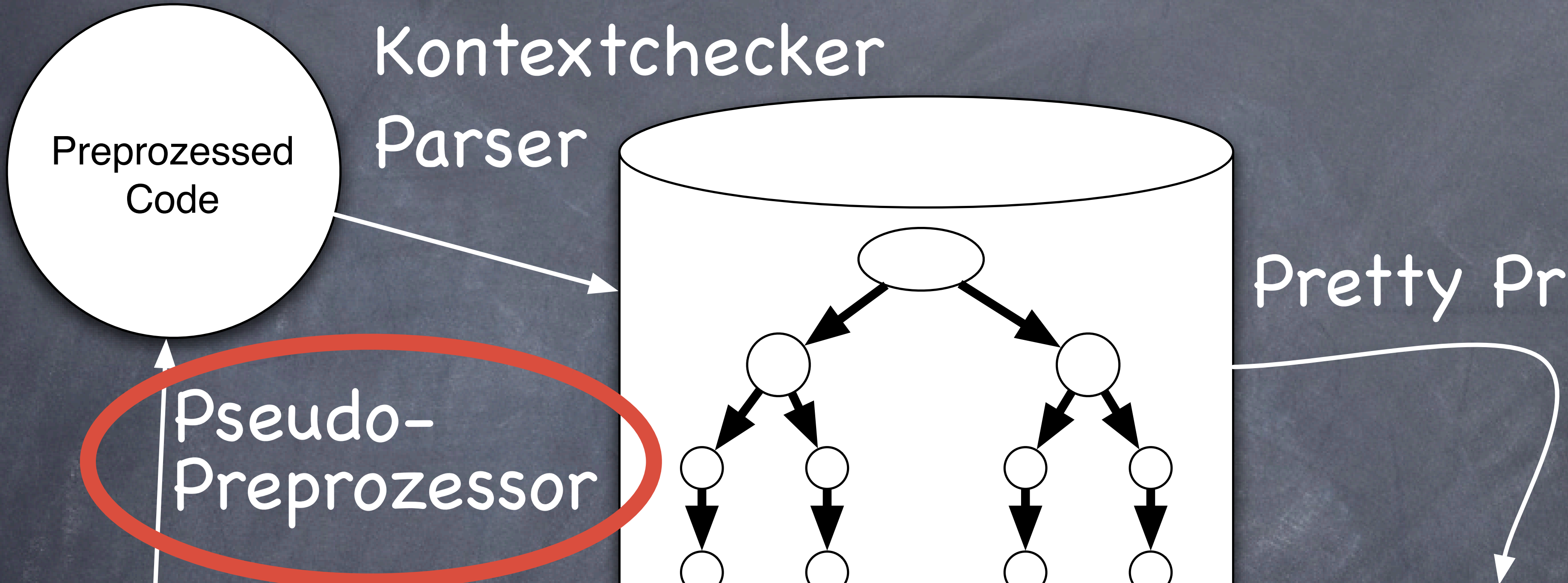
Lösungsvorschlag



Kontextchecker

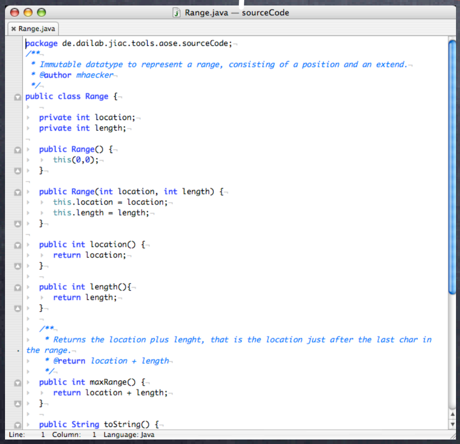
Parser

Preprozessed Code

Pseudo-Preprozessor

Pretty Printer

Refactoring



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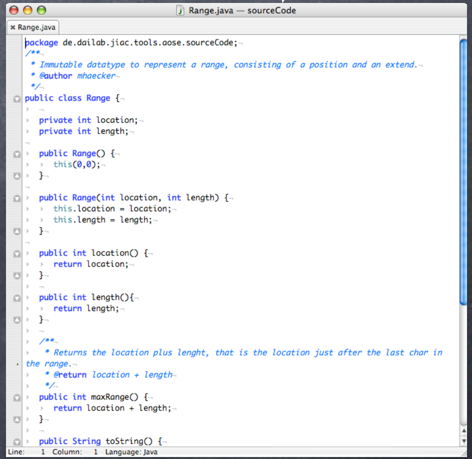

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	public Range() {
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	public int location() {
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	 * Returns the location plus lenght, that is the location just after the last char in the range.
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	public int maxRange() {
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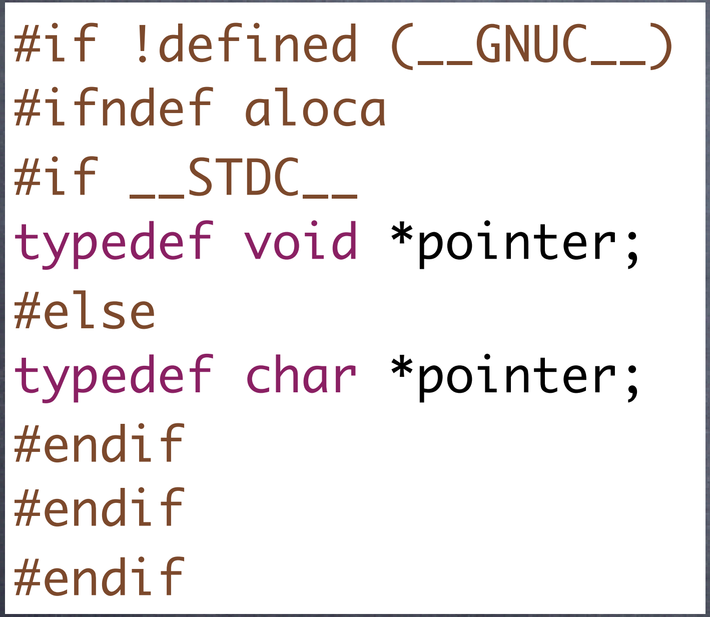
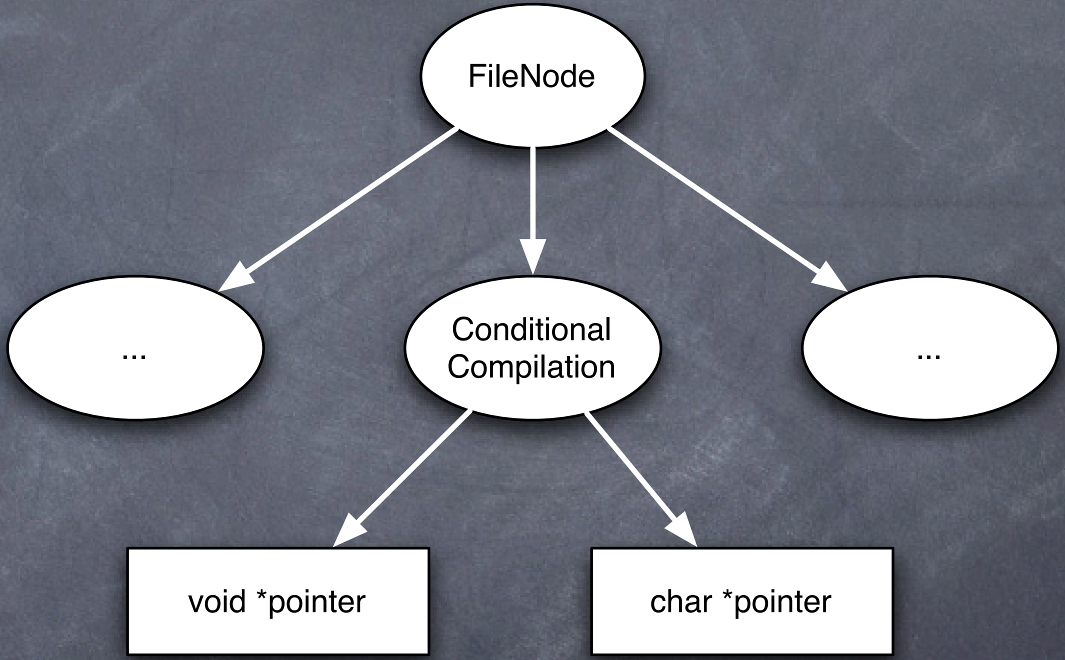
	public String toString() {
```

Ideen für die Probleme im Detail

#if, #ifdef, #ifndef



```
#if !defined (__GNUC__)
#ifndef aloca
#if __STDC__
typedef void *pointer;
#else
typedef char *pointer;
#endif
#endif
#endif
```



$\neg\ \text{defined}\ (\_\_\text{GNUC}\_\_)$
$\wedge\ \neg\ \text{aloca}\ \wedge\ \_\_\text{STDC}\_\_$

#if in Statements

```
dep->changed = !dir_file_exists_p(name, "");
#ifdef VMS
    if (dep->changed && strchr(name, ':') != 0)
#else
    if (dep->changed && *name == '/')
#endif
    {
        freerule(rule, lastrule);
    }
```

```
dep->changed = !dir_file_exists_p(name, "");
#ifdef VMS
    if (dep->changed && strchr(name, ':') != 0) {
        freerule(rule, lastrule);
    }
#else
    if (dep->changed && *name == '/') {
        freerule(rule, lastrule);
    }
#endif
```

```
for(i=0;
#if BY_ROW
    i<r;i++)
        s+=a[k][i];
#elif BY_COL
    i<C;i++)
        s+=a[i][k];
#endif
```

```
#if BY_ROW
for(i=0; i<r;i++)
    s+=a[k][i];
#elif BY_COL
for(i=0; i<C;i++)
    s+=a[i][k];
#endif
```

Ungültiger Code
“Impossible Conditions“

```
#ifdef emacs
#ifdef static
#ifndef STACK_DIRECTION
                     you
                    lose
-- must know STACK_DIRECTION at compile-time
#endif /* STACK_DIRECTION undefined */
#endif /* static */
#endif /* emacs */
```

```
#ifndef STACK_DIRECTION
#error you lose -- must know STACK_DIRECTION at compile-time
#endif /* STACK_DIRECTION undefined */
```

#define

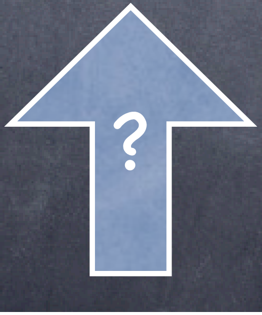
```
#define CLOSURE(returnType, arguments, someCode) ({ \
    returnType uniqueSymbol(function)(arguments) { \
        someCode; \
    } \
    uniqueSymbol(function); \
})
```

```
#define BEGIN {
#define END }

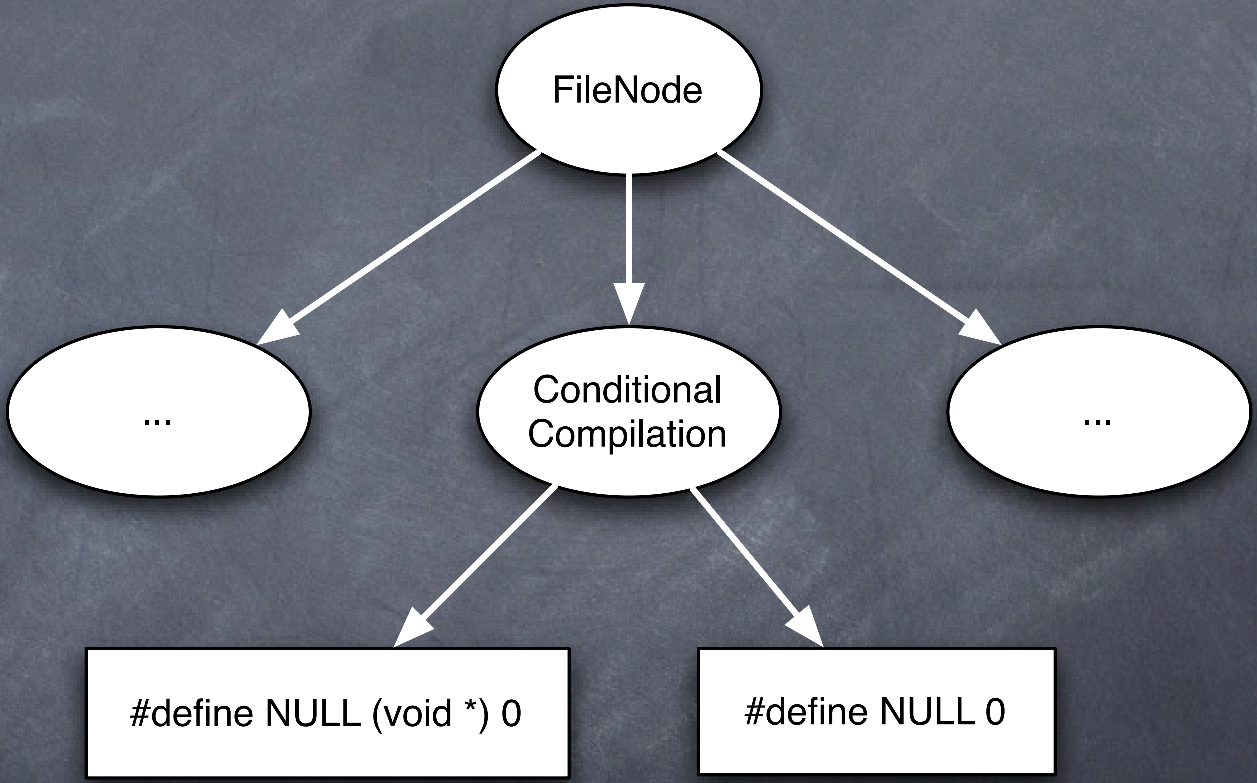
if (x < y) BEGIN y = x; x++; END
```

Multiple Macro-Definitions

```
#if !defined (__GNUC__)
#   define NULL (void *) 0
#else
#   define NULL 0
#endif
```



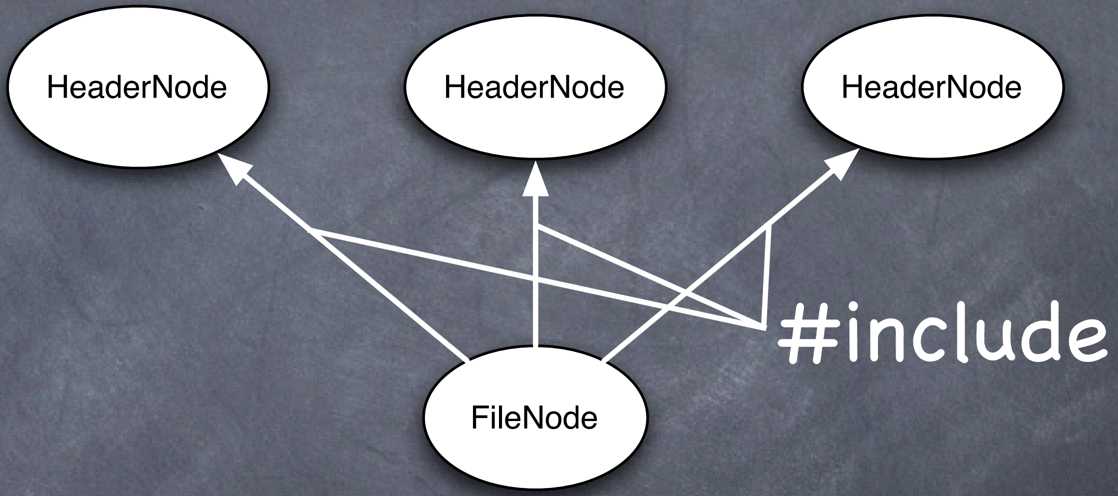
```
if (a != NULL)
    b = a;
```



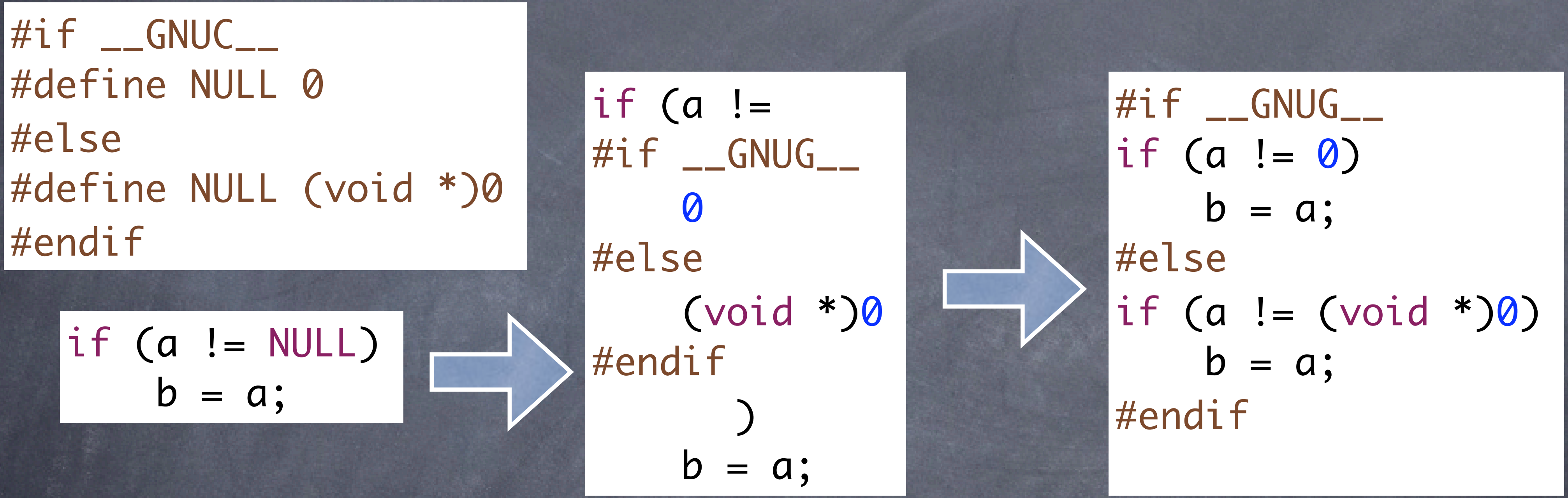
¬ defined (__GNUC__)

#include

- Include-Graph als Lösung
- Symbol-Table enhancements
- Multiple-Includes?



Größe des AST?



```
#if __GNUC__
#define NULL 0
#else
#define NULL (void *)0
#endif
```

```
if (a != NULL)
    b = a;
```

```
if (a !=
#if __GNUG__
    0
#else
    (void *)0
#endif
      )
    b = a;
```

```
#if __GNUG__
if (a != 0)
    b = a;
#else
if (a != (void *)0)
    b = a;
#endif
```

```
struct inode {
    struct address_space i_data;
#ifdef CONFIG_QUOTA
    struct dquot *i_dquot[MAXQUOTAS];
#endif
    struct list_head i_devices;
};
```

Ein Beispiel: Extract Function

```
#ifdef _C1
     int q;
#endif
```

```
int f1() {
     nelems++;
     #ifdef _C1
          q+= j;
          nelems-= q;
     #else
          nelems*= j;
     #endif
}
```

```
int f1() {
     nelems = f2(nelems);
#ifndef _C1
     nelems*= j;
#endif
}

int f2(int nelems) {
     nelems++;
     #ifdef _C1
          q+= j;
          nelems-= q;
     #endif
     return nelems;
}
```

Zusammenfassung

- Einige offene Probleme
- CPP == Messy
- Aber machbar!

Quelle: http://www.ritilan.com/archives/images/blogimages/031104_382128_PinkFuzzyBunny-thumb.jpg

Danke & Fragen