Programming Practices

Prof. Dr. Dirk Riehle

Friedrich-Alexander University Erlangen-Nürnberg

AMOS E02

General Principles 1 / 4

KISS

(Keep It Simple, Silly)

General Principles 2 / 4

YAGNI

(You Ain’t Gonna Need It)

General Principles 3 / 4

DRY

(Don’t Repeat Yourself)

General Principles 4 / 4

1. Make it run
2. Make it right
3. Make it fast

Definition of Big Ball of Mud [FY97]

A Big Ball of Mud is a haphazardly structured, sprawling, sloppy, duct-tape-and-baling-wire, spaghetti-code jungle. These systems show unmistakable signs of unregulated growth, and repeated, expedient repair. Information is shared promiscuously among distant elements of the system, often to the point where nearly all the important information becomes global or duplicated. The overall structure of the system may never have been well defined. If it was, it may have eroded beyond recognition. Programmers with a shred of architectural sensibility shun these quagmires. Only those who are unconcerned about architecture, and, perhaps, are comfortable with the inertia of the day-to-day chore of patching the holes in these failing dikes, are content to work on such systems.

Benefits of Good (“Well-Factored”) Code

1. **Maintainability**
   (Easier to understand)
2. **Extensibility**
   (Easier to adapt and evolve)
3. **Predictability**
   (Improves planning ability)

Video on Technical Debt [1]

Technical Debt

(Ward Cunningham)

[1] See https://youtu.be/Jp5japiHAs4

Video Lessons

- Technical Debt is a Metaphor
  - Communicates well to manager
  - (Certainly in financial services)
- Taking on debt can speed up development
  - It may be justified to learn faster
  - But you have to pay up later
- If you don’t pay back debt you’ll slow down
  - Paying up means refactoring
  - Still, never write poor code deliberately

Handling Technical Debt

1. **Identify problem**
   (So-called “code smells”)
2. **Identify need to act**
   (Correlate occurrences)
3. **Know how to act**
   (Refactor code)

Code Smell

- According to Fowler [F99]
  - “smells are certain structures in the code that indicate violation of fundamental design principles and negatively impact design quality”
  - also, “a code smell is a surface indication that usually corresponds to a deeper problem in the system”
- Code smells are not bugs

Example Code Smells

- Duplicated Code
- Long Method
- Large Class
- ...

Refactoring (Practice)

- Definition and purpose
  - Is a behavior-preserving transformation of existing source code
  - It is a change made to the internal structure of software to make it easier to understand and cheaper to modify without changing its observable behavior
- More on refactoring
  - Change the structure of code without changing behavior
  - Focus on non-functional features within range of specification
  - Are defined techniques that are typically language specific
  - Are ideally supported by IDEs, for example, the Eclipse JDT
- Defined by Opdyke [O92], popularized by Fowler [F99]

Example Refactorings

- Rename class
- Pull-up field
- Extract method
- …
- More at http://refactoring.com

Example Extract-Method Refactoring 1 / 2

```
public class PhotoManager extends ObjectManager {
     protected Map<PhotoId, Photo> allPhotos = new HashMap<PhotoId, Photo>();

     public void addPhoto(Photo photo) {
          PhotoId id = photo.getId();
          assertIsNewPhoto(id);
          allPhotos.put(id, photo);
          ...
     }

     public Photo getPhotoFromId(PhotoId id) {
          Photo result = doGetPhotoFromId(id);
          if (result == null) {
               ...
               if (result != null) { allPhotos.put(id, result); }
          }
          return result;
     }

     public Set<Photo> findPhotosByOwner(String ownerName) {
          ...
          for (Iterator<Photo> i = r.iterator(); i.hasNext();) {
               Photo photo = i.next();
               allPhotos.put(photo.getId(), photo);
          }
          return r;
     }
     ...
```

Example Extract-Method Refactoring 2 / 2

```
public class PhotoManager extends ObjectManager {

     public void addPhoto(Photo photo) {
          ...
          doAddPhoto(photo);
          ...
     }

     public Photo getPhotoFromId(PhotoId id) {
          ...
          doAddPhoto(photo);
          ...
     }

     public Set<Photo> findPhotosByOwner(String ownerName) {
          ...
          for (Iterator<Photo> i=r.iterator(); i.hasNext(); ) {
               doAddPhoto(i.next());
          }
          ...
     }

     protected void doAddPhoto(Photo myPhoto) {
          allPhotos.put(myPhoto.getId(), myPhoto);
     }

     ...
```

When to Refactor?

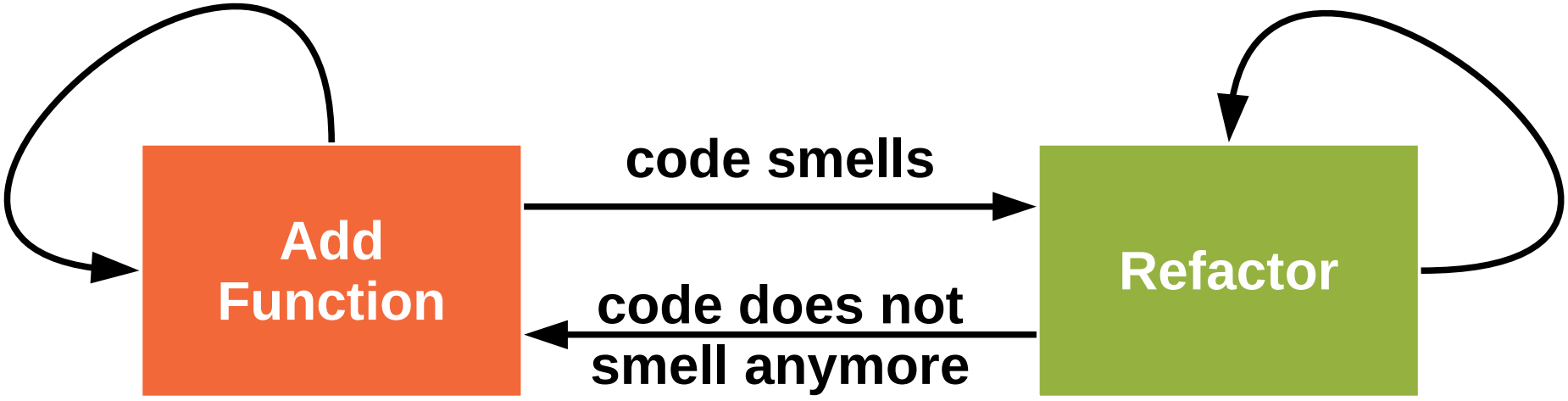
The “three strikes” rule

1st time: Just do it

2nd time: Wince at duplication

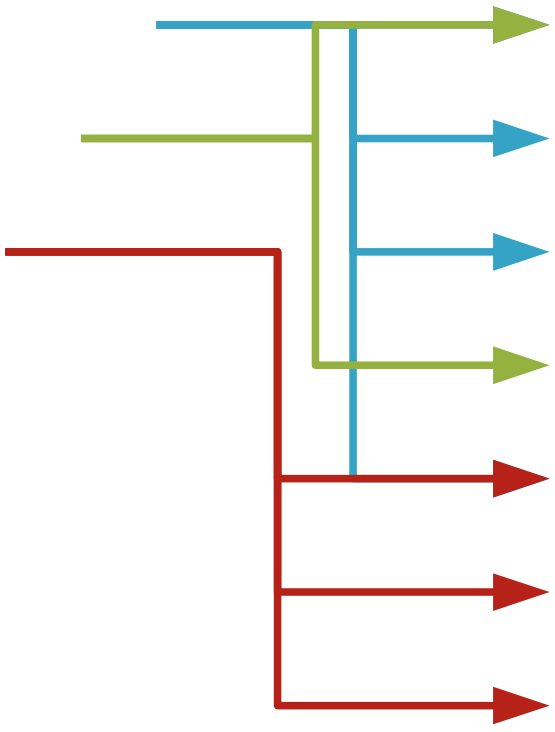
3rd time: Refactor

Refactoring Process (Two Hats)



Code Smells and Refactorings

- Duplicated code
- Long method
- Large class
- ...



- Extract method
- Pull up field
- Form template method
- Decompose conditional
- Extract class
- Extract subclass
- Extract interface
- ...

Example Refactoring Process

- The refactoring process can become complex
  - It may turn into a series of refactorings
- Example Removal of Switch Statement
  - Extract Method
  - Move Method
  - Replace Type Code …
    - with Subclass or
    - with State / Strategy
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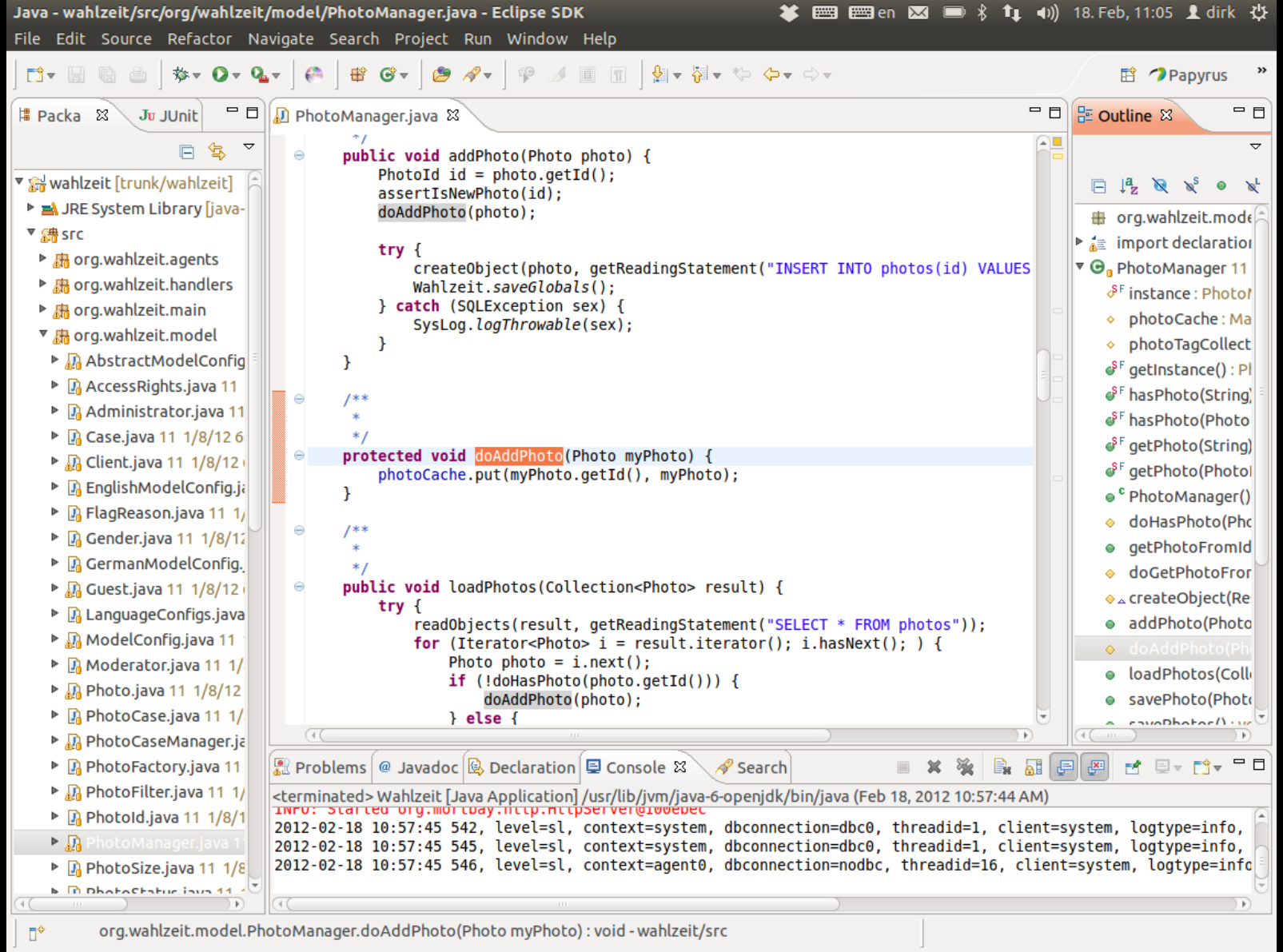
Java - wahlzeit/src/org/wahlzeit/model/PhotoManager.java - Eclipse SDK
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Moderator.java 11 1/
Photo.java 11 1/8/12
PhotoCase.java 11 1/
PhotoCaseManager.ja
PhotoFactory.java 11
PhotoFilter.java 11 1/
PhotoId.java 11 1/8/1
PhotoManager.java 1
PhotoSize.java 11 1/8
PhotoManager.java
*/
public void addPhoto(Photo photo) {
PhotoId id = photo.getId();
assertIsNewPhoto(id);
doAddPhoto(photo);
try {
createObject(photo, getReadingStatement("INSERT INTO photos(id) VALUES
Wahlzeit.saveGlobals();
} catch (SQLException sex) {
SysLog.logThrowable(sex);
}
}
/**
*
*/
protected void doAddPhoto(Photo myPhoto) {
photoCache.put(myPhoto.getId(), myPhoto);
}
/**
*
*/
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try {
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Photo photo = i.next();
if (!doHasPhoto(photo.getId())) {
doAddPhoto(photo);
} else {
Outline
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<terminated> Wahlzeit [Java Application] /usr/lib/jvm/java-6-openjdk/bin/java (Feb 18, 2012 10:57:44 AM)
2012-02-18 10:57:45 542, level=sl, context=system, dbconnection=dbc0, threadid=1, client=system, logtype=info,
2012-02-18 10:57:45 545, level=sl, context=system, dbconnection=dbc0, threadid=1, client=system, logtype=info,
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org.wahlzeit.model.PhotoManager.doAddPhoto(Photo myPhoto) : void - wahlzeit/src

Quiz on Refactoring

- Your code smells. All signs for refactoring are given. Under which circumstances should you not start a refactoring?

Review / Summary of Session

- Agile principles of programming
  - KISS, YAGNI, DRY
  - Make it run, right, fast
- Technical debt and refactoring
  - Principles, two hats
  - Example refactorings and tools

Thank you! Questions?

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- Contributions
  - ...

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Prof. Dr. Dirk Riehle

Friedrich-Alexander University Erlangen-Nürnberg

AMOS E02

It is Friedrich-Alexander University Erlangen-Nürnberg – FAU, in short.

Corporate identity wants us to say “Friedrich-Alexander University”.

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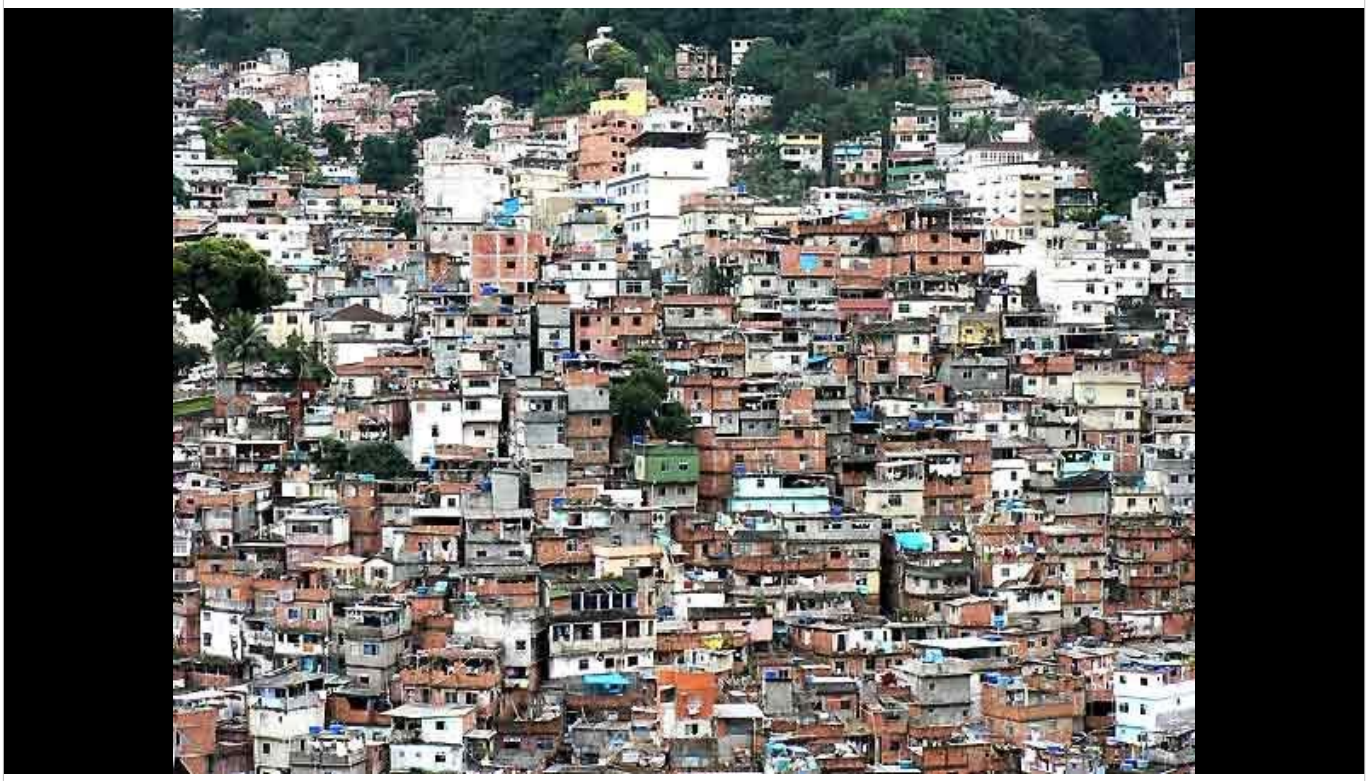

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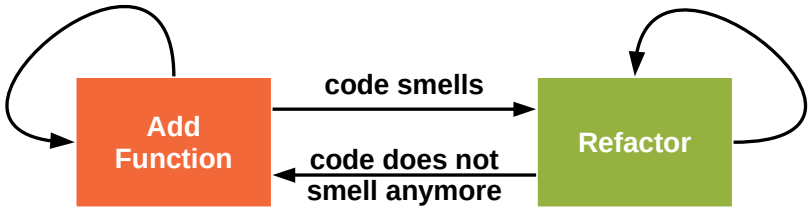

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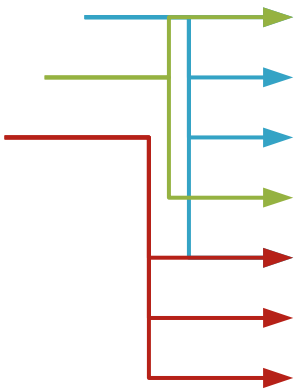

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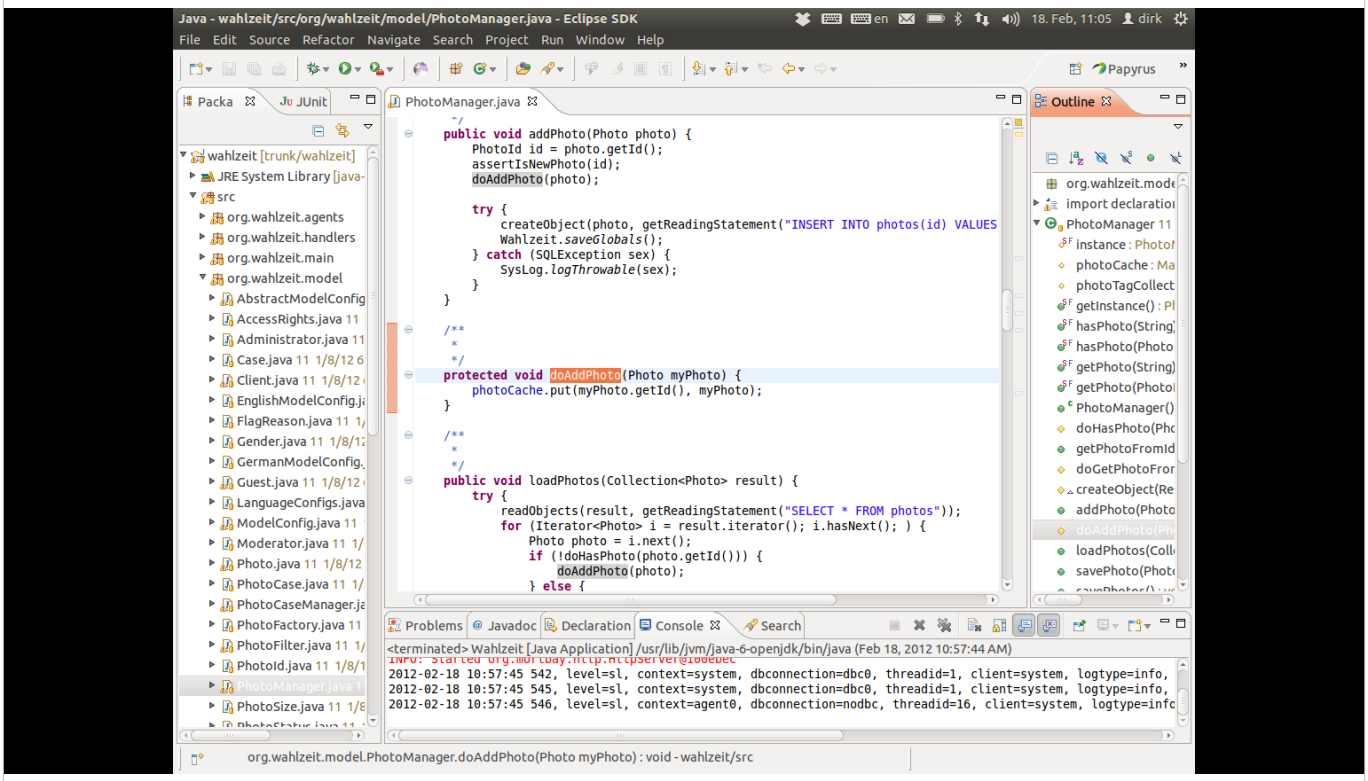
Java - wahlzeit/src/org/wahlzeit/model/PhotoManager.java - Eclipse SDK
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PhotoId id = photo.getId();
assertIsNewPhoto(id);
doAddPhoto(photo);
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} catch (SQLException sex) {
SysLog.logThrowable(sex);
}
}
/**
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*/
protected void doAddPhoto(Photo myPhoto) {
photoCache.put(myPhoto.getId(), myPhoto);
}
/**
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*/
public void loadPhotos(Collection<Photo> result) {
try {
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for (Iterator<Photo> i = result.iterator(); i.hasNext();) {
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Outline
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import declaratio
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instance : Photo
photoCache : Ma
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Quiz on Refactoring

- Your code smells. All signs for refactoring are given. Under which circumstances should you not start a refactoring?

The code will be abandoned (no business value in refactoring)

You are already in the middle of a refactoring---finish that first

Review / Summary of Session

- Agile principles of programming
  - KISS, YAGNI, DRY
  - Make it run, right, fast
- Technical debt and refactoring
  - Principles, two hats
  - Example refactorings and tools

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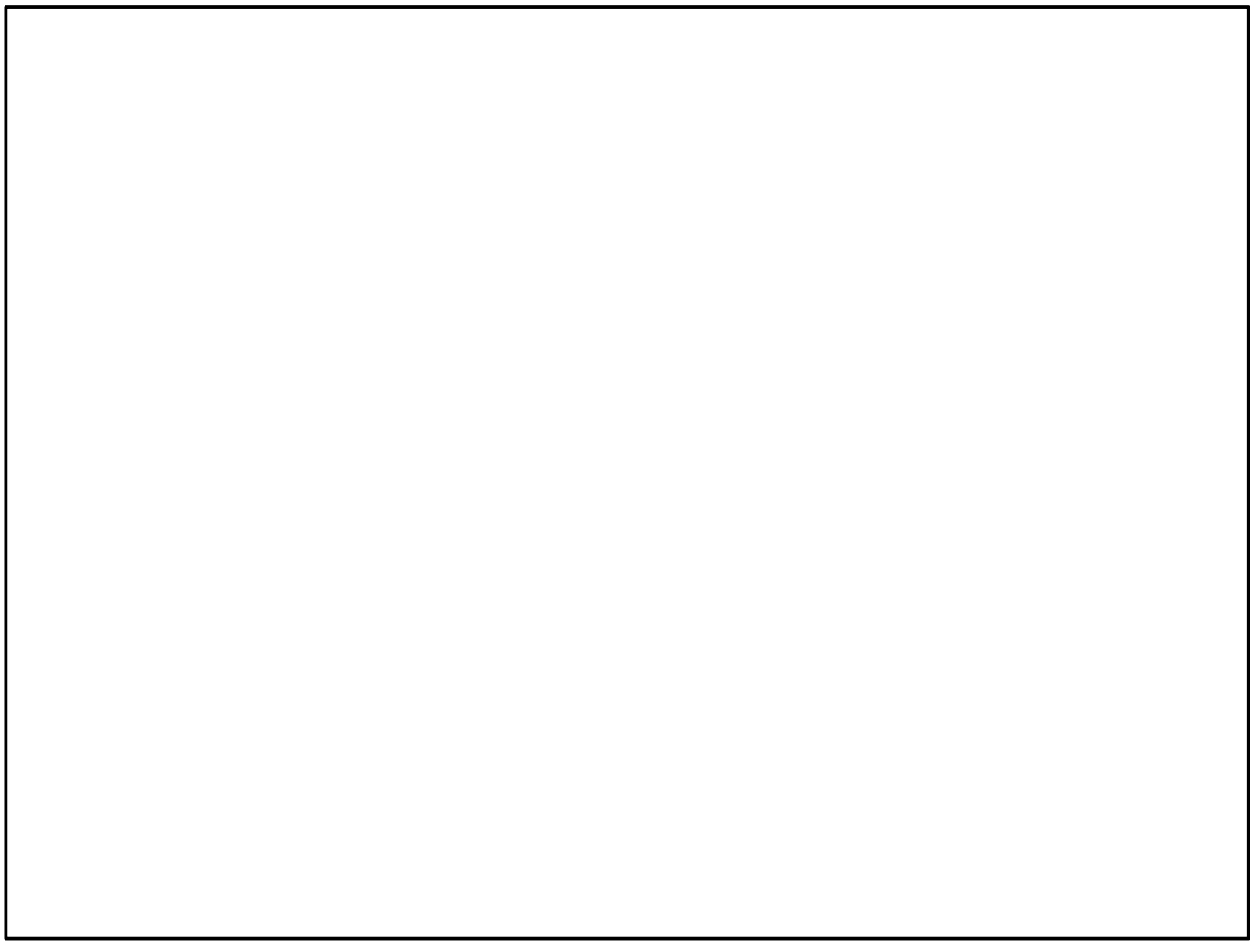
DR



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