

Course Homework

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ADAP A02

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Homework Schedule

- See **Homework** tab at <https://oss.cs.fau.de/oss-adap-course>

Week Terminology

- This week = current course week (starts with lecture)
- Last week = the course week before this week
- Next week = the course week after this week

Homework Summaries

- Explain your programming homework in two pages
 - Should be appropriately tagged on main branch
- Should have the following header (at max. ½ page):
 - Project name
 - E.g. Flowers
 - Project repository
 - E.g. [http://github.com/\\$STUDNAME/wahlzeit](http://github.com/$STUDNAME/wahlzeit)
 - Project's continuous integration information
 - E.g. [https://travis-ci.org/\\$STUDNAME/wahlzeit](https://travis-ci.org/$STUDNAME/wahlzeit)
 - This week's tag
 - E.g. adap-cw03 on master
 - This week's diff:
 - E.g. [https://github.com/\\$STUDNAME/repository/compare/adap-cw02...\\$STUDNAME:adap-cw03](https://github.com/$STUDNAME/repository/compare/adap-cw02...$STUDNAME:adap-cw03)
- Followed by the explanation of what you did and why (at max. 1.5 page)
 - Please explicitly answer the weekly questions rather than deliver a generic answer

Homework Submission

- Submit this week's homework as PDF to course management system
 - Submission should not be anonymous
 - Name files lastname-firstname-cwxy.pdf
- Submission closes right before class (submit by then)

Open Source License Compliance

- You can copy other people's code to solve some homework if
 - You copy the code only after the homework deadline (to catch-up) and
 - Comply with the license requirements of that code
- Wahlzeit is licensed under the AGPLv3 license
 - All contributed code is thereby also licensed under AGPLv3
 - Combining such code is possible if you comply with the license
- The AGPLv3 license requirements are to
 - Publish your own changes to the source code (done automatically) and to
 - Attribute the original author of the code you use and some more
- Please see <https://www.gnu.org/licenses/agpl-3.0.en.html>

CW#01 Homework General

- This week's required content
 - Set-up GitHub account
 - Fork Wahlzeit
- Set-up environment
 - Install necessary applications
- Build and start application
 - Add at least three photos for illustration
- Commit and tag with **adap-hw01** on GitHub
- Submit this week's summary, including answers to questions

CW#01 Homework Details

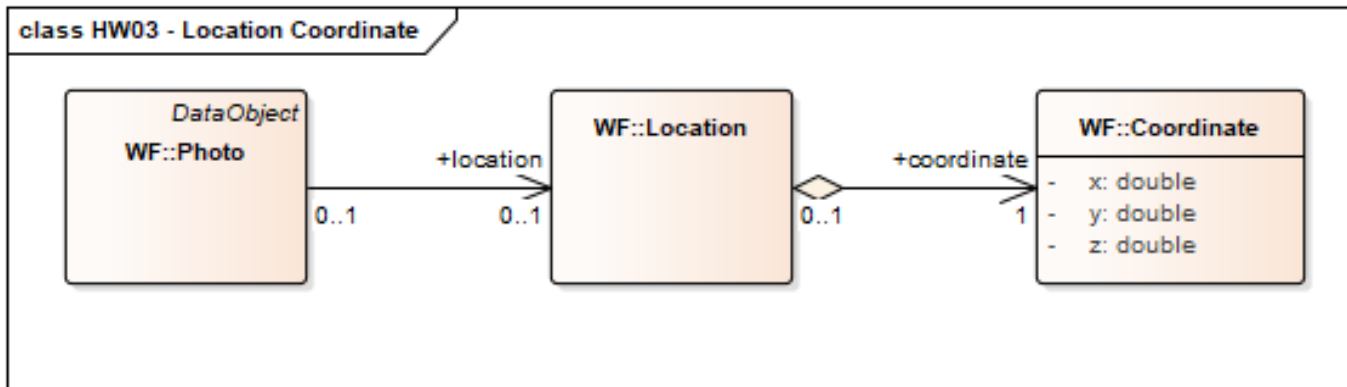
- Compare Dockerfiles
 - There are two Dockerfiles in the root folder of the Wahlzeit project:
 - Dockerfile and simple.Dockerfile
 - Compare the the two Dockerfiles
 - Review the steps taken in both files
 - Explain what is happening
 - Explain the differences between the files
 - Read up about multi-stage Docker builds
 - <https://docs.docker.com/develop/develop-images/multistage-build/>
 - Explain the advantages of the two-stage build over the simple one in the context of the Wahlzeit
 - Use the provided Dockerfiles as examples!

CW#02 Homework Overview

- This week's required content
 - Make project decision (type of photo)
 - Add a Location and Coordinate class to Wahlzeit
 - Ensure GitHub Actions are successfully executed (see README.md)
- Build, commit, push, and tag
 - Tag with adap-hw02
 - Push to GitHub and Container Registry
- Submit this week's summary
 - Use [https://github.com/\\$STUDNAME/repository/compare/adap-hw01...\\$STUDNAME:adap-hw02](https://github.com/$STUDNAME/repository/compare/adap-hw01...$STUDNAME:adap-hw02)
 - Keep using this pattern from now on

CW#02 Homework Details

- Add a Location and a Coordinate class to Wahlzeit
 - Associate classes as shown in class model
 - Use Cartesian coordinates for Coordinate class
 - Ensure that objects are stored properly in database
- Implement at least the following methods
 - `double Coordinate#getDistance(Coordinate)` // direct Cartesian distance
 - `boolean Coordinate#isEqual(Coordinate)`
- Forward `equals()` to `isEqual()`

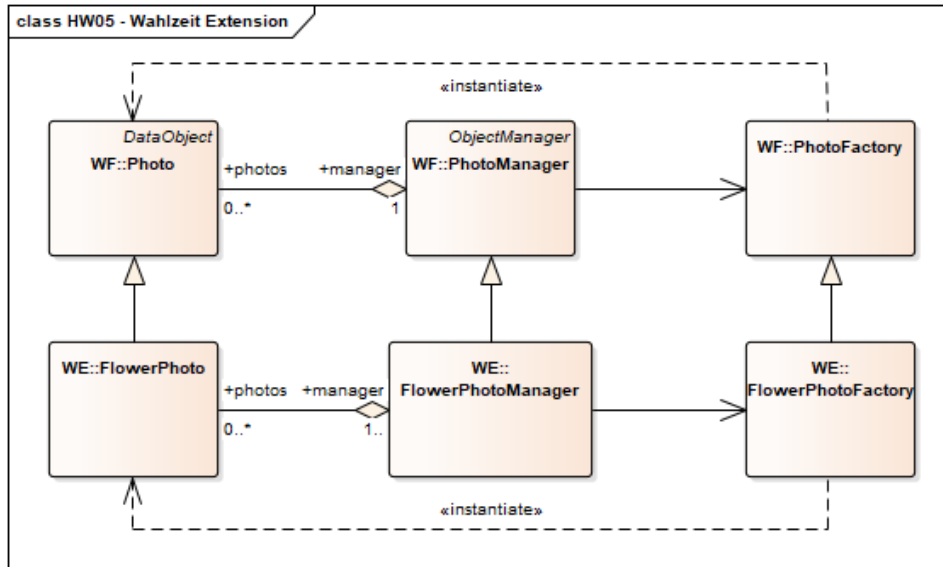


CW#03 Homework Overview

- This week's required content
 - Extend Wahlzeit with your Photo class; add others if necessary
 - Add test cases for Coordinate, Location, and Photo classes
- Build, commit, push, and tag
- Submit this week's summary

CW#03 Homework Details 1 / 2

- Extend Wahlzeit with your Photo class (e.g. FlowerPhoto)
 - Add other classes, where necessary
 - Ensure that your classes plays well with Wahlzeit
 - Specifically, make sure that your photo class is instantiated
 - Make sure that your photos can be saved and loaded using your photo class
- Ignore the user interface (if your class adds new attributes)



CW#03 Homework Details 2 / 2

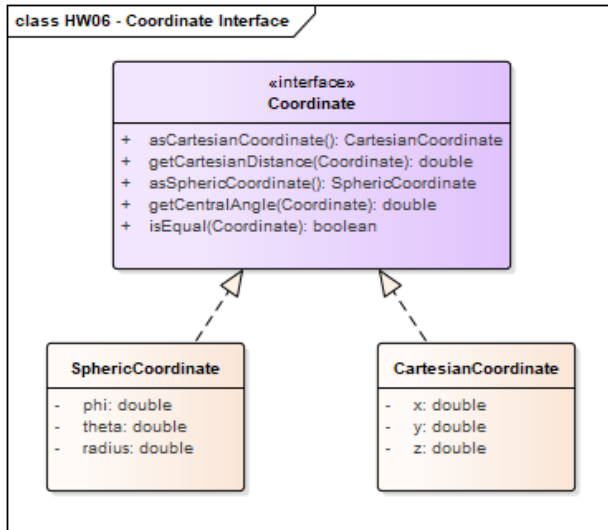
- In your summary, please provide answers to the following questions
 - Why did you extend the Photo class?
 - Why did you not just replace the Photo class?
 - Which tests did you add and why?

CW#04 Homework Overview

- This week's required content
 - Introduce an interface for the Coordinate class
 - Add an alternative implementation for the Coordinate class
- Build, commit, push, and tag
- Submit this week's summary

CW#04 Homework Details

- Add a Coordinate interface to Wahlzeit
 - Add an alternative implementation of your current Coordinate class
 - Provide spheric and Cartesian coordinate implementations of Coordinate
 - Ensure that spheric and Cartesian coordinates can be used interchangeably
 - Try to solve it with short methods and no typecasts (but interpretation methods)
 - See https://en.wikipedia.org/wiki/Great-circle_distance for definition of central angle



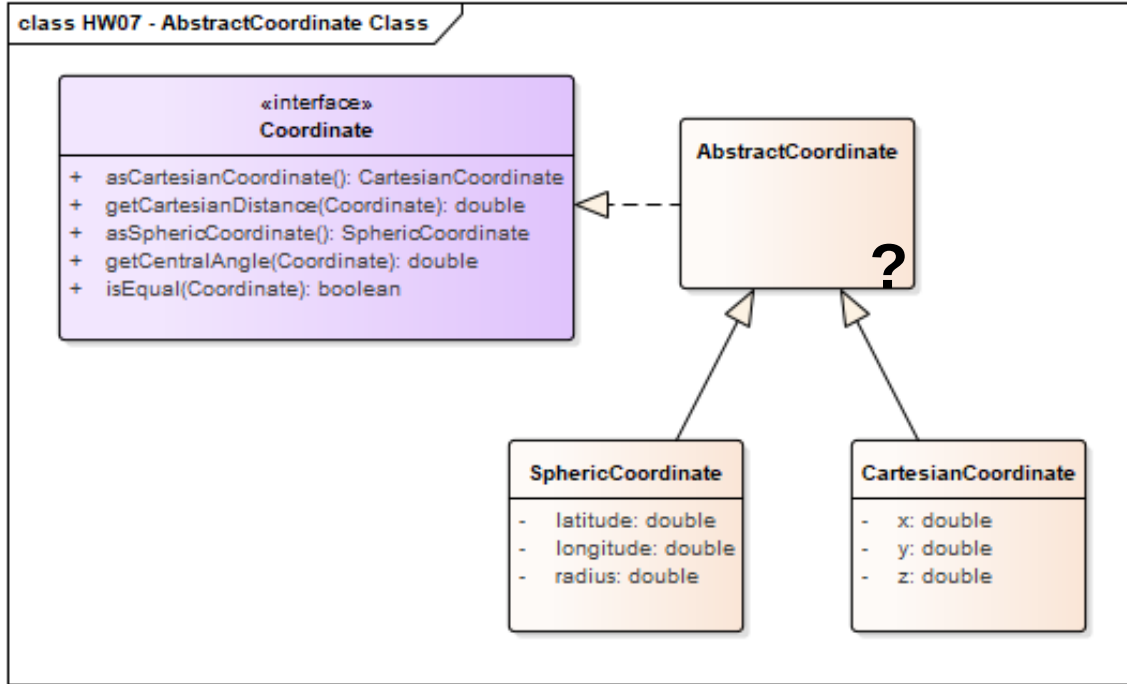
- In your summary, please provide answers to the following questions
 - How did you implement the equality check and why?

CW#05 Homework Overview

- This week's required content
 - Introduce an abstract superclass for the Coordinate class hierarchy
- Build, commit, push, and tag
- Submit this week's summary

CW#05 Homework Details

- Introduce an abstract superclass AbstractCoordinate
 - Refactor for minimal redundancy using an inheritance interface



- In your summary, please provide answers to the following questions
 - How did you decide which methods go into the abstract superclass or in the implementations?

CW#06 Homework Overview

- This week's required content
 - Add design-by-contract to Coordinate interface and class hierarchy
 - Use assert statements and assertion methods for both
 - Preconditions
 - Postconditions
 - Implement assertClassInvariants methods for class invariants
- Build, commit, and tag
 -
- Submit this week's summary

CW#06 Homework Details

- In your summary, please provide answers to the following questions
 - How do you test for conditions?
 - Would you rather use Java's `assert` or a dedicated assertion method? Or something else?

CW#07 Homework Overview

- This week's required content
 - Add error and exception handling to your classes
- Build, commit, push, and tag
- Submit this week's summary

CW#07 Homework Details

- Your classes are, at a minimum
 - The Coordinate and related classes
 - Your Photo and related classes
- Review the contracts
 - Associated with your classes
 - And extend them, if necessary
- Determine components boundaries
 - Persistence, domain model, user interface
 - And implement appropriate error handling
- In your summary, please provide answers to the following questions
 - What type of exceptions did you use, where, and why?

CW#08 Homework Overview

- This week's required content
 - Turn the Coordinate classes into value object classes
 - All Coordinate classes should be immutable and shared
 - Make sure that Coordinate objects are still interchangeable
- Build, commit, and tag
- Submit this week's summary

CW#08 Homework Details

- In your summary, please provide answers to the following questions
 - What benefits or drawbacks does the Value Object pattern have in this context?
 - How did you handle the mixing of Coordinate objects of different classes and why?

CW#09 Homework Overview

- This week's required content
 - Document five design pattern instances in Wahlzeit using annotations
- Build, commit, push, and tag
- Submit this week's summary

CW#09 Homework Details

- Emulate the following example

```
@PatternInstance(  
    patternName = "Abstract Factory"  
    participants = {  
        "AbstractFactory", "ConcreteFactory"  
    }  
)  
public class PhotoFactory { ... }
```

```
@PatternInstance(  
    patternName = "Abstract Factory"  
    participants = {  
        "AbstractProduct",  
        "ConcreteProduct"  
    }  
)  
public class Photo { ... }
```

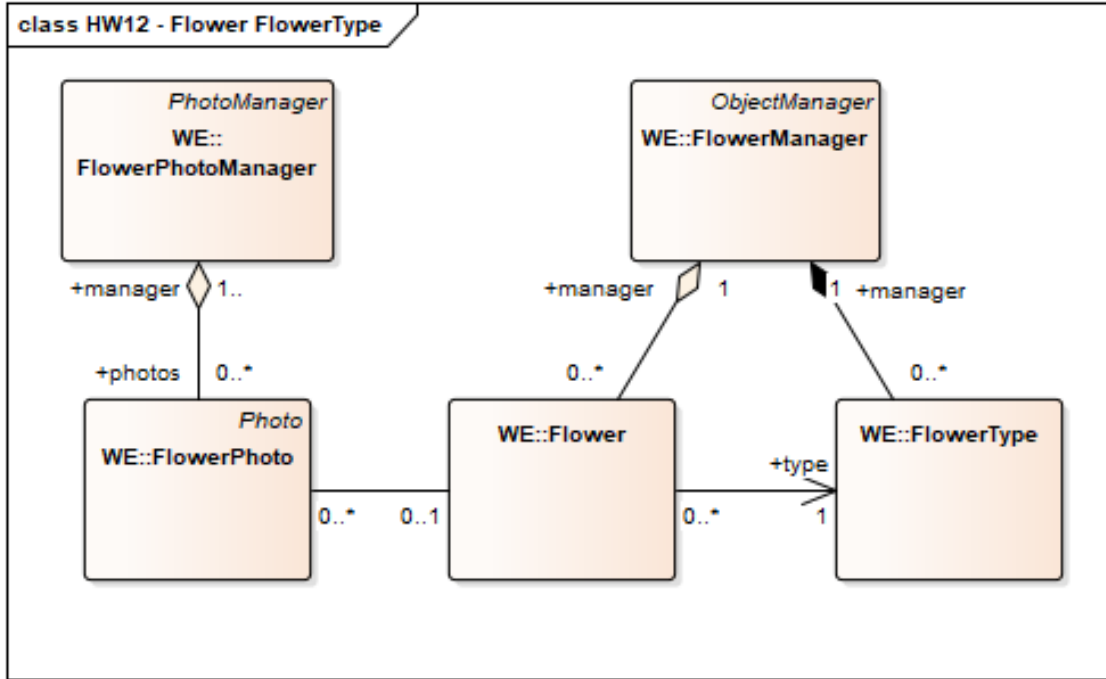
- In your summary, please provide answers to the following questions
 - What is the purpose of the design patterns you documented?
 - Does the use of these design pattern make sense to you? Why?
 - What are the drawbacks of using these design patterns here?

CW#10 Homework Overview

- This week's required content
 - Apply the Type Object pattern to your class model
- Build, commit, push, and tag
- Submit this week's summary

CW#10 Homework Details

- Apply the Type Object pattern to your class model
 - Add your domain class and the corresponding type (object) class
 - Implement an isSubtype() method for your type object class



- In your summary, please provide answers to the following questions
 - How did you deal with type hierarchies?

CW#11 Homework Overview

- This week's required content
 - Trace and document the instantiation of both
 - your photo class and
 - your domain class
- Build, commit, push, and tag
- Submit this week's summary

CW#11 Homework Details

- Trace and document the instantiation process of both
 - your photo class and
 - your domain class
- For each class, document
 - the sequence of method calls that lead to the new object
 - Start with the call to your object manager or, if none, your factory
- For each class, document
 - the object creation solution as a point in the solution space
 - Use the object creation table (i.e. you should provide a six tuple)

CW#12 Homework Overview

- This week's required content
 - Describe the following three collaborations
 - YourObjectPhoto with YourObject
 - YourObject with YourObjectType
 - A collaboration of your choice
- Build, commit, push, and tag
- Submit this week's summary

CW#12 Homework Details

- Describe the following three collaborations
 - YourObjectPhoto with YourObject
 - YourObject with YourObjectType
 - A collaboration of your choice
- Use the syntax from class, i.e. these keywords
 - `collaboration`, `role`, `binds`, ...
- In your summary, please provide answers to the following questions
 - How to object collaborations relate to design patterns?

Thank you! Questions?

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Credits and License

- Original version
 - © 2012-2020 Dirk Riehle, some rights reserved
 - Licensed under Creative Commons Attribution 4.0 International License
- Contributions
 - Andreas Bauer (2018-2020)
 - Georg Schwarz (2019-2020)