

Design Techniques

Ch 2.6-2.12

- 1) What technique can we use for **initial design**?
- 2) What technique can we use to **document a design**?

Process

- Early Software Engineering Process Phases:



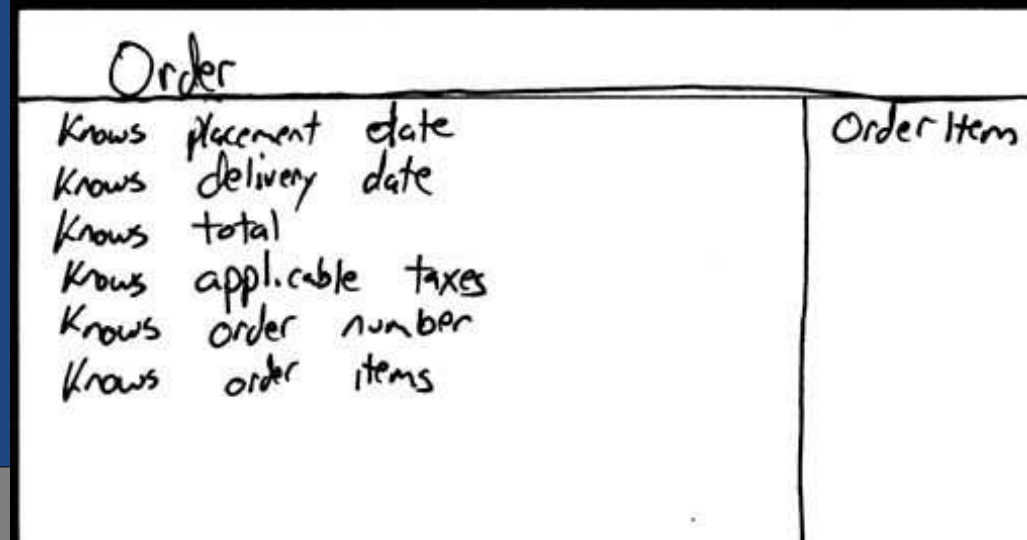
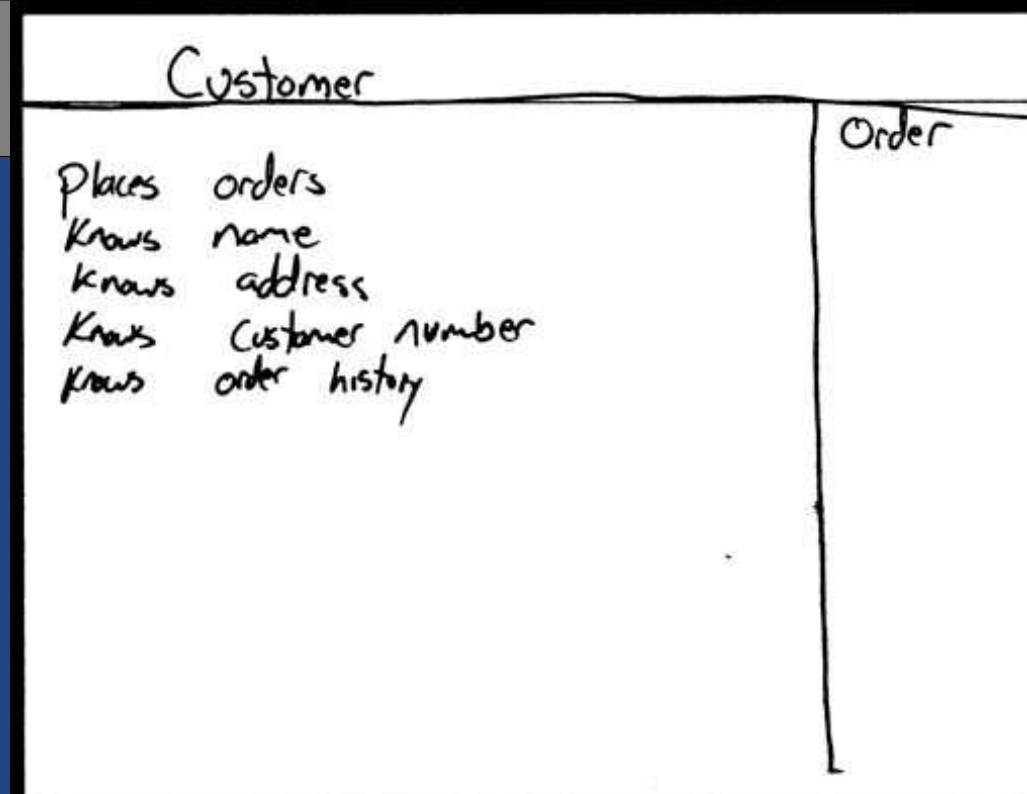
Software design techniques...

CRC Cards

a Design Technique

CRC Cards

- CRC Cards:...
- It's an index card listing:
 - Class Name
 - Class Responsibilities
Ex: Manage messages
 - Class Collaborators
..
Ex: Message class



CRC Cards

- **Purpose**
 - Support an..
- **Physical card support**
 - Walk-through a use-case deciding..
 - Lay cards out on table and re-arrange them as needed.
- **Small, so limit responsibility of the class**
 - No "God" object (knows everything)
 - If too much on a card,..

CRC Process

- 1) For each discovered class, write its name on the top.
 - Look for..
- 2) Left side: Responsibilities
 - Not method names, but..
 - Message class example:
 - Good: manage message content
 - Bad: `getContent()`, `getContentLength()`, `setContent()`
- 3) Right side: Collaborators
 - no particular order; which classes does this one use
 - does not line-up with responsibilities
- 4) Don't list all details; just enough to show..

CRC Example

Mailbox

manage passcode

MessageQueue

manage greeting

manage new and saved messages

MailSystem

manage mailboxes

Mailbox

CRC Use

- CRC Cards are good for
 - discussions and collaboration
 -
- But they are messy
 - Not good for recording design decisions.
UML Diagrams do this!

In-class exercise: Pledge Tracker Description

- Participants gather pledges from friends and neighbours for completing a charity walk-athon
 - Pledge lists donor's name and billing info.
- App reads pledge data from file (.csv) and:
 - Generates invoices for pledge (.pdf's)
 - Allow entry of payments received (saves to file)
 - Display summary of unpaid pledges (names, \$)
 - Display summary of total pledge amounts: total \$ pledged, \$ paid, \$ unpaid

CRC Example

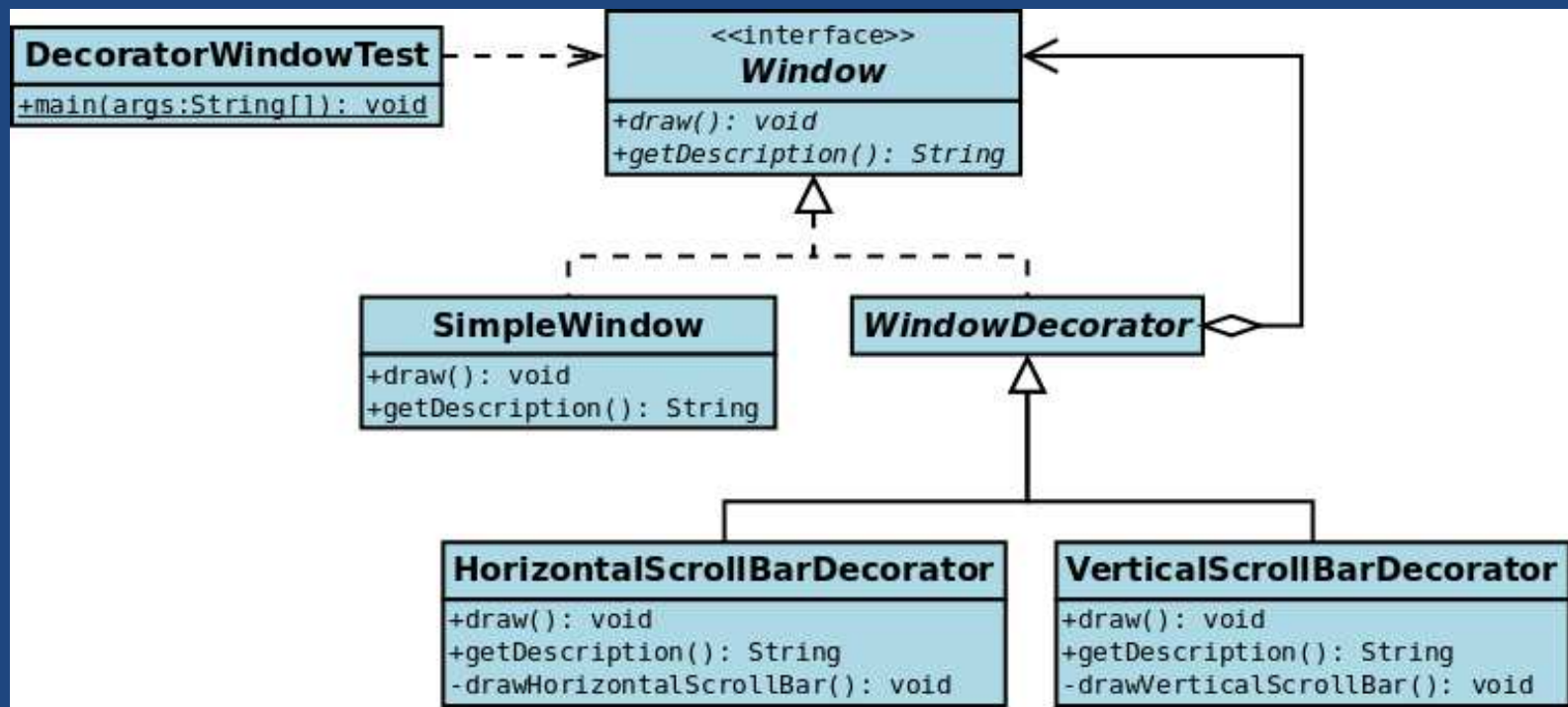
- What classes would be in charity pledge tracker?
- Draw a CRC card for a class or two.

UML Class Diagrams

a Design Communication Technique

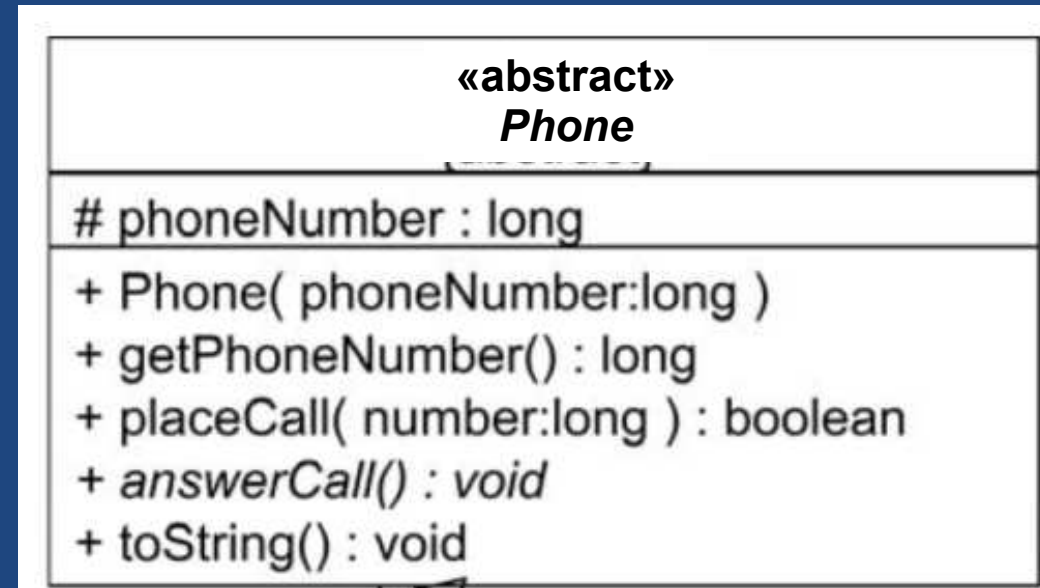
UML Class Diagram

- UML Class Diagram
 - A diagram showing..

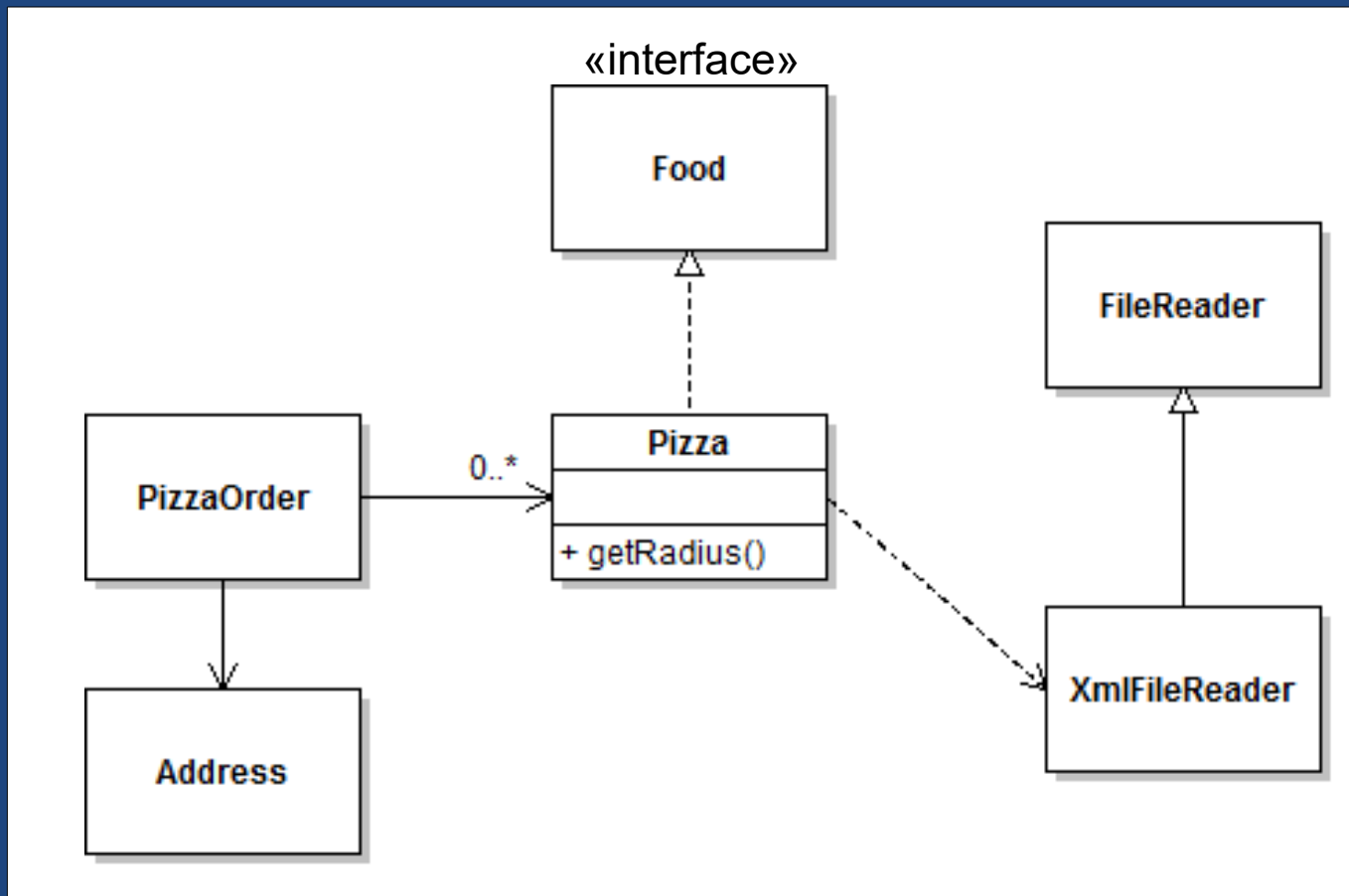


UML Class diagram implementation details

- **3 Sections**
 - Class name
 - Attributes (fields)
 - Operations (methods)
- **Types (Optional)**
 -
 - **methodName() : returnType**
- **Visibility:** Can precede attributes and methods
 - + for..
 - # for..
 - for..

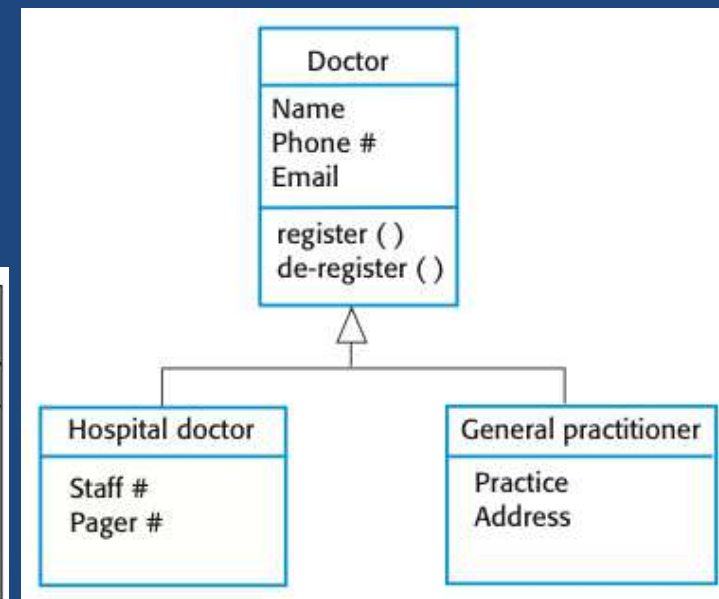
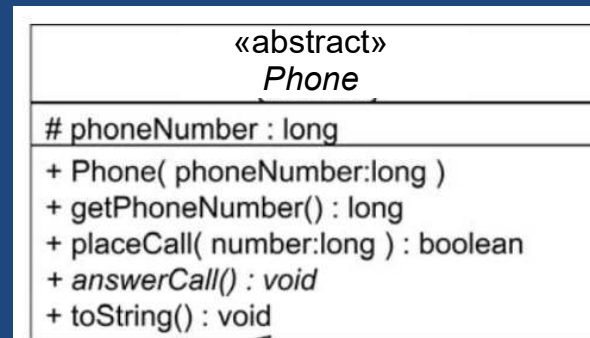
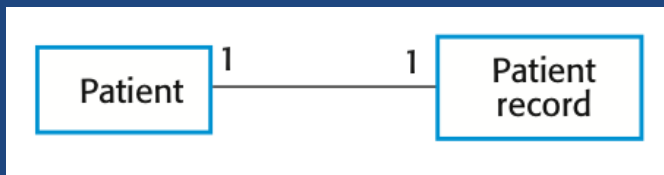


Class Connections



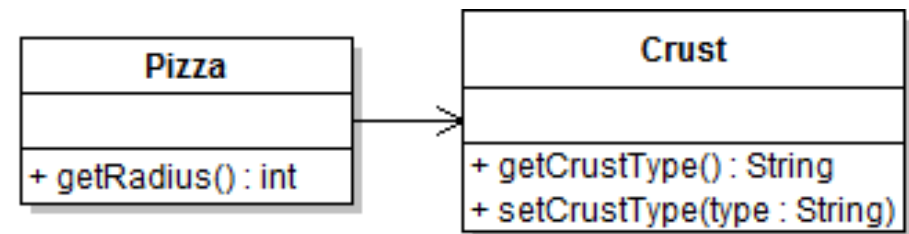
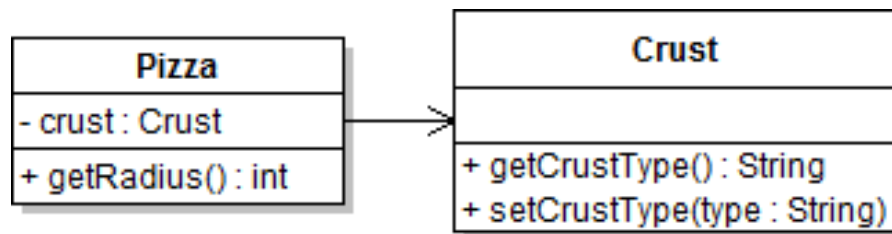
Level of Detail

- Choose required level of detail
 - What are you trying to show in your diagram?
 - Who is the..
- Some Options
 - Classes & relationships.
 - Attributes and methods.
 - Types, arguments, visibility (+, -, #).

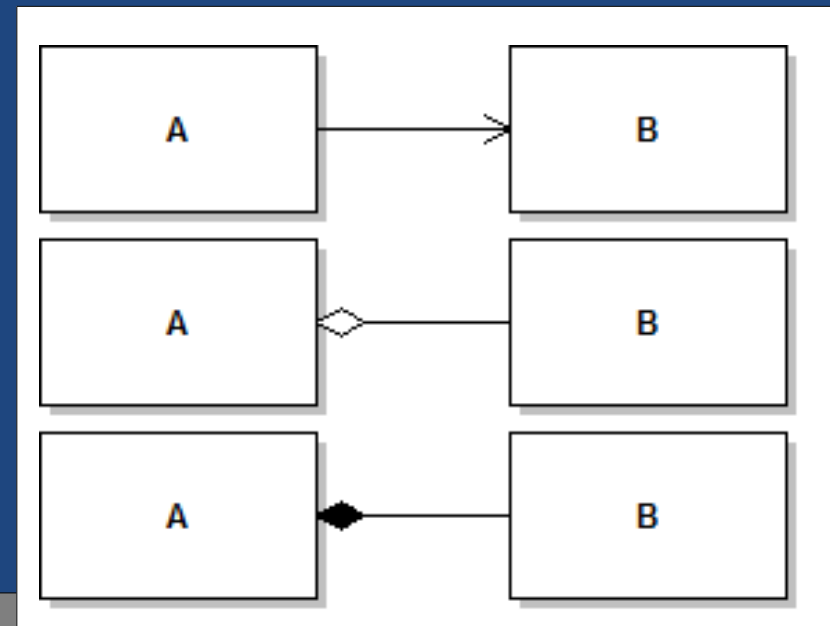


Class Diagram Notes

- If **Pizza** “has-a” **Crust**, don't..

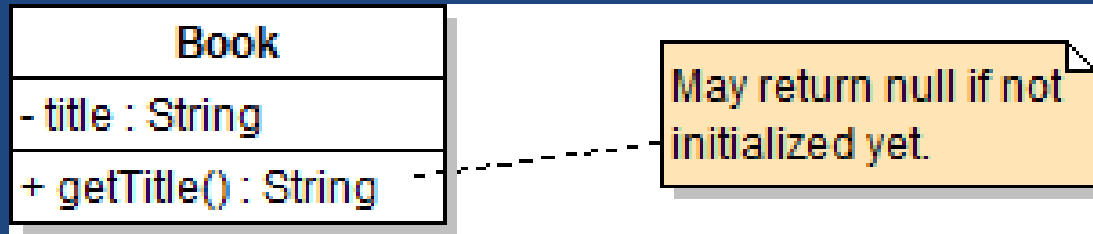


- **A** “has-a” **B** can be shown as any of the following:
 - Directed association (we'll use this; simplest)
 - Aggregation
 - Composition



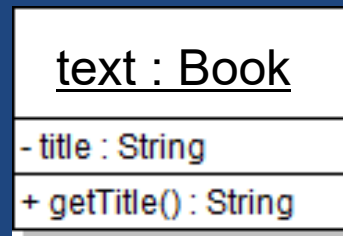
More Notation

- add comments:



- Show objects:
A class but with a ':' (and underlined)

..



UML Class Diagram Example

- Draw a **UML class diagram** for the classes from the CRC cards for the pledge tracker.
 - Show just class names and relationships.

Summary

- CRC: Early design process.
 - Index card listing class name, responsibilities, and collaborators.
 - High-level and informal description.
- UML Class Diagrams: Formalize design.
 - Draw classes and class relationships.