

# ECE 3574: Applied Software Design

## Composition

## Project 1 Final Due Date is Friday 3/3 at 5 PM

- ▶ Project 1 beta grading is finished.
- ▶ You each have a zip file with feedback.zip (use the latest one) on Canvas.
- ▶ The same grading script will be used for final grading (except for bug fixes).

Project 2 will be released before spring break.

Today we will learn how to build up complex concepts and models from simple parts.

- ▶ Composition models “has-a”
- ▶ Examples
- ▶ Composition and the Law of Demeter
- ▶ Composition and Qt
- ▶ Exercise

# Composition is a major way of modeling has-a relationships

A composite type has member variables that correspond to its components.

```
class Foo
{
    ComponentType component;
}
```

# Classic Example: People, Employees, and Customers

A Person has-a

- ▶ name
- ▶ age
- ▶ address

An Employee is-a Person and has-a

- ▶ id
- ▶ role
- ▶ salary

# Classic Example: People, Employees, and Customers

A Person has-a

- ▶ name (first/last?)
- ▶ age (possibly unknown?)
- ▶ address (format?)

An Employee is-a Person and has-a

- ▶ id (unique?)
- ▶ role (static or dynamic?)
- ▶ salary (currency?)

Is a customer always a person?

# Prefer Composition to Inheritance

Inheritance is overused and leads to tight coupling.

Composition

- ▶ gives the most flexibility with least coupling
- ▶ shorter compile times, a member can be a pointer, thus only declared
- ▶ less error prone, no private/protected/public

Use inheritance only when you need to implement is-a relationships that require polymorphism.

Sometimes has-a is just as good as is-a

Consider the Employee is-a Person.  
A Person could also have-a Job.



# Ontology

Ontology is the name used for defining objects and their relationships.

Composition and Inheritance in C++ gives us the primary means to model the world.

Each problem domains have their own ontologies

# Composition is very useful in GUI design

For example, a window has-a

- ▶ menu
- ▶ controls
- ▶ view

A menu has-a ...

A control has-a ...

A view has-a ...

## Exercise

See website

## Next Actions and Reminders

- ▶ Read about Qt Event System