

CSCE 240: Advanced Programming Techniques

Lecture 8: Object Oriented Concepts - Continued

PROF. BIPLAV SRIVASTAVA, AI INSTITUTE

3RD FEBRUARY 2022

Carolinian Creed: "I will practice personal and academic integrity."

Credits: Some material reused with permission of Dr. Jeremy Lewis.
Others used as cited with thanks.

Organization of Lecture 8

- Introduction Section
 - Recap of Lecture 7
 - TA and SI Updates
- Main Section
 - Concept: Multiple classes – UML diagrams and Object Oriented programs
 - Concept: Code organization
 - Discussion: Prog. Assignment #1 and Project discussion
- Concluding Section
 - About next lecture – Lecture 9
 - Ask me anything

Introduction Section

**CEC UNDERGRADS:
GRADUATE SCHOOL FAIR**

LEARN ALL ABOUT GETTING A MASTERS OR PhD

SIGN UP NOW:



- Tuesday, February 15
- 300 Main RM B213 or remote via livestream
- 6:00-8:00 PM

FREE PIZZA!

Recap of Lecture 7

- We introduced UML – a language independent notation for communicating about OO software
- Looked at concept of encapsulation
- Discussed background of chatbot

Updates from TA, SU

- TA update: Yuxiang Sun (Cherry)
- SI update: Blake Seekings

Main Section

Concept: Working with Multiple Classes

Example: Refrigerator

- is a type of electrical appliance [Generalization/ Specialization]
- has freezer section, cooler section, water compartment [Composition]
- can have ice tray, food items [Aggregation]

Example: Refrigerator in UML Classes

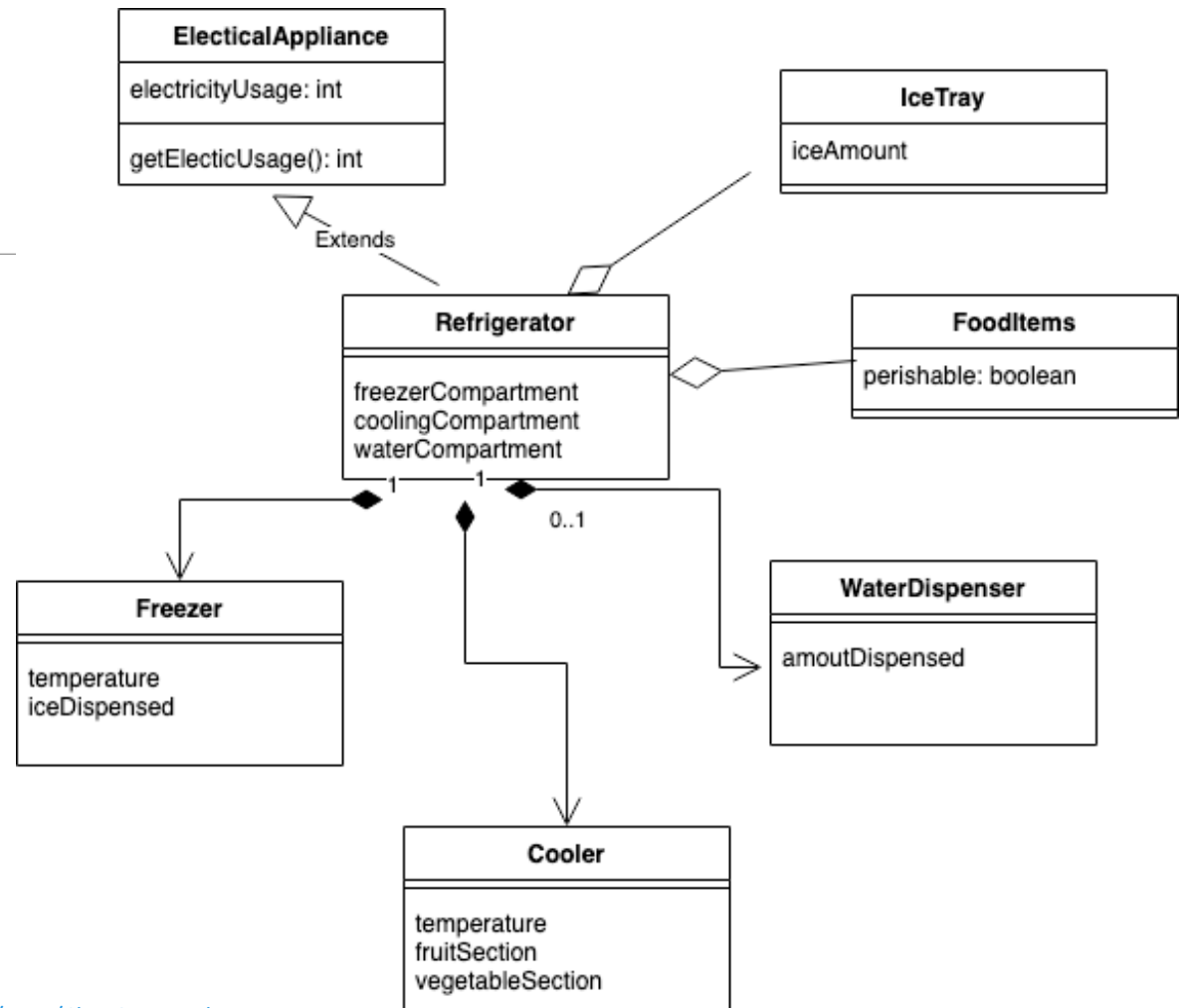


Diagram at:

<https://github.com/biplav-s/course-adv-proglang/tree/main/sample-code/UML/Class8-examples>

Relationship Types

- Association: is related to
- Generalization: is a special type of (inverse relationship: specialization of)
- Aggregation: is made up of, but can also exist independently
- Composition: is made up of, but cannot exist independently

References:

1. UML 2.5.1 specs
2. Tutorial: <https://www.visual-paradigm.com/guide/uml-unified-modeling-language/uml-aggregation-vs-composition/>

Example: Representative Information

- Contact Information (Type-I1)
 - Name
 - Label: District, County, Party
 - Addresses: Columbia, Home
 - Phone: Business, Home
- Personal Information (Type-I2)
- Committee Assignments (Type-I3)
- Sponsored Bills in the House (Type-I4)
- Voting Record (Type-I5)



Representative William H. Bailey

Republican - Horry
District 104 - Horry County - [Map](#)

Columbia Address
420D Blatt Bldg.
Columbia 29201

Home Address
4487 Lake Circle
Little River 29566

Business Phone (803) 212-6918
Home Phone (843) 458-0844

[Send message to Representative Bailey](#)

Personal Information

- Retired Public Safety - Law Enforcement & Fire
- Residing at 4487 Lake Cir., Little River
- Born Dec. 4, 1962 in Conway
- Son of William W., Sr. and Katherine Gause
- Horry-Georgetown Technical College, A.D., 1999
- Coastal Carolina University, B.A., 2001
- Webster University, M.S., 2004
- Sept. 23, 1983 married Karen Elizabeth, 2 children, Anne Marie and Christopher
- City of North Myrtle Beach, Public Safety, Officer, 1990-04, Director, 2005-10
- FBI National Academy, 2003
- Horry County Airport Advisory Committee, 2004-10
- S.C. Supreme Court Task Force and Probate, 2009

Committee Assignments

- [Interstate Cooperation, 2nd V.C.](#)
- [Judiciary](#)

Sponsored Bills in the House

- Primary Sponsor: ☒ Yes ☐ No
- Search Session: [Find Bills](#)

Voting Record


- Search Session: [Find Votes](#)

Modeling Questions

- Consider: **Contact Information (Type-I1)**
 - Name
 - Label: District, County, **Party**
 - Addresses: Columbia, Home
 - Phone: **Business**, Home
- Composition or aggregation
 - If reusing information, model as aggregation (e.g., Party)
 - If specific to the class, model as composition (e.g., Business phone number)

Example: Representative Information

- Contact Information (Type-I1)
 - Name
 - Region
 - Addresses: Columbia, Home
 - Phone: Business, Home
- Personal Information (Type-I2)
- Committee Assignments (Type-I3)
- Sponsored Bills in the House (Type-I4)
- Voting Record (Type-I5)
- Service in Public Office (Type-I6)



Representative Terry Alexander

Democrat - Florence
District 59 - Darlington & Florence Counties - [Map](#)

Columbia Address
314C Blatt Bldg.
Columbia 29201

Home Address
1646 Harris Court
Florence 29501

Business Phone (803) 734-3004
Home Phone (843) 665-7321

[Send message to Representative Alexander](#)

Personal Information

- Education Consultant & Pastor
- Residing at 1646 Harris Court, Florence
- Born January 23, 1955 in Florence
- Son of the late James and Adell Alexander
- Durham Business College, A.D., 1976
- Francis Marion University, B.A., 1991
- Howard University School of Divinity, M. Div., 1998
- Married to Starlee Davis Alexander, 2 children, Terrell McClain and Matthew
- Pastor, Wayside Chapel Baptist Church
- Career Development Consultant
- Adjunct Professor of Religion, Limestone College
- Pee Dee Regional Council of Governments
- Past President, Habitat for Humanity, Board of Directors
- Charter member, The Florence Breakfast Rotary Club
- Past President, Boys and Girls Club of Florence
- Boy Scouts of the Pee Dee Executive Boards
- Florence Branch, NAACP, past President
- Mercy Medicine Board
- Pee Dee Chapter American Red Cross
- 100 Black Men of the Pee Dee
- Kappa Alpha Psi Fraternity, Inc.
- Francis Marion Society
- National Association of County Officials
- National Association of Black County Officials
- South Carolina Association of Black County Officials
- South Carolina Association of Guidance Counselors
- South Carolina Alliance of Black Educators

Committee Assignments

- Education and Public Works, 2nd V.C.
- Regulations and Admin. Procedures

Sponsored Bills in the House

- Primary Sponsor: ☒ Yes ☐ No
- Search Session: [Find Bills](#)

Voting Record

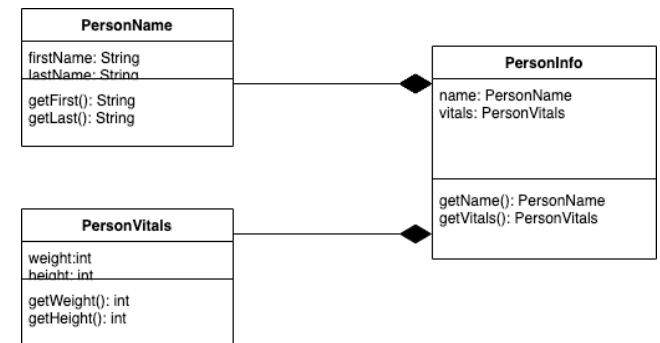
- Search Session: [Find Votes](#)

Service In Public Office

- Florence County Council, 1990-06, District Number 3
- House of Representatives, 2007 - Present

Exercise

- Using browser, go to: <https://app.diagrams.net/>
- Go to: File -> Open from -> Device -> and load file “Example.drawio”
(From: <https://github.com/biplav-s/course-adv-proglang/tree/main/sample-code/UML/Class7-examples>)
- Extend it to represent Contact Information (Type-I1) // Sub-type of PersonInfo
 - Name // Type: String or reuse PersonName
 - Label: District, County, Party
 - Addresses: Columbia, Home
 - Phone: Business, Home
- Review it
 - Does your chosen district’s representative have weight/ height information on the website ? If so, we can already handle it !!
- You can save file or export the diagram in any supported format



Concept: Code Organization

Options to Organize Code

- Option 1: All classes in the same file
 - Not suggested
 - Makes code hard to reuse
 - Makes code hard to understand
- Option 2: Have classes as separate header (.h) and implementation files (.cpp)
 - Each class should have a clear purpose
 - Header file has specification of the class: data members and function specification, but not implementation; implementation is in .cpp
 - Good suggestions in: <http://websites.umich.edu/~eecs381/handouts/CppHeaderFileGuidelines.pdf>
 - Someone reusing the code will only need to look at the header file, not implementation
 - **Pitfall:** too many files if the project is small, especially if development is by a single person team
- Option 3: Mix and match of above
 - Separate classes for important concepts
 - Utility “class” for rest of the data members, functions

Review: Code Implementation in Instructor Code

- As supported by Eclipse IDE !
 - Creates header and implementation files automatically
 - sub-directories with clear purpose
- Keeping project size small

Code Review

- `PersonName`: has separate header and implementation files for a class
- `SimpleRelational`: has single class implementation file
- `Class7and8_C++_OO`: is a utility file

Discussion: Course Project

Course Project – Assembling of Prog. Assignments

- **Project:** Develop collaborative assistants (chatbots) that offer innovative and ethical solutions to real-world problems ! *(Based on competition - <https://sites.google.com/view/casy-2-0-track1/contest>)*
- Specifically, **the project will be building a chatbot that can answer questions about a South Carolina member of state legislature from:**
<https://www.scstatehouse.gov/member.php?chamber=H>
 - Each student will choose a district (from 122 available).
 - Programming assignment programs will: (1) extract data from the district, (2) process it, (3) make content available in a command-line interface, (4) handle any user query and (5) report on interaction statistics.

Core Programs Needed for Project

- Prog 1: extract data from the district
- Prog 2: process it based on questions
- Prog 3: make content available in a command-line interface
- Prog 4: handle any user query and
- Prog 5: report statistics on interaction of a session, across session

Programming Assignment # 1

- Goal: extract data from the district of choice
 - Language of choice: Any from the three (C++, Java, Python)
- Program should do the following:
 - Take district name as input
 - Read content from the district's URL or a local text version of the district page
 - Report statistics of content: lines, words, chars
 - Write content out in an output file formatted with indentation
- Code organization
 - Create a folder in your GitHub called "prog1-extractor"
 - Have sub-folders: src (or code), data, doc, test
 - Write a 1-page report in ./doc sub-folder
 - Send a confirmation that code is done to instructor and TA, and update Google sheet

Discussion

Concluding Section

Lecture 8: Concluding Comments

- We ...

About Next Lecture – Lecture 9

Lecture 9: Object Oriented - Inheritance

- OO - Inheritance
- Home work 2 will be given
- Programming assignment #2 begins – hints given

8	Feb 3 (Th)	Code org (C++)	Prog 1 - end
9	Feb 8 (Tu)	OO – inheritance	Prog 2 - start
10	Feb 10 (Th)	OO - polymorphism	HW 3 due
11	Feb 15 (Tu)	In class test	Quiz 1 – In class