Software Design

Analyze The Problem And Develop A Software Architecture

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What is a Program?

- Take some information or actions
- Convert or process that input
- Produce desired information or action
- Information?
  - ID #
  - Recorded value
- Action?
  - Close a switch
  - Activate a device

Algorithms

- Identify the processing required to do the processing or conversion
- Also called an algorithm
- For realistic programs there will be many
- Can use a single massive algorithm
- Causes overcomplicated code
- What to do?

Decomposition

- Break the program/application into smaller pieces
- Maybe repeat, to multiple levels of decomposition
- Feature of all programming paradigms
  - Functional decomposition (procedural)
  - Object oriented design

Simple Example

- Program to convert Fahrenheit to Celsius
- Simple!
  - Prompt user
  - Read in number
  - Use the crazy formula
  - Display the number
  - We’re done!
  -

Complications

- Validate input?
  - Value can’t be less than absolute zero
  - Value needs to be numeric
- Needs change
  - Maybe we need to convert the other way?
  - I didn’t know there was a Kelvin scale!
- Format output?
  - Which value is which?
- More than one conversion at a time?

Decomposition

- You know input may have many subtasks so create an input() function to collect them all
- If necessary create other functions for the sub tasks
  - checkAbsolute() to handle the value of absolute value in each scale
  - checkIfNumeric() consolidates that validation

Decomposition

- Formatting output?
  - Collect it in one place
  - Maybe a variable number of decimal places required
    - That would change the input too
- Maybe unanticipated output changes?
  - Without further thought you know where they go!

Decomposition

- Create int convert(value) and we're done!
- Add C2F conversion? Now we need-
  - int convertF2C(value) and int convertC2F(value)
- Add Kelvin and it gets complicated
- Create a general purpose conversion function
  - Maybe
  - int convert(char source, char target, int val) ?
- Requires addition of a menu to input function

Suggestions

- Start with pencil and paper
- Try to build in general purpose from the beginning. Anticipation.
- Decompose
  - Functions
  - Classes
- **Make sure all requirements are satisfied!!**
  - In the rush to meet a deadline this is often missed

Wrap Up

- Why go through this?
- For small programs a jumble of code might work
- Consider that closet every family has
  - Random things tossed in willy nilly
  - At first it's not a problem
  - But then you can't find the pong game from uncle Ted

Wrap Up

- Solution?
- Closet organizers- shelves or the hanging things
- If nothing else you have several smaller piles to root through
- Analogous to designing software rather then sitting down and just writing code