(4-3) Selection Structures II in C
H&K Chapter 4

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CptS 121 (May 15th, 2019)
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Nested if statements (1)

- Consider the following scenario:
  - Count the number of people in the room:
    - Only count on weekday
    - For each weekday, only count at 11am
Nested if statements (2)

We can write a *nested* if statement to handle this situation:

```
char date;
int time;
int number_people;

if (date == 'M' || date == "T" || date = "W" || date = "T" || date = "F")
{
    if (time == 11)
    {
        /* call the function, count_number_people. */
        number_people = count_number_people();
    }
}
```
Consider the following updated scenario:

A high school baseball team awards merit points to players based on their offensive performance and the class standing ('f' = freshman, 'o' = sophomore, 'j' = junior, and 's' = senior). In particular, freshmen and sophomores earn an extra point for home runs, whereas juniors and seniors do not earn any points for singles. Write a C if-statement that, given an at-bat character and a class standing character, properly awards points.
We can write an even more *nested* if statements to handle this situation:

```c
char at_bat, class_standing;
int points;
...
if (at_bat == 's') { /* single */
    if (class_standing == 'f') || (class_standing == 'o') {
        points = 1;
    } else {
        points = 0;
    }
} else if (at_bat == 'd') { /* double */
    points = 2;
} else if (at_bat == 't') { /* triple */
    points = 3;
} else if (at_bat == 'h') { /* home run */
    if (class_standing == 'j') || (class_standing == 's') {
        points = 4;
    } else {
        points = 5;
    }
} else { /* out */
    points = 0;
}
```
Nested if statements (3)

- Nested if statements vs. compound conditionals
  - Consider the following scenario: The National Weather Service would like to identify hourly weather reports in which the relative humidity is low (below 20%, the temperature is pleasant (between 75 and 85), and the winds are calm (0 to 10 m.p.h.). Assuming that the variables humidity, temp, and wind_speed hold those values, write an if statement that prints out a message when the conditions are met.
Nested if statements (4)

- Nested if statements vs. compound conditionals (cont.)
  - Alternative 1: Nested if
    
    ```c
    if (humidity < 20)
      {if (temp >= 75)
        {if (temp <= 85)
          {if (wind_speed <= 10){printf("Perfect conditions!\n");}}}
      }
    }
    ```
  - Alternative 2: Compound if conditional
    
    ```c
    if ((humidity < 20) && (temp >= 75) && (temp <= 85)
       && (wind_speed <= 10)
    {
      printf("Perfect conditions!\n");
    }
    ```
Nested if statements (5)

- Important to note that the C compiler always matches an `else` with the most recent incomplete `if`

  Example:

  ```c
  if (humidity < 20)
  {
    if (temp <= 32)
    {
      printf("It's a cool, dry day.");
      if (wind < 10)
      {
        printf("Luckily, the winds are calm.");
      }
    }
    else
    {
      printf("The humidity is low, it's above freezing.");
    }
  }
  ```
Nested if statements (6)

- Guidelines for using nested if statements
  - Use braces to enclose all if branches, even if they contain only one statement
    - This will obviate the problem of mismatching if and else branches
  - If possible, structure conditions so each alternative falls on false branch of previous condition (else if…)
  - In conditionals, don't mistake = for ==
    - The C compiler won't be able to catch this error, and you're condition will always evaluate to the same Boolean result!
References

Collaborators

- Chris Hundhausen
- Andrew O'Fallon