Lab Assignment Week 03

CSC 3320 – System-level Programming

Wednesday, January 29th, 2025

Introduction

Welcome to the third programming lab of CSC 3320! Today, we will be covering the following topics:

1. Basic C Programming
    - Variables
    - Expressions
    - Formatted I/O

Lab Policies

- Attendance is mandatory.
- Labs must be completed **individually.**
- TAs are here to help you. Ask them for help!
- Lab assignments are due at midnight on the day of your lab.

Comments

The lab assignment requires the inclusion of comments to enhance code readability and understanding. Specifically, a block comment at the beginning of the Python file is required. Your block comment should include the following:

- The program name
- The author's name (your name)
- A description of the program's overall purpose

Additionally, inline comments should be used throughout the code to explain specific lines or sections that might be less obvious to someone reading the code. These inline comments can clarify complex calculations, explain the purpose of certain variables, or provide additional context for specific code blocks.

Deliverables:

1. The C Code for your program. (.c file).
2. A screenshot of the output in the Terminal.
3. Word Document with your answers to the regular expression questions.

If you have any questions, please do not hesitate to ask your TA.

Program: Kinetic Energy Calculator

You will write a C program to compute the time required for an object to reach the ground when dropped from a user-specified height, the velocity at which it hits the ground and the kinetic energy at the moment of impact.

First, your program will calculate the time taken by the object to reach the ground:

$$t = \sqrt{2 * \frac{h}{g}}$$

Where:

- ***t*** = time the object takes to reach the ground in seconds (***s***).
- ***h*** = height which the object was dropped from in meters (***m***).
- ***g*** = acceleration due to gravity, 9.8 meters per second squared (***m/s²***)

Second, using the computed time above, you will determine the velocity at which it hits the ground using the following formula:

$$v = g * t$$

Where:

- ***v*** = velocity at which the object hits the ground (***m/s***).
- ***g*** = acceleration due to gravity, 9.8 meters per second squared (***m/s²***)
- ***t*** = time the object takes to reach the ground in seconds (***s***).

Finally, using the computed velocity above, you will determine the kinetic energy at the moment of impact using the following formula:

$$e = \frac{1}{2} m * v^2$$

Where:

- ***e*** = kinetic energy at the moment of impact in Joules (***J***)
- ***m*** = mass of the object in kilograms (***kg***)
- ***v*** = velocity at which the object hits the ground in meters per second (***m/s***).

Program Requirements

- All variables must be of type `float` or `double`.
- Prompt the user with a suitable message to read the object's mass in kilograms and the height of the drop in meters from the terminal.

  `Enter the mass of the object in kilograms:`

  `Enter the height of the drop in meters:`

- Implement the given formulas above to calculate the ***time taken, velocity of the object***, and ***kinetic energy at impact with the ground***.
- Store the result of each equation in their own variable, respectively, with meaningful names.
- Display the results in the following format using formatted strings using **printf()**:

  `The time taken by an object weighing ___ to reach the ground when dropped from a height of ___ meters is ___ seconds.`

  `The velocity of the object when it hits the ground = ___ m/s.`

  `The kinetic energy at the moment of impact with the ground is ___ Joules.`

- You are not required to use Snowball to write this program. However, your program will be graded based on whether it works correctly on Snowball, so you should ensure it compiles and runs on Snowball.

Example Output

```
Enter the mass of the object in kilograms: 10
Enter the height of the drop in meters: 15
The time taken by an object weighing 10.00 to reach the ground when dropped from a height of 15.00 meters is 1.75 seconds.
The velocity of the object when it hits the ground = 17.15 m/s.
The kinetic energy at the moment of impact with the ground is 1470.00 Joules.
```

Deliverables

For today's lab, you must upload the C program code for your kinetic energy calculator and its output in the terminal on iCollege. Please name your C code and screenshot using the following format:

- C Files
  - lastname_firstname_filename.c
  - For example, **hawamdeh_faris_energy.c**
- Screenshots
  - lastname_firstname_filename.png
  - For example, **hawamdeh_faris_energy.png**