Lab Assignment Week 04

CSC 3320 – System-level Programming

Week of January 29th, 2024

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.

Deliverables:

1. The C Code for your program. (.c file).
2. A screenshot of the output in the Terminal.

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 taken by the object 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 taken by the object 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 in the mass of the object in kilograms and the height of the drop in meters.

  `Enter the mass of the object in kilograms:`

  `Enter the height of the drop in meters:`

- Use the given formulas 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 result in the following format:

  `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.`

- Your program will be graded based on whether it works correctly on Snowball, so you should make sure that your program 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 will need to the C program code for your kinetic energy calculator and its output in the terminal on iCollege. Please name your C code and screenshot as follows:

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