MA4830 – Realtime Software for Mechatronic Systems

Minor Programming Assignment

12 September 2021

Introduction

The CA scope and objective of this assignment is restricted to creating a computer program, written in C, to be executed on QNX or Windows OS. It will be restricted to a sequentially executing, standard I/O (kbd & display).

Assignment

You are tasked to write a program to calculate the properties of standard 2D & 3D objects. These would include length of circumference, area and volume of objects that include rectangles, circles, cubes and cones.

The program will request for the appropriate parameters, from the user, depending on the type of object chosen. The program is required to guide the user to input the appropriate parameters depending on the type of object parameters, desired. The input parameters and output results should be tabulated and displayed onto the computer screen.

Details on required task

- Analyse the parameters required depending on:
  - class of object (2D or 3D)
  - 2D: rectangle/Square/Circle
  - 3D: cube/blocks/circles/cubes/ cones
- Determine the appropriate parameters to be calculated
  - circumference/surface area/volume
- Develop the necessary equations and algorithms for the above requirement.
- Provide a basic flowchart describing the flow of input data, and output computation.
- *As a bonus consider how you may extend the requirements to improve the scope & sophistication of your program.*

Elaboration of Requirements

- Real-time check of data entered, via keyboard.
  - Check validity of input values and for any missing data (as required)
  - Adaptive additional data requested, based on type of object, referenced.
  - Help & suggestion in identification of input error.
- Software robustness
  - Stable operation and avoidance of infinite loop or programming “hanging”
- Pleasant format of output results showing data points entered with the mean and standard deviation values indicated. Preferably the data entered and computed would be presented in a table or “graphical” format.

Administration Details:

Report Content:

- Explanation of what the program achieves
  - Its limitations and novelty (if any)
  - Highlight notable attributes
- Simple flow chart explaining the various sub-tasks/&flow of the program
- Example run and user manual
  - Print out the sample runs, highlighting the input and output parameters
    - Add to report as a screen shot.

  - **Report Format**: Typically, <5 pages of report comprising of the following:
    - Short description on how to solve the equations
    - Flow chart and program listing (with comments)
    - Screen shot of screen output
  - **Composition of Group**
    - 2 to 4 members per group.

Grading Scheme

- Meets basic requirements (40%)
  - Bonus +5% (beyond 100%)
- Accurate flow chart (15%)
- Program listing (25%)
- Program completeness and usability (20%)
  - Structure, comments and modularity
  - Robustness and ease-of-use.
- This assignment comprises 20% of total course marks

Dateline: 8 October 2021 (Friday following the recess week)