CS122 Engineering Computation Lab
Lab 4

Bruce Char
Department of Computer Science
Drexel University
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Review of Lab 3 Cycle

• Lab 3 – completed – including make up labs for missed classes
  – Quiz and quizlet grades to be issued this week.
  – Major Lab 3 concepts to remember
    • Use of “for”, “while” loops and “if” statements to solve a variety of firing angle analyses
Review of Lab 2 Cycle

- **drawBoxB function syntax:**
  - `drawBoxB:=(width, height, xlo, ylo ,c) →`
    - `display([line([xlo,ylo],[xlo+width,ylo],color=c),
      line([xlo+width,ylo],[xlo+width,ylo+height],color=c),
      line([xlo,ylo],[xlo,ylo+height],color=c),
      line([xlo,ylo+height],[xlo+width,ylo+height],color=c)],
      axes=none, scaling=constrained);`

- **Need in Lab 4 for movement of particle in box exercises**
Review of Lab 3 Cycle

• Blammo trajectory analyses – why we used “for”, “while” and “if”
  – 1.1 – Compute distance traveled for a variety of firing angles
    • for angle from 30 to 75 do
      – Simple “for” loop to cover integer range of angles
  – 1.2 – Find smallest angle that hits target
    • for angle from 10 to 90 while (abs(distance-targetdist) > tol) do
      – “for” loop defines overall set of angle to consider
      – “while” loop will stop the computations the 1st time an angle produces a distance
        that hits target
  – 1.3 – Print all firing angles that produce a target hit
    • for angle from 10 to 89 do
      if (abs(distance-target) < tol) then
        printf (…….);
      end if;
    a. Must compute for all angles, since multiple angles can produce the desired result
    b. Will only print out statistics for the angles that produce a hit on target
Administrative Notes

• Please contact your instructor immediately if you are eligible for extended time for the Proficiency Exam
• A comprehensive preview for the proficiency exam will be sent as an attachment in this Thursday’s weekly communication email
• Please also review your bbVista Lab and Quiz grades and report any discrepancies to your instructor
• As with cs121, there will be an opportunity to earn a 2% bonus for submitting a student evaluation. Details to follow!
Administrative Notes

• Quick student poll – show of hands

Which lecture mode do you feel is more effective?
* CS121 mode – prepared lecture demos (sit and watch)
* CS122 mode – Part 0 – hands on practice
Proficiency Exam Preview

• Same logistics as in cs121
  – Proctored format
  – A quiz pair: 6 point and 8 point quizzes (about 25 and 70 minutes)
  – Sign-in and score verification on exit
  – No access to bbVista – will have access to all course site materials

• To be conducted during week of March 7 (week 10) in class for your regularly scheduled lab session

• Practice – week of February 28 (week 9)
  – All 4 quizzes taken throughout the term will be re-posted – note that quiz 4 will take place during week 9
  – A special quiz containing some problems not included in regular quizzes will also be issued – these questions are candidates for inclusion
  – Lab solutions will be posted on bbVista
  – Full quiz week (9) CLC coverage – Monday through Friday
Lab 4 Overview

- Based on materials from Chapter 15, 16 and 17 readings
  - Chapter 16 – the purpose of variables used in loops (new)
  - Chapter 14 – More on repetition and looping (review)
    • “while” loop – conditional looping + relational operators
    • Combining “for” and “while” loops
    • Dealing with runaway (infinite) “while” loops
  - Chapter 15 – Conditional execution (review)
    • Choosing alternatives – if .. then .. else .. elif constructs
Lab 4 Overview

• Lab 4 outline
  – Part 0 exercises
    • Practice on “if”, “if-else” and “if-elif-else” constructs
  – Part 1 – particle movement in box
    • 1.1 – using the drawboxB function from Lab 2 to animate the bouncing of a particle off of the East wall of a box
    • 1.2 - revising script from 1.1 (drawBoxB + East wall bounce) to handle bounce off of West wall
    • 1.3 – adding logic to bounce off of North and South walls
    • 1.4 – simulating diagonal movement and movement within a box of smaller dimensions
Lab 4 Overview

• Lab 4 outline

  – Part 2 – Movement of a bouncing ball
    • 2.1 – modification of a starter script (Blammo trajectory logic) to create an initial trajectory into ground
    • 2.2 – Further modification to produce bounces and rebounds off of ground
    • 2.3 – Plot and movie to show a specified number of bounces
Lab 4 Maple Concepts: Discussion

• Choosing among cases – if-then-elif-else-end
  – if (condition1) then
    • Code to execute if condition1 is true
  – elif (condition2) then
    • Execute if condition2 is true
    • Note – only can reach here if condition 1 was false
  – elif (condition3) then
    • if condition 3 true (1 and 2 were false)
  – else
    • “catch all” bucket – if all case conditions specified above were false
  – end if;

• East, West, North and South wall bounces for particle movement will utilize this construct

• See today’s Part 0 exercises for example and syntax
Lab 4 Maple Concepts: Discussion

- Use of the ptpos (list) variable in Part 1 of today’s lab
  - ptpos is a list that represents a point in the X-Y grid with an x coordinate = x and y coordinate = y
  - For example, if the value of ptpos is the list [9,1], it indicates that the moving point is at the simulated coordinate (9,1) within the box.
  - To get the value of the x coordinate in the midst of the simulation, use the expression ptpos[1].
  - To get the value of the y coordinate, use the expression ptpos[2].
Simple demo of using a list to represent a point’s coordinates

```plaintext
ptpos := [1,2];
# print out x and y coordinates
printf("x position is:%f, y position is: %f\n", ptpos[1], ptpos[2]);

# plot position of point based on value of ptpos

with(plottools): with(plots):
p := point(ptpos, color=red, symbolsize=25); # generate a plot structure
display([p]); # show the plot.

ptpos[1] := 2;
ptpos[2] := 3; # change the position to (2,3);
q := point(ptpos, color=blue, symbolsize=25); # generate another plot structure
display([p,q]);
```
A multi plot and an animation of a moving point

restart; #start afresh
with(plottools): with(plots):
ptpos := [1,2]; #initialize point position

#generate a multiplot of a moving point, and an animation
vx := 1; # horizontal movement in one time step
vy := 2; # vertical movement in one time step

pointTab := table();

for i from 1 to 10 do
    ptpos := ptpos + [vx,vy];
    pointTab[i] := point(ptpos, color=blue, symbolsize=25);
end do:

display(convert(pointTab,list));
display(convert(pointTab,list), insequence=true);
Quiz Week (9) Activities

• Quiz 4 will be released on Friday (2/25) at 6 PM
  – Deadline: Wednesday (3/02) at 4:30 PM)
  – Makeup quiz – from Thursday (3/03) at 9 AM through Sunday (3/06) at 11:00 PM
    • 30% penalty
• No Pre-lab quizlet
• Be sure to visit the CLC for quiz assistance
• Practice week for Proficiency Exam
  – Will announce posting of practice quizzes shortly
  – Exam to be conducted during week of March 7 (week 10)