Balloon
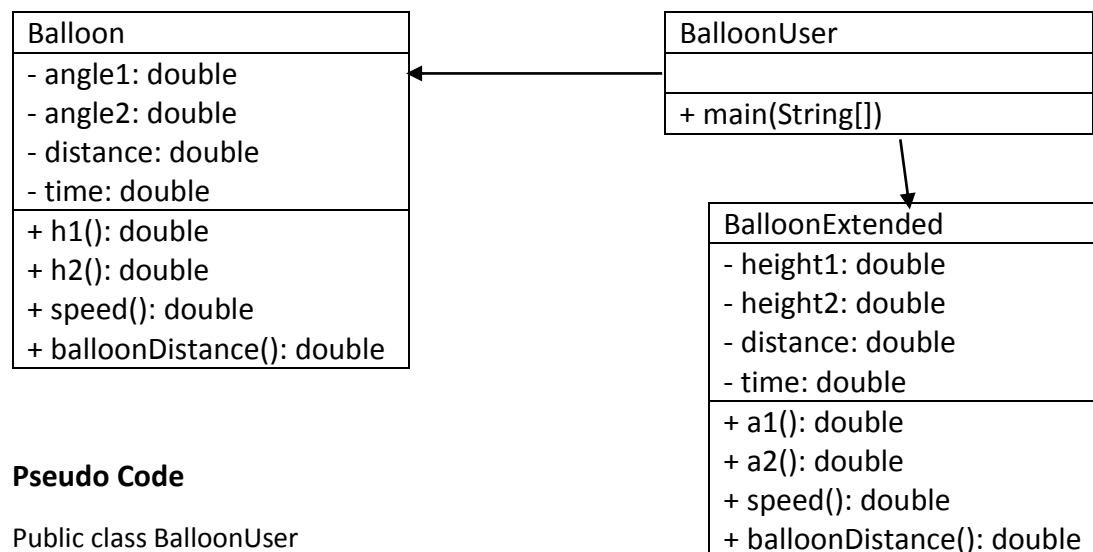
Analysis

The balloon program allows a user to input two angles of observation, and then the program proceeds to calculate the first observation height, the increase in height to the second observation, the speed of the balloon and the distance to the balloon at the second observation. The extended requirements however, allows the user to enter the two heights and then the program proceeds to calculate the two angle of observations, speed and distance to the balloon.

Design

There will be three classes; Balloon, BalloonExtended and BalloonUser. Balloon will contain four methods to calculate the four output values, as will BalloonExtended. BalloonUser will contain one method which will read in the values given by the user and pass them to Balloon. It will then output the values that Balloon or BalloonExtended calculates.

Class Diagram

Balloon
- angle1: double
- angle2: double
- distance: double
- time: double
+ h1(): double
+ h2(): double
+ speed(): double
+ balloonDistance(): double

BalloonUser
+ main(String[])

BalloonExtended
- height1: double
- height2: double
- distance: double
- time: double
+ a1(): double
+ a2(): double
+ speed(): double
+ balloonDistance(): double

Pseudo Code

Public class BalloonUser

Main = string args

      Create new scanner

      Get user choice of program

      Start IF

            1 = mode1

      End IF

      Start else

2 = mode2

End else

Method = mode1

Call Balloon class

Create new scanner

Set angle2, distance and time values

Get angle1

Start IF

State error value if not between 0 and 90

End IF

Start else

Get angle2

End else

Start IF

State error if angle2 isn't between 0 and 90

End IF

Start else

Get horizontal distance

End else

Start IF

State error if less than 0

End IF

Start else

Get time

End else

Start IF

State error if time less than 0

End IF

Start else

Create new Balloon class

Output values

End else

End

Method = mode2

Call BalloonExtended class

Create new scanner

Set height2, distance and time values

Get height1

Start IF

State error value if not above 0

End IF

Start else

Get height2

End else

Start IF

State error if height2 not above 0

End IF

Start else

Get horizontal distance

End else

Start IF

State error if less than 0

End IF

Start else

Get time

End else

Start IF

State error if time less than 0

End IF

Start else

Create new BalloonExtended class

Output values

End else

End

Public class Balloon

Create constructor

Method = h1

Calculate distance*tan(angle1)

Return value

Method = h2

Calculate distance*tan(angle2 – angle1)

Return value

Method = speed

Calculate h2/time

Return value

Method = balloonDistance

Calculate distance/cos(angle2)

Return value

Public class Balloon

Create constructor

Method = a1

Calculate arctan (height1/distance)

Return value

Method = a2

Calculate arctan ((height2/distance)+tan height1)

Return value

Method = speed

Calculate h2/time

Return value

Method = balloonDistance

Calculate distance/cos(a2)

Return value

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Testing

Test	Expected	Actual
Use integer values; 30, 50, 100 and 40	Height: 57.7 Increase: 61.4 Speed: 1.5 Distance: 155.5	Please input the first angle of elevation, it should be between 0 and : 30 Please input the second angle of elevation, it should be between 0 and s: 50 Please input the horizontal distance, it must be a positive value: 100 Please input the time in seconds, it should be a positive value: 40 The original height of the balloon is 57.735026918962575 metres The increase in height of the balloon is 61.440332340458426 metres The speed of the balloon is 1.5360083085114606 metres per second The distance of the balloon at second observation is 155.5723826860412 C:\Users\Jack\Documents\YEAR1\COMP101\Assessment 3>_
Uses real values; 14.7, 11.1, 67.43 and 44.123	Height: 17.6 Increase: -4.4 (showing a decrease in the height) Speed: -0.1 (showing a decrease in the speed) Distance: 68.7	Please input the first angle of elevation, it should be between 0 and : 14.7 Please input the second angle of elevation, it should be between 0 and s: 11.1 Please input the horizontal distance, it must be a positive value: 67.43 Please input the time in seconds, it should be a positive value: 44.123 The original height of the balloon is 17.68992934401915 metres The increase in height of the balloon is -4.460689302595045 metres The speed of the balloon is -0.101096669112696429 metres per second The distance of the balloon at second observation is 68.71548364141535 C:\Users\Jack\Documents\YEAR1\COMP101\Assessment 3>_
Use extreme values; 0, 0, 10000 and 10000	Height: 0, Increase: 0, Speed:0, Distance: 10000	Please input the first angle of elevation, it should be between 0 and : 0 Please input the second angle of elevation, it should be between 0 and s: 0 Please input the horizontal distance, it must be a positive value: 10000 Please input the time in seconds, it should be a positive value: 10000 The original height of the balloon is 0.0 metres The increase in height of the balloon is 0.0 metres The speed of the balloon is 0.0 metres per second The distance of the balloon at second observation is 10000.0 metres C:\Users\Jack\Documents\YEAR1\COMP101\Assessment 3>_
Use extreme values; 90, 90, 10000 and 10000	Height: 1.6, Increase: 0, Speed: 0, Distance: 1.6	Please input the first angle of elevation, it should be between 0 and : 90 Please input the second angle of elevation, it should be between 0 and s: 90 Please input the horizontal distance, it must be a positive value: 10000 Please input the time in seconds, it should be a positive value: 10000 The original height of the balloon is 1.633123935319537E20 metres The increase in height of the balloon is 0.0 metres The speed of the balloon is 0.0 metres per second The distance of the balloon at second observation is 1.633123935319537 C:\Users\Jack\Documents\YEAR1\COMP101\Assessment 3>_

Use the values the original program uses to see if my extended works	Angle1: 30, Angle2: 50, Speed: 1.536, Distance:155.5	Please enter 1 to enter two angles, speed and distance: Or please enter 2 to enter two heights, speed and distance: 2 Please input the first observation height of elevation: 57.735 Please input the second observation height: 61.44 Please input the horizontal distance, it must be a positive value: 100 Please input the time in seconds, it should be a positive value: 40 The original angle of observation of the balloon is 29.99998843242657 The second observation of the balloon is 72.04532276177937 metres The speed of the balloon is 1.536 metres per second The distance of the balloon at second observation is 324.3966572175393 C:\Users\Jack\Documents\YEAR1\COMP101\Assessment 3>
Test that user selecting 1 takes them to the correct program	Balloon	C:\Users\Jack\Documents\YEAR1\COMP101\Assessment 3>java BalloonUser Please enter 1 to enter two angles, speed and distance: Or please enter 2 to enter two heights, speed and distance: 1 Please input the first angle of elevation, it should be between 0 and :
Test that user selecting 2 takes them to the correct program	BalloonExtended	C:\Users\Jack\Documents\YEAR1\COMP101\Assessment 3>java BalloonUser Please enter 1 to enter two angles, speed and distance: Or please enter 2 to enter two heights, speed and distance: 2 Please input the first observation height of elevation: