CS 330 Artificial Intelligence and Game Development
Spring 2022

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Programming Assignment 2: Path Following

Objective

Your objective is to implement and test the dynamic Follow path behavior.

Requirements

Implement and test the dynamic Follow path behavior using the "chase the rabbit" algorithm, as presented in the textbook (section 3.3.12) and the slides (Lecture 8), and as implemented in the example R code. Note that implementing the Follow path behavior **will require also implementing several supporting geometry functions**, as described in Lecture 8 and also implemented in my example R code in program `CS 330, Dynamic movement, 1 Support v8.r`.

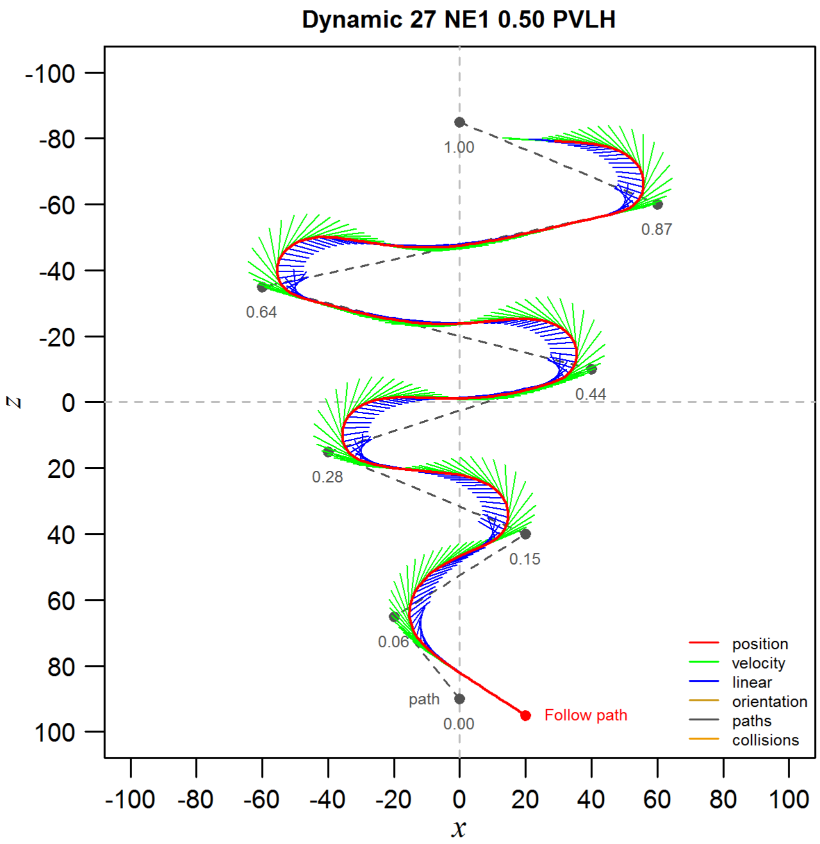
Your implementation of Follow path should be **added to your code for Program 1**. The Follow path behavior depends on and reuses the dynamic Seek behavior, movement update, and other functionality you implemented in Program 1.

Run your program for 125 simulated seconds with a time step duration of 0.5 using Newton-Euler-1 integration. Your scenario should have one character with these initial conditions:

Character number	1
Character id	2701
Steering behavior	Follow path
Initial position	20, 95
Initial velocity	0, 0
Initial orientation	0
Max velocity	4
Max acceleration	2
Path to follow	1
Path offset	0.04

The path your character should follow has eight vertices. From start to end, they are:
(0, 90) (-20, 65), (20, 40), (-40, 15), (40, -10), (-60, -35), (60, -60), (0, -85)

Your program should output each character's trajectory as a text file (.txt). The output file should have one record per character per timestep, including a record for the initial conditions (time = 0). The format of the output text file is the same as Program 1. In field 10 of the output trajectory file, the steering behavior code Follow path is 11.



Replicate, as closely as possible, the character movement trajectory shown in the preceding image. You are not required to implement a trajectory plotting program yourself; I will provide three different plotting programs (see Resources below). In fact, you are not required to plot your trajectories at all (but see recommendation 2 in Assignment-specific Recommendations below).

Deliverables

1. Source code for the dynamic movement program, including Path following
2. Trajectory data file, with trajectory data for the one character
3. (Optional) Trajectory plot image, with the one character

Grading

The assignment is worth a maximum of ten (10) points. It is 10% of your final semester grade, so each point is 1% of your semester grade. The grading rubric is as follows:

Points	Criterion
0-1	Deliverables all submitted
0-2	Software engineering quality of the program reasonably good
0-1	Movement update present and correct
0-2	Movement behavior (Follow path) present and correct

0-1	Supporting geometry and path functions present and correct
0-1	Trajectory data file in proper format and readable by trajectory plotting program
0-2	Trajectory reasonably similar to example trajectory
0-10	Total

The criteria are independent of each other (except, of course, that you cannot get any of the other points if you don’t turn the assignment deliverables in). Note that if your trajectory data file is not readable by the trajectory plotting program, the highest score possible may be 7.

Resources

All of the following have been posted to the course Canvas page in Files > Programming Assignment 2: Path Following:

1. Example R code for Dynamic Movement to use as reference. This is the same set of files provided previously.
2. Two trajectory plotting programs, one written in Python and one written in Matlab. Both of these programs are the same plotting programs provided earlier. You are welcome to use these trajectory plotting programs if you do not want to learn how to use the example R trajectory plotting program. Disclaimer: These programs were written by students, not me. You will likely need to change a couple of things to get them to properly plot this new behavior.
3. A partial example of the trajectory file for this assignment’s scenario generated by the R implementation of the assignment movement behaviors, with times 0-4 for the one character.
4. An image of the complete trajectories for this assignment, i.e., the same image as above.

Due date

See Assignments page in the course Canvas website.

Assignment-specific recommendations

(See the general instructions for general recommendations.)

1. If your Program 1 was not working properly, begin this assignment by getting it working. This programming assignment **depends on the Seek movement behavior and the movement update function from Program 1 both working correctly**.
2. Test your program by plotting your trajectory data file with one of the trajectory plotting programs that have been posted to Canvas (see Resources above). I may input your deliverable trajectory data file into my plotting program when grading your assignment. If your trajectory does not resemble mine, or if your data file is not properly formatted and thus unreadable by my program, you may not know it unless you attempt to generate the plots.
3. If you decide to team, one team member should immediately start by implementing the supporting geometry functions and testing them separately. Until they are correct, the Follow path behavior will not work correctly.

End of Programming Assignment 2