

### Project 3. Mobile Robot Path Planning Using Artificial Potential Field

**Total points: 100**

1. Design/Implement an Artificial Potential Controller to allow a mobile robot to follow/track a virtual moving target (See Project 2-Instruction, pages 2-4).
2. Write Matlab, Python, or C/Cpp code to implement your designed potential controller.
3. Write a report of the project to cover the following items:
  - a. **(50 points)** Noise free environment (robot is assumed to localize itself accurately without noise, and be able to sense target position accurately):
    - Plan the target to move in a linear/line trajectory and plot the tracking results: (i) trajectories of the target and robot, (ii) tracking error between the target and robot, (iii) robot's heading; and (iv) robot's velocity. **(25 points)**.
    - Plan the target to move in the sine wave trajectory and plot the tracking results: (i) trajectories of the target and robot, (ii) tracking error between the target and robot, (iii) robot's heading, and (iv) robot's velocity. **(25 points)**.
  - b. **(50 points)** Noisy environment (robot is assumed to be able to sense the target, but with noise ). You can use Gaussian noise model (randn function), a similar noise function in the project 1:
    - Add noise to the target position. Then, plan the target to move in a linear/line trajectory and plot the tracking results: (i) trajectories of the target and robot, (ii) tracking error between the target and robot, (iii) robot's heading, and (iv) robot's velocity. **(25 points)**.
    - Add noise to the target position. Then, plan the target to move in the sine wave trajectory and plot the tracking results: (i) trajectories of the target and robot, (ii) tracking

error between the target and robot, (iii) robot's heading, and (iv) robot's velocity. **(25 points).**

- c. Put all the source code/software in the Appendix with instruction of running the code

#### **4. Project Deadline: March 28, 2025**

- **Submit the project into Canvas:**
  - + **Submit your report in .pdf format into Canvas for convenience of grading.**
  - + **Zip all of your project files and submit into Canvas for the instructor to run your code.**
- **Code must be written by you. Do NOT use or copy code from online or other sources. Plagiarism will be 0 grade penalty.**