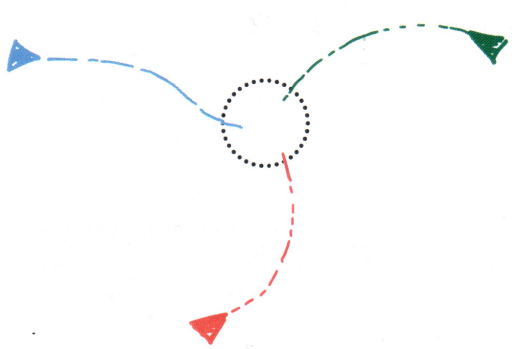
Laboratory work: "rendez-vous and tracking"

Problem: *A set of mobile robots have to agree on a rendez-vous position and, when they are in proximity to the rendez-vous point, they start a tracking task on a circular trajectory*

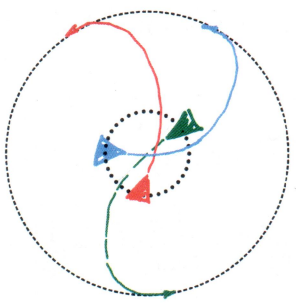
Scenario and tasks

You will have to deal with the control of three unicycle robots in an open space, with:

- **Phase 1:** consensus protocol to solve the rendez-vous problem
- **Phase 2:** regulation task from the initial position to the rendez-vous destination
- **Phase 3:** tracking task along a circular trajectory



(a) Phase 1-2



(b) Phase 3

Assignment:

Choose the scenario and the methodologies you want to explore; develop the following:

- Definition: environment and performance indexes.
- Realization of the consensus/regulation/tracking schemes.
- Results/performance analysis and discussion.

Other main issues that may be studied:

- Analysis with different initial conditions - controller gains - ...
- Method comparison.

Methodologies

Rendez-vous problem:

1. consensus protocol;
2. average consensus protocol.

Tracking control:

1. linearization of the state error dynamics;
2. non-linear controller of the state error dynamics;
3. feedback linearization based on a reference point on the sagittal axis;
4. feedback linearization based on second order derivatives.

Regulation:

1. Cartesian regulation;
2. posture regulation scheme (with singularity at the origin);
3. posture regulation scheme (without singularity at the origin).