

# Lab. Distributed Real Time Cyberphysical Systems

## Kilobot Platoon - General Requirements Definition

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- Architecture:
  - Environment
  - SoS Organization
- Communication:
  - CS-Level
  - SoS-Level
- Emergence
- Dinamicity
- Time

Environment:

**AE-1:** The kilobots shall operate on a whiteboard.

**AE-2:** An obstacle shall be located in the middle of the whiteboard

## SoS Organization:

- ASoS-1: The SoS is composed by  $N$  kilobots
- ASoS-2: The SoS is also composed by a controller that loads the program in kilobots memory
- ASoS-3: The SoS shall be a platooning among the kilobots composing the SoS
- ASoS-4: When the SoS starts, kilobots shall be positioned in a straight line, at a distance of  $D$  cm
- ASoS-5: When the SoS operates, distance between kilobots shall be maintained approximately  $D$  cm
- ASoS-6: The leader is decided before execution
- ASoS-7: All kilobots shall know leader's ID

CS-Level:

- CCS-1: Each kilobot has a RUMI to exchange messages among each other
- CCS-2: Each kilobot has a RUMI to communicate with the controller
- CCS-3: Controller has a RUMI to communicate with kilobots
- CCS-4: Each kilobot has a RUPI to estimate distances

## SoS-Level:

- CSoS-1:** Each kilobot shall use its RUMI to exchange informations about:
- Direction
  - When it is Joining the platoon
  - When it is Leaving the platoon
- CSoS-2:** When the SoS starts, each kilobot notifies to his adjacent follower he is his leader, by transmitting a message
- CSoS-3:** Each kilobot has a RUPI to estimate distance between sender and receiver

E-1: The interaction of multiple kilobots shall originate a unique platoon

- D-1: The platoon shall allow any kilobot to enter the platoon
- D-2: The platoon shall be composed of at least 2 kilobots
- D-3: The introduction of a kilobot in the platoon shall be allowed only at its tail
- D-4: The platoon shall allow any kilobot to leave the platoon
- D-5: If a leader kilobot is leaving the platoon, the immediate follower shall become leader



- T-1: Kilobot shall measure time according to a local clock
- T-2: Timely-related events shall be triggered by message exchange
- T-3: When a kilobot starts shall prepare motors for M ms