DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)

Many practical applications of mobile robots require the use of robot teams. Such teams allow faster task completion time, increased robustness, and most importantly, provide solutions to applications with multiple tasks that are inherently distributed in space and time. An example of the above are teams of mobile robots handling transport tasks in flexible manufacturing systems, warehouses or port terminals, as well as social robots delivering post in offices, meals in hospitals, or serving as guides in museums.

However, it can be observed that robots often fail to do what they are expected to do; they go the wrong way, they drive into obstacles, and sometimes they just stay in place until one figures out what went wrong. This problem becomes even more critical when we deal not with a single robot but a group of robots executing some transport tasks that require from them to move in the same area. Even if each robot knows how to perform its mission, they may may fail to do it because of a collision with another robot or mutual blocking their further routes. Some constructors try to teach robots experimentally how to avoid collisions, but some day there appears a situation that has not been foreseen and tested, and the robot again collides, comes to a deadlock, or gets lost and starts going in the direction opposite to its goal.

And now think about your calculator. It can add or multiply different numbers and never fails. Is it because its constructor showed it how to add each particular pair of numbers? No, it is because the calculator has a built-in mathematical model of addition and uses it for any arguments. This is exactly what we are going to do for our mobile robots – develop a model of correct space sharing that will modify the robot's path and/or slow down or stop it in order to prevent a collision, tell the robot when it can already continue its motion, never let it come to a deadlock, and most importantly, always lead the robot to its destination.

Since such a correct behavior can be enforced in many ways, we will also look for one that is efficient with respect to some criteria, for example allows the robots to accomplish their tasks in possibly short time.