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Sommario Recently, the problem of controlling multi-agent (in particular, multi-robot) systems has attracted increasing attention in view of their pervasive application potential, increased performances and robustness with respect to a single-robot solution. However, their application usually requires a good knowledge of the mutual position and orientation of the components of the system. A great number of techniques have been developed to achieve this result, mainly based on recursive filters, and most of them assume the knowledge of the identity of the measured robots. A still open problem is the data association between measurements and current estimates, i.e., assuming that at a given time a robot has an estimate on the pose of each of its mates and some measurements, the problem of associating each measurement to the originating robot. This problem arises when the robots are equipped with sensors unable to discriminate among different robots, such as range finders, or in adverse environmental conditions. Its impact is reflected in all aspects concerning multi-robot localization, from the formulation of the problem to its solution. For example, the presence of false positives measurements (measurements of obstacles mistaken for robots) is allowed only by this assumptions. Moreover, we will see how the static problem of reconstructing the state of a multi-robot

system from the measurements gathered from all its components admits in some particular configurations more than one solution due to the anonymity of the measurements. Last, the filtering itself using the odometry measurements of each robot cannot be performed without reconstructing the identity of the robots. In fact, the knowledge of the identity of the robot sending a given odometry would be useless without the knowledge of the identities of the current estimates. This work will focus mainly on a 2D scenario and a team of differential drive robots modeled as unicycles with the ability of sensing each other's positions. Since we want to design methods suitable for real world implementation, we will assume the presence of false positive and negatives measurements and limited field of view of the sensors. Despite the system being decentralized, we will not discuss synchronization issues, assuming that the robots move slow enough to avoid the introduction of significant error during the delay times. We will explore a number of different possibilities to solve the data association problem, from the more classical ones such as maximum likelihood criterion, to more sophisticated systems based on geometrical considerations or multi-tracking tools. An extensive experimentation will highlight the pros and cons of each method, as well as some extensions of the proposed methods dealing with different types of measurements or models will give rise to interesting considerations

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