

NEXT LEVEL INNOVATION IN ROBOTICS AND AUTONOMY

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Title: Nonlinear formation control strategies for agents without relative measurements under heterogeneous networks

The talk will be on a new algorithm on continuous sliding mode based on integral sliding mode control (ISMC) where the discontinuous part of the ISMC is replaced by continuous control. It is shown that the well-known super twisting control (STC) which replaces the discontinuous part of the ISMC acts as a disturbance observer and hence cancels the matched disturbance. As the overall controller is continuous, the proposed method is advantageous over the existing integral sliding mode control, which has a discontinuous term. Also from the practical implementation point of view, in particular for mechanical systems, discontinuous term will result in chattering which is very much undesirable. Some implementation results on a practical system and its superiority will be also discussed.

In the second part of the talk, an output feedback stabilization of perturbed double integrator systems using super twisting control (STC) will be presented. It will be shown that when STC is implemented based on super twisting observer (STO) then it is not possible to achieve second order sliding mode (SOSM) using continuous control on the chosen sliding surface. Two methodologies are proposed to circumvent the above mentioned problem. In the first method, control input is discontinuous which may not be desirable for practical systems. In second method continuous STC is proposed based on higher order sliding mode observer (HOSMO) which achieves SOSM on the chosen sliding surface. For simplicity, we are considering here only the perturbed double integrator, which can be generalized for an arbitrary order. Some Numerical simulations and experimental validation will be also presented to show the effectiveness of the proposed method.