

# **Distributed Model Predictive Control of the Multi-Agent Systems**

## **Introduction**

Interests in the cooperative control of multi-agent systems have been growing significantly over the last years. The main motivation is the wide range of military and civilian applications, including formation flight of UAV and automated traffic systems. The proposal presents a driving method that makes use of a Distributed Model predictive control and deep learning techniques for obstacle avoidance and path prediction in an unknown environment.

## **Statement of Problem**

The proposal primary focuses on the design of an effective control technique for path prediction and obstacle avoidance in unknown environments. Distributed MPC has the ability to redefine cost functions and constraints as needed to reflect changes in the system and/or the environment. Which makes the agents operate close to the constraint boundaries and obtain better performance than traditional approaches. Deep neural network learning will take in inputs for the various sensors and visual cameras to make decisions for mobile robots' safety in the predicted path. The MPC-based control will have a point-based optimization which will convert the dynamic collision avoidance problem into a static collision avoidance problem so that the prediction could be made faster and the design could be used effectively in unknown environments.

## **Objectives and Plan of Action**

The objective of designing multiple mobile robots that could be used in unknown environments could be designed in the following order.

1. Designing and simulating a Distributed MPC that could predict the path with optimal velocity and obstacle avoidance and collision among the robots as the loss function.
2. Incorporating a neural network model into the MPC design to improve the safety features while mission planning, simulating the results to compare the performance.
3. Validating the controller design in the hardware model.

## **Conclusion**

The nonlinear controller design for mobile robots with model predictive control and deep learning technique could be designed effectively and could be used for surveillance in any scenarios. The design could be used for traversing the robots to any unfamiliar environment as the proposed control can minimize the velocity in collision-prone areas. The robot would transmit voice and image from the site to the base station effectively. This design would be very effective in areas of natural disasters where direct human intervention is limited.

## References

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