

## Combined Model Predictive Controller Technique for Enhancing NAO Gait Stabilization

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**Abstract :** The humanoid robot, specifically the NAO robot must be able to provide a highly dynamic performance on the soccer field. Maintaining the balance of the humanoid robot during the required motion is considered as one of a challenging problems especially when the robot is subject to external disturbances, as contact with other robots. In this paper, a dynamic controller is proposed in order to ensure a robust walking (stabilization) and to improve the dynamic balance of the robot during its contact with the environment (external disturbances). The generation of the trajectory of the center of mass (CoM) is done by a model predictive controller (MPC) conjoined with zero moment point (ZMP) technique. Taking into account the properties of the rotational dynamics of the whole-body system, a modified previous control mixed with feedback control is employed to manage the angular momentum and the CoM's acceleration, respectively. This latter is dedicated to provide a robust gait of the robot in the presence of the external disturbances. Simulation results are presented to show the feasibility of the proposed strategy.

**Keywords :** preview control, Nao robot, model predictive control

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