ZJUDancer Team Extended Abstract

Shuai Wang, Shuaichen Zhang, Yiyao Zhou, Yike Shen, Xinning Wu, Yiran Wang, Xianmin Huang, Yubo Chen,Yifang Sun, Hao Su, Zhongxiang Zhou, Rong Xiong

College of Control Science and Engineering, Zhejiang University, Hangzhou, China

1 Lessons Learned and Major Problems to Be Done

1.1 Hardware Part

In previous RoboCup competitions, our circuits often encountered issues after falls or collisions. This seriously affected the performance of our robot, compared to other teams that hardly experienced circuit crashes throughout the competition phase. Last year, after studying designs from other teams, we simplified our circuit setup, but problems still occurred in certain situations. This year, we will further optimize the circuit design to improve stability. Also, mechanically, we discovered in last year's competition that the limits of some joints in the robot's legs were too small, restricting the robot's leg movement and affecting its maximum stride during walking. This year, we plan to appropriately increase these limits to improve the flexibility of the robot in movement.

1.2 Software Part

In terms of localization, we feel that there is still room for improvement in the current particle filter-based localization system. Last year, we tried using visual-inertial odometry, but the data showed significant fluctuations in certain environments, and the stability did not meet the competition requirements. This year, we plan to further improve its numerical stability so that it can be used in competition. In terms of the robot's movement, we have previously used a ZMP preview-based method, which is mature but somewhat outdated. Going forward, we plan to develop a control method based on MPC (Model Predictive Control) to enhance the robot's movement capabilities. Additionally, in previous competitions, our robot required a full reboot after being picked up, during which we had to connect with an Ethernet cable, power on the host computer, and so on, wasting a lot of time. This year, we plan to add power detection so that when the robot detects a servo power loss, it will automatically restore to its initial state in the program. This way, a full reboot of the robot can be achieved simply by restarting the lower-level power, saving time on connections.

2 Plans to Be Implemented and Current Status

As previously described, on the hardware side we have identified a number of current issues and set out to address them. These are issues that we intend to

address before the 2025 competition and make them effective for competition. Currently, for the circuitry section, we have reconfigured our circuitry section to improve stability. For the mechanical part, we have already increased the limit ranges of the robot's leg joints and are currently testing the effects. For the software part, we are currently testing the optimized visual-inertial odometry. The code for the MPC controller is still being debugged. The work on the power detection module has not yet started. In addition to this, we have set up the reinforcement learning framework and started training, but it will not be applied in the competition in the near future.