

Extended Abstract of Team ZJUDancer

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Abstract. This extended abstract presents some lessons learned from the participation in the previous RoboCup competition. And we highlight some major problems the team is trying to solve for the upcoming competition. Also the plans of the major changes the teams anticipates to have implemented by the RoboCup 2020 competition are shown. Finally, we describe the status of implementation of the planned changes by the time of submitting the application.

Keywords: lessons · problems · plans.

1 Lessons from the Previous RoboCup Competition

Foot force sensor This year we add foot force sensor, however, we did not design a good protective measure for the foot pressure sensor, which caused the foot pressure sensor to be damaged frequently during the competition.

Motion During the game, we found that our kicking movement was slow compared to other teams, which wasted a lot of time in the game, and we were unable to cancel the kick when the ball was no longer in the corresponding position. The stability of the walking motion generated by our gait engine is better, but during the walking process, the upper body has obvious sway, which will affect the visual function and localization of the robot.

Vision and localization During the game, we have some visual detection mistakes, such as detecting white objects outside the field as balls. The drift phenomenon of imu is obvious, resulting in a larger drift of the direction of the robot.

2 Major problems

The major problems our team is trying to solve for the upcoming competition are listed below. The first problem is that the drift of IMU, which will result in the drift of the direction of the robot. The second problem is that our kicking movement is not good enough. The kicking distance is closer than other teams. And the speed of kicking is not fast enough. The third problem is that the

walking stabilizer need to be more robust. Now our robots' walking performance on the flat floor is good, but the performance on uneven ground is not good enough, especially when there is a collision during the game. The fourth problem is the detection mistakes of balls. During the last competition, our robots has repeatedly identified objects outside the field as balls. The last problem is to improve our robots' behavior or teamwork strategy. During the last competition, we have tried some easy pass strategy. We hope to make the strategy more effective and adapt to multiple situations.

3 Plans

IMU We plan to replace our IMU and try to improve the drift of the IMU. Also, we are going to try to improve the performance of the gait odometer by using IMU to fuse other sensors.

Motion We plan to develop a stabilizer for the kicking process. We plan to develop the PID or MPC controller using the IMU and servo data as the feedback. Also, we will research the trajectory planning of the hanging foot. This involves dynamic analysis of the collision between the robot's foot and the ball. By optimizing the trajectory of the hanging leg, the fastest ball speed can be achieved. We plan to calculate the upper body pose of the robot through the IMU data feedback to control the angle of the hip joint to achieve the purpose of making the upper body stand upright.

Vision and localization We plan to improve our vision recognition model to avoid misdetection. Also, we plan to do more line detection and matching which is beneficial for the localization. And we will develop camera while balance adjustment automatically to adapt to natural light. We plan to do more targeted strategies, such as using different localization strategies for robots in different roles (striker, defender..). And the recognition of enemy robots will be done. Then the information sharing among robot will be strengthened such as ball position and robot position.

4 The status of implementation of planned changes

At present, we have completed the selection, circuit design and data testing of the new IMU, and will be testing the new IMU on the robot. The stabilizer for kicking the ball has been completed and is being tested, and related research on trajectory planning is underway. The walking upper body pose controller has been completed and is being tested. The optimization of the visual recognition model is in the process of collecting and calibrating the data set. The identification of the enemy robots has been completed, and the line detection and matching on the edge of the field is being studied. In addition, the mechanical design of the goalkeeper has been completed, and physical production is underway and will be tested soon.