

UTRA Extended Abstract

RoboCup 2022 Humanoid League (KidSize)

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1 Lessons Learned From Previous Competitions

In the RoboCup 2021 competition, we had recently made numerous changes to many of our core software components such as our strategy framework, walking engine, and computer vision modules. These changes were also made very close to competition and had not enough time to thoroughly test both in isolation and integrated together. This caused numerous problems within the robot such as unstable walking and false positive object detection.

Another major problem we faced was not enough testing within the competition simulation environment and improper testing setup caused us to not notice these problems until midway through the competition.

For example, if our docker was started before the simulation environment the initial IMU values would indicate that the robot was falling back-wards, triggering our trajectory for getting up.

2 Cheaper Custom Servo

Our plan and progress is similar from 2020 to develop servos with specs comparable to Dynamixel MX64s[1]. Initially we planned to re-purpose hobby servos, we have pivoted to using brush-less motors and designing new gearboxes. The success of this project has yet to be determined.

3 Feedback from Pressure Sensors

Our plan and progress is similar from 2020 to integrate pressure sensors into the feet of the robot and to integrate pressure data into the robot's control systems. We are currently testing prototype designs and expect to have the sensors integrated before the competition.

4 Software Improvements

We plan to develop our strategy framework more and integrate team communications for better coordination. We also plan to use advanced machine learning and AI techniques to improve the stability of the robot's gait, and develop a dynamic kicking engine. Our simulation environment in webots includes all major components such that our software can be deployed without any changes in both the robot and the simulation. We have started the process of tuning the simulation parameters to make it correlate better with real-world results.

5 Research Interests

Object Detection

One of our current research interests lie in computer vision and object detection tasks. We are exploring ways to improve upon current solutions such as [3] by changing neural network architecture or the training methods.

Reinforcement Learning

One of our current research interests lie in reinforcement learning and using Isaac GYM to train agents to learn various skills needed for Soccer.

References

1. *UTRA Extended Abstract Robocup 2020*. Available online at https://submission.robocuphumanoid.com/uploads//UTRA_Robosoccer-tdp-5e533ac29ed6f.pdf
2. *GitHub*. 2015. *wojtusch/DDSServo*. [online] Available at: <https://github.com/wojtusch/DDSServo> [Accessed 2 Dec. 2019].
3. *Towards Real-Time Ball Localization using CNN*. RoboCup 2018: Robot World Cup XXII. Springer (2018).