RoMeLa UCLA AdultSize Extended Abstract 2023

Colin Togashi, Gabriel Fernandez, and Dennis Hong

University of California, Los Angeles, Los Angeles CA 90095, USA
{ctogashi, gabriel808, dennishong} @ ucla.edu
http://www.romela.org

Abstract. Using lessons learned in 2022, RoMeLa UCLA plans to participate in Robocup 2023, bringing two ARTEMIS platforms to compete in the soccer competition. Overall improvements to the software mainly in the forms of locomotion and vision have been made to further enable soccer behavior.

Keywords: ARTEMIS · RoboCup · Humanoid

1 Lessons Learned

RoboCup 2022 marked the return of RoMeLa to competing in the AdultSize humanoid soccer competition [1]. As a result, a number of lessons were learned both on and off the field. The two major takeaways were the importance of fast, robust locomotion to required to play soccer and the necessity of reliable vision, specifically the ball position relative to the robot. All soccer behavior must be based on a stable locomotion stack. Without the ability to move omnidirectionally unassisted, more complex gameplay simply cannot be achieved. Furthermore, the success of a robot in the AdultSize league is largely dependent upon how fast it can move. The faster the robot, the higher likelihood it will succeed. For vision, it was underestimated at what level of reliability was needed to compete. This was expected on the first year of return, however, moving forward, a much larger emphasis on consistently and accurately determining the ball position needs to occur to achieve success.

2 Planned Changes

For the upcoming competition, the changes can be split into hardware and software upgrades. Only a few hardware upgrades were made as most of the improvements were aimed at locomotion and vision algorithms.

2.1 Hardware

The main upgrade to the platform was a change in the inertial measurement unit (IMU) used. During the last competition, the Microstrain 3DM-GX5-25 experienced a noticeable lag between any accelerations and the actual measurement

(around 40ms). This adversely affected the estimation and the overall stability of the locomotion. As a result, ARTEMIS will now use the Microstrain 3DM-CV7-AHRS with the magnetometer disabled. As of writing, the estimator has been reimplemented with the new IMU and shows much more promising results. The measured latency has been reduced to around 10ms with plans to further experiment if this can be reduced.

Otherwise, the platform has remained relatively unchanged. However, RoMeLa plans to fully complete another ARTEMIS platform for a total of two ARTEMIS robots competing in the next competition. This should ease maintenance and logistics as only parts for a single type of robot will be needed as opposed to the previous year. Manufacturing on the second unit is ongoing.

2.2 Software

The main problem of the last competition was the fact that ARTEMIS could barely achieve assisted locomotion at the venue, let alone perform soccer based tasks such as dribbling or kicking. As such, the main focus since the last competition has been to reorganize and improve the overall locomotion stack on the robot. Large efforts have been made to properly tune the whole body controller, footstep planner, and swing leg trajectories. This has allowed ARTEMIS to exhibit much more stable walking, including a walk outside around the UCLA campus and indoors over uneven terrain. Further improvements to the walking control stack including contact based phase adjustments to the gait schedule and more compliant foot touchdowns are ongoing and expected to be completed for the competition.

Concurrently, the vision system has been improved by further training the convolutional neural network on the previous competition data. Since the dataset used was the main limiting factor, there are plans to set up a practice field with the regulation dimensions in order to gather more images before the actual competition. With this setup, the vision algorithms should be able to train in a more realistic environment.

3 Conclusions

Team RoMeLa looks forward to participating at Robocup 2023. The team expects to complete the proposed changes by this summer to provide more interesting and exciting game play during the competition.

References

1. M. Ahn, T. Zhu, and D. Hong. “RoMeLa Extended Abstract for Robocup 2022 Humanoid League”. In: Humanoid League Team Descriptions, RoboCup 2022, Bangkok (June 2022)