

# RoMeLa UCLA AdultSize Extended Abstract 2024

Mingzhang Zhu, Colin Togashi, and Dennis Hong

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

**Abstract.** Applying insights gained in 2023, RoMeLa UCLA intends to join RoboCup 2024 with two ARTEMIS platforms for soccer competition. Hardware adjustments will focus on stabilizing wiring connection and debugging abrupt hardware failures. A lot of improvements to the software would be implemented in every modules including vision, planners, proximity detection, etc. to further enhancing robot’s performance.

**Keywords:** ARTEMIS · RoboCup · Humanoid

## 1 Lessons Learned

Team RoMela returned to RoboCup 2023 with two ARTEMIS platforms competing at the same time [1]. As a result, a number of valuable lessons were learned to improve overall soccer behavior. A main limitation that prevented fluid game flow was constant collisions and misidentification of the ball and landmarks. To this end, improving both the vision detection pipeline and the collision avoidance algorithm are imperative to maintain higher walking speeds and enabling more competitive play. At the higher level, noise heavily affected current planners which often ended in persistent locking loops. In addition, a standing kick was developed too late in the timeline to be effectively used in the strategy. Finally, maintaining a stable code stack and better code testing practices are needed to ensure the robot’s optimal performance during competitions.

## 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 vision, localization and path planning algorithms.

### 2.1 Hardware

During the last competition, both ARTEMIS platforms experienced a noticeable amount of collapses, which significantly affected the gameplay progress.

The root cause was unknown at the time, but found to be a result of various factors, including loose batteries connection points, joint limit errors, and cables becoming loose. As a result, small design improvements aimed at reliability and easier testing will be implemented to enhance hardware stability. On the whole, however, both platforms remain relatively unchanged from last year.

## 2.2 Software

One of the main problems of the last competition was the fact that ARTEMIS struggled to stably recognize other robots and avoid collisions, leading to either frequent pushing violations or simply standing still. This prevented the amount of time the robot actually could participate in a game. As such, our focus moving forward is on developing a stable and efficient proximity detection algorithm to ensure compliance with pushing rules and enable efficient movement when surrounded by other robots.

For vision, we plan to train convolution neural network with a large amount of actual data. In the lead up to last year’s competition, the network was trained in environments that did not truly represent the competition conditions as no indoor practice field was available. To achieve this, we will set up a half practice field to gather more images before the actual competition. The vision system will be trained to recognize other robots, or potentially supplemented by the proximity detection system. A large weakness of the vision system during the last competition was the false detection of soccer balls. To tackle this issue, we aim to filter out these anomalies by establishing a correlation between ball size and relative distance.

Meanwhile, a large drawback of the current path planner caused non-smooth trajectories and erratic movement due to various sources of noise. To ensure this doesn’t happen again, various bug fixing including testing with more noise and on the practice field are being explored to enhance robustness. Additionally, comprehensive consideration of all scenarios and timing will be implemented to avoid the robot getting stuck in one place indefinitely. Overall strategy will try to leverage a standing kick that was developed too late in the timeline to be used effectively last year.

## 3 Conclusions

Team RoMeLa looks forward to participating at Robocup 2024. The team expects to complete the proposed changes by this summer to provide more interesting and exciting game play during the competition.

## References

1. C. Togashi, G. Fernandez, and D. Hong. “RoMeLa Extended Abstract for Robocup 2023 Humanoid League”. In: Humanoid League Team Descriptions, RoboCup 2023, Bordeaux (July 2023)