# RoMeLa UCLA AdultSize Extended Abstract 2025

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**Abstract.** Applying insights gained in 2024, RoMeLa UCLA intends to join RoboCup 2025 with two ARTEMIS platforms for soccer competition. Hardware adjustments will focus on improving the robustness of the system to falls. Improvements to the software would also be implemented, particularly in modules including high level planning, proximity detection, trajectory planning, etc. to further enhance robot's performance.

Keywords: ARTEMIS · RoboCup · Humanoid

# 1 Lessons Learned

Team RoMela returned to RoboCup 2024 with a strong performing system allowing us to take first place in our league[1]. While there was much to be proud of, including our vision and localization modules, there were still a number of issues experienced which kept ARTEMIS from reaching its full potential. These were namely a functional lag which caused overshoot in our path planning algorithm and a high level strategy which was primarily tuned for individual play. As the competition becomes more advanced it is crucial that we improve our efficiency in order to stay competitive. We plan on doing this primarily through more streamlined path generation and using cooperative teamwork between the two players to better control the field, in a similar way to how human players do. We also saw that on the hardware side we experienced significant downtime in games due to repairing damages sustained during falls.

# 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 high level and path planning algorithms.

#### 2.1 Hardware

While we had significantly fewer falls in 2024 than we had in 2023, we still experienced a considerable number which was often disruptive to our game play.

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In the future we would like ARTEMIS to stand itself up after a fall, but even before that we need to ensure that ARTEMIS can handle a fall without sustaining significant damage. Our hardware improvements here will be focused around making more robust feet, shoulders, and necks for our system. Further consideration will be given to protecting key electrical pieces such as the ZED camera and the computer.

#### 2.2 Software

For our 2024 season we were able to setup a test field which proved to be crucial in forming and stabilizing our software stack. While the stack was robust to complete the basic tenets of the game it was far from optimized. Many edge cases and more complex play strategies were not able to be properly integrated into the behavior tree governing the high level control. We are planning on further exploring our passing algorithm to allow our stack to plan future moves based off of the current state of the game and generating predictive defensive strategies and then robustly communicating these plans to its teammate. This way we can engage in more human-like play.

Our other main area of development is attempting to make our stack, particularly our trajectory generation, robust to lag. Last year we saw significant differences in play quality when switching between tethered and wireless play. During wireless play using the game controller computer and the provided game wifi we saw significant overshoot which we also did not see on our home network. We were unable to debug this issue at the venue and will expect a similar issue this year. For this reason it is crucial to make our mid-level planner to be as efficient as possible to ensure the effects of lag are minimal.

Lastly we will continue development on our locomotion stack. This is primarily to continue to improve the overall stability of the system and to generate more effective and tuneable kicking trajectories. There may also be consideration for damage reduction motions when falling is detected to help mitigate any fall damage.

### 3 Conclusions

Team RoMeLa looks forward to traveling to Brasil to compete in Robocup 2025. The team expects to complete the proposed improvements by the summer and to demonstrate new and exciting game play during the competition.

# References

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