Blenders Football Club: Extended Abstract
RoboCup Humanoid KidSize Soccer 2025

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Abstract. This extended abstract outlines the lessons learned from the Blenders FC's participation in RoboCup 2025. In addition, it highlights the major challenges that the team has faced and is actively addressing in preparation for the upcoming competition. It also details the planned improvements and provides an update on the current implementation status of these changes.

Keywords: Humanoid · Soccer · RoboCup.

1 Lessons learned

Blenders F.C. is the humanoid soccer team of the Monterrey Institute of Technology, Campus Guadalajara, Mexico. The team had its first participation as the only Mexican team in the category in Eindhoven, The Netherlands, in July 2024. During this edition, the team had the opportunity to experience the environment of an international competition and faced several challenges. The most significant lessons learned included understanding the logistics of the competition, recognizing the importance of localization, and gaining insight into the state-of-the-art technologies and strategies employed by other competitors. During their second participation in Salvador de Bahía, Brazil, the team was able to provide more stable detection and behavior, thanks to the new improvement in their computational hardware.

Additionally, during this last edition the team identified several areas for improvement concerning hardware and resource requirements, including the need for additional batteries, more powerful chargers, and spare gears and actuators for damaged OP3 robots[1], as well as the need to fall-proof the main computational modules along with any spare electronics necessary in case something fails during a match.

2 Major problems

The continuous learning and improvement for the team stems from the observation of problems during the 2025 competition.

As a small team with new hardware changes, software development could not develop as much as the team would hope until the new Jetsons arrived, a month before the tournament. Given this, one of the tasks that lost priority was localization, focusing on the change of hardware and reinforcing the detection models. During the competition, the importance became evident, as time was lost due to penalties, and a disadvantage emerged because the robots lacked the knowledge of their specific position in the field, although now detecting the goals gave them a slight sense of direction.

The first problem was caused due to the transportation of the robots, as we started to check the electrical components and noticed that some of them were unsoldered into the board and could possibly cause a power malfunction if tried to use the robot.

One of the main problems from last competitions was the lack of computer power specially required for vision tasks, for an improvement this year we changed from an Intel NUC to a Nvidia Jetson Nano what allowed greater processing speeds, however the board came in just a couple weeks before leaving for the competition causing to have very limited time to make a proper testing and configuration with the new boards.

3   Major changes

The team keeps on working and improving our algorithms, the first major change is the implementation of a YOLOv12 Tiny model [2] to identify soccer balls and goalposts, as well as other robots, using the new capabilities of the hardware.

Furthermore, changes like the implementation of localization for the robots are in progress by the time this application is submitted, but projects to be fully tested for the XVII Mexican Robotics Tournament, which will take place in April. At this moment, the team has made advances implementing ORB SLAM as well as feature detection on the field, planning on merging them with the IMU data to develop the new localization algorithm.

The main change in the architecture was a switch from using Finite State Machines to Behaviour Trees, that allowed for simplicity and modularity for the description of the required robot behaviour based on a series of internal and external conditions.

One of the last important changes being made is the transition from ROS to ROS2 in the system.

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