ITAndroids Humanoid
Extended Abstract for RoboCup 2024

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Abstract. ITAndroids is a robotics competition group associated with the Autonomous Computational Systems Lab (LAB-SCA) at Aeronautics Institute of Technology (ITA). ITAndroids is a reference team in Latin America, having won more than 75 awards in robotics competitions in the last 12 years. In 2017, the team developed the Chape humanoid robot and built four units to participate in RoboCup Humanoid KidSize for the first time. Since then, the team has been evolving the robot's hardware and software while participating in many competitions, especially RoboCup and the Latin American Robotics Competition (LARC). The team also designed the Chape G2 robot, the second generation of Chape, which is currently under construction and testing. This work describes our recent development efforts for RoboCup 2024.

1 Lessons learned in previous RoboCup competitions

During the RoboCup 2023 competition, the team realized that one way to avoid false positives from computer vision would be to annotate images during the competition itself. Furthermore, the version of YOLO used in competition by ITAndriods was v3, showing difficulty for robots to recognize the ball from a distance equivalent to half the field, while other teams with more recent versions of YOLO could detect the ball at long distances, thus making us understand the need to migrate the software to new versions of YOLO.

Another difficulty that the team faced during previous matches of the competition was that in some moments when robots fell, one of the arms ended up disconnecting one of the servos during the lifting movement, showing that they needed to have greater length than the other wires.

Finally, we also noticed that the team's robots spent a lot of time searching for the ball because they made very large turns during the search, in addition

to using a stride that could be accelerated. Another thing learned was that the team's robots had previously had difficulty responding to GameController commands and this should be corrected.

2 Major problems that the team is trying to solve

As per lessons learned from other competitions and new updates made available, the team's robots are migrating from ROS1 and Ubuntu 20.04 to ROS2 and Ubuntu 22.04, respectively. Furthermore, we are looking to improve object recognition using auto-annotation, in addition to of course updating the YOLO version.

Other modifications intended by the team are to reduce angular inaccuracies of manually folded pieces, create a new goalkeeper behavior so that he defends by going after the ball if it is at an appropriate distance from the goal and improve the calibration of the joint position, since the current calibration of the team's robots team easily undergo changes with small impacts and vibrations.

Furthermore, another objective of the team is to develop the Chape G2 robot, an equivalent to the team's current robots but with a larger size, given that over the years the team's robots have proven to be one of the smallest in the competition and consequently be more easily knocked over when they touch other robots in the field.

It is worth highlighting that of all these modifications intended by the team, those that are scheduled to be completed in time for RoboCup 2024 are the complete migration to ROS2, reducing false negatives with self-annotation, development of new goalkeeper behavior, and reducing mechanical inaccuracies with the use of screws to obtain right angles on the mechanical parts instead of bending the aluminum. Another objective for the next competition is to have finished the design of the Chape G2's electronic and mechanical parts.

Of these modifications intended to be finalized by the next competition, We have currently completed adding some of the screws to obtain right angles on the mechanical parts and the new goalkeeper behavior has already been created and tested. The remaining objectives are still in the development phase since November 2023.

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