

ITAndroids Humanoid

Extended Abstract for RoboCup 2023

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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 over 60 awards in robotics competitions in the last 10 years. In 2017, the team developed the Chape humanoid robot, and built four units to participate in RoboCup Humanoid Kid-Size 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 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 2023.

1 Lessons learned in Previous Competitions

We highlight some lessons learned in RoboCup 2022 and Latin America Robotics Competition (LARC) 2022:

1. Do not over downscale your image resolution for neural networks. During RoboCup 2022, we downscaled the image too much. This caused the ball not being found accross the field, as it was too far away.
2. Using tools to aid with calibration is very fruitful. We built a support stand for the robot and used it to calibrate the zero of the joints. This, along with using a set square to verify alignment of pieces, reduced the workload of calibration and resulted in better results in LARC 2022.
3. Our robot always kicks with the same leg. This causes overloading of the other leg, responsible for support of the entire robot. Also, it would be faster to use the most appropriate leg, as done by CIT Brains [1].

4. The use of notebook like power supplies is not very reliable. Using a CCTV power supply we used at LARC 2022 is more reliable and flexible.

2 Solutions being implemented

We highlight some solutions already implemented or being implemented in our robot team:

1. We have already doubled the resolution of the image used in our neural network and found much better results at LARC 2022.
2. The kicking algorithm is already able to handle the selection of the other leg to kick. But we need a criteria to decide which one to use.
3. During LARC 2022, some aluminium pieces broke. We are recovering the knowledge of their manufacturing.
4. The Bios settings often reset in our Intel NUCs. This makes it so they do not boot automatically when powered and the power button is inaccessible while they are inside the robot. Changing the CMOS battery has given mixed results, working for some, but not all NUCs. We are still looking for a definitive solution.
5. We are upgrading our code to Ubuntu 22.04 and ROS 2 from Ubuntu 20.04 and ROS 1. This is requiring a restructure of our code along many other undergoing changes.
6. We have designed a new generation of robots, which will have 65 cm of height (our current robots have 53 cm), stronger servos (XM-540), and a faster main computer (Intel NUC i7).
7. The CAD of this new generation is now finished and we have already manufactured arms, legs, torso, camera support, and feet. Only the parts that will be welded or that are used as connectors for robotic joints are missing.
8. The PCB for the new robot had been designed but they had design problems. We redid their design and we are reviewing the new PCBs.
9. We hope to finish the manufacturing of a prototype soon in order to test it in RoboCup 2023.
10. We are refactoring and fixing our localization code. We will test it during the Virtual Season 2022/23 along with using new features and improvements in the detections of other features such as the lines and the field boundary that have already been made.

Acknowledgment

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References

1. Y.; et al Hayashi, R.; Hayashibara. Cit brains (kid size league). In *RoboCup Qualification*, 2019.