WF Wolves – Humanoid KidSize Team Description for RoboCup 2022

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Abstract. In this team description paper the team WF Wolves, their robots and the current research status are introduced. Additionally the fields of research, the developed software and future work are illustrated. Hereby WF Wolves apply for participation at the RoboCup 2022 for **Team Competition** in Bangkok, Thailand.

1 Introduction

The team WF Wolves is from Wolfenbuettel, Germany and is supported by the Ostfalia University of Applied Sciences. We are a interdisciplinary student working group, where Bachelor, Master and Ph.D. students work together from different disciplines such as Computer Science, Electrical Engineering and Mechanical Engineering. Since 2014 we are working with our adapted version of the Nimbro-OP based platform [2] successfully. In Hefei (KidSize/TeenSize) and in Leipzig (Teen-Size) we were ranked second place within the Technical Challenges. Further in 2017 we ranked second in the new Drop-In Challenge category at the RoboCup World Championship in Nagoya, Japan. Together with the Hamburg Bit-Bots we made the fifth place in TeenSize at the Iran Open in 2017. Sadly during the COVID-19 pandemic we worked on a simulation approach using pybullet and weren't able to adapt our work to Webots in time. In this paper we want to give an overview of our challenges in RoboCup and how we are trying to overcome them. Thereby we intend to participate at the RoboCup 2022 for Humanoid League, KidSize.

2 Lessons Learned and Problems

On the last Robocup soccer competition, 2019 in Sydney Australia, we participated as a joint team with the Bit-Bots in the Teen- and KidSize league. While the Bit-Bots core team focused mostly on KidSize league, we focused on TeenSize League while still being able to exchange robots between leagues comfortably. Due to the shutdown of TeenSize League, we as a joint team, decided to participate as each team on its own as we wanted to increase playing experience. As a downside we are not able to exchange robots between our teams anymore.

Hence our team needs to close the gap between the numbers of players from the abandoned TeenSize to KidSize League. Certainly one of our goals is to maintain the information sharing and experiences we have gathered between our teams. But since small differences exist, we agreed on trying out different approaches for evaluation, further we have to keep and even improve the usage of specified interfaces even more using a common ROS based framework [3].

3 Major Changes and Status of Implementation

With the introduction of artificial grass, the walking became a huge challenge for us. Besides mounted studs [5], one of our robots has weight cells mounted under the foot plates. During the COVID-19 pandemic we updated our internal workflow with support of simulations. However much of our embedded servo routine including PID-controllers and robot motions were legacy code. To introduce simulation and improve maintainability as well as interchangeability we switched to new motor controllers and walking algorithms among others according to ROS standard. Instead of using an overengineered and nearly unmaintainable python script, the robot behavior is now realized via FlexBE[6], a framework to design complex robot workflows also used in DARPA and ARGOS challenges. Thus we are able to build, analyze and adapt our robot behavior more easily. Currently we evaluate the usage of a new camera, therefore the used Logitech C920 HD Pro Webcam will be replaced by the Blackfly S USB3 by Flir which provides 3.2 MP in color to improve the image capturing process. Additionally tensorflow and neural networks are used to detect balls, field lines and goal posts [4]. In this field, especially in cooperation with the Bit-Bots we want to evaluate multiple approaches. Regarding classification of images, the Bit-Bots Imagetagger is used [1]. To be able to participate in the KidSize league we are increasing our robot count to five robots in total. This enables us to provide a full team as well as the option to have one spare robot with experimental hardware.

References

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