RoboCup 2023 Submission Survey

Survey response 1

Software

Team Name
Rhoban Football Club

Is your software fully or partially OpenSource. If so, where can it be found:
https://github.com/Rhoban/kid_size

Do you have a kinematic or dynamic model of your robot(s)? If so, how did you create it (e.g. measure physical robot, export from CAD model)?
Model is created from CAD design on onshape. We develop a software to build URDF from onshape assembly (https://github.com/Rhoban/onshape-to-robot)

Are you using Inverse Kinematics? If so what solution (analytic, (pseudo)inverse jabcobian, etc...) are you using?
We currently use analytical inverse kinematics but we are switching to a numerical approach based on Quadratic Programming, which is equivalent to jacobian pseudo inverses subject to inequality and equality constraints

Are you simulating your robot? If so what are you using simulation for?
We use pyBullet as a viewer and physics simulator, but we can hardly get reliable simulations with that

What approach are you using to generate the robot walking motion?
We programmatically craft (cubic) splines parametrized by walk orders and many hand-tuned parameters. We are considering switching to a linear MPC for the trajectory of CoM, which will be controlled using the above-mentionned QP controller.

What approach are you using to generate motions for standing up?
Standup motions are currently generated using hand crafted splines

What approach are you using to generate kicking motions?
Kicking motions are currently generated using hand crafted splines

Do you use any other motions than the previously mentioned? If so, what approaches are you using to generate them?
The stand up motion is generated using hand crafted splines. The head motion is generated in order to track objects, scan efficiently around for features or for the ball, and to protect the head in case of falling

Which datasets are you using in your research? If you are using your own datasets, are they public?
We use our own datasets

What approaches are you using in your robot's visual perception?
We use Yolov5, trained over our own datasets

Are you planning with objects in Cartesian or image space? If you are using Cartesian space, how do you transform between the image space and cartesian space?
We have an intrinsic camera model and use extrinsic robot pose estimation to store everything in the robots world frame. This is what is used for planning. We do the transformations using the classical pinhole equations.

How is your robot localizing?
We use a custom particle filters based on observation produced by Yolo (goal posts, line Ts and Ls, center circle, penalty marks)

Is your robot planning a path for navigation? Is it avoiding obstacles? How is the plan executed by the robot (e.g. dynamic window approach)?
Yes, we use A* on a graph built over the obstacles and follow a point at a constant distance from the robot along the shortest path trajectory

How is the behavior of your robot's structured (e.g. Behavior Trees)? What additional approaches are you using?
We use hierarchical state machines. Some parts of the behavior like footstep planning is delegated to (deep) reinforcement learning

Do you have some form of active vision (i.e. moving the robots camera based on information known about the world)?
When we look at features we remember where the ball is in the robots world frame so that we can look at it later on

Do you apply some form of filtering on the detected objects (e. g. Kalman filter for ball position)?
We use some custom filtering, but not well established filters like Kallman

Is your team performing team communication? Are you using the standard RoboCup Humanoid League protocol? If not, why (e.g. it is missing something you need)?
No we are not, mostly for lack of time and investment on that particular aspect

Please list contributions your team has made to RoboCup
Rhoban FC participated to 8 different RoboCup in KidSize - 2022: 2nd Regular tournament - 2019: 1st Regular tournament, 1st Drop-In, 1st Technical Challenges - 2018: 1st Regular tournament, 1st Drop-In - 2017: 1st Regular tournament, 1st Drop-In, Best Humanoid Award - 2016: 1st Regular tournament - 2015: 3rd place - 2014: Quarter finals - 2013: - 2011: First participation

Please list the scientific publications your team has made since the last application to RoboCup (or if not applicable in the last 2 years).
Loic Gondry, Ludovic Hofer, Patxi Laborde-Zubieta, Olivier Ly, Lucie Mathé, Grégoire Passault, Antoine Pirrone, and Antun Skuric. Rhoban Football Club: RoboCup Humanoid KidSize 2019 Champion Team Paper. oct 2019.

Please list the approaches, hardware designs, or code your team is using which were developed by other teams.
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What operating system is running on your robot and which middleware are you using (for example Ubuntu 22.04 and ROS2 Galactic)?
Robot OS is Ubuntu 22.04 on Intel NUC, no middleware.

Is there anything else you would like to share that did not fit to the previous questions?
We think picking random balls is of little scientific interest, since the vision is mainly solved by state of the art methods like Yolo that require almost no code to be written.

If you have a description document of your software you would like to share, you may do so here.

filecount - If you have a description document of your software you would like to share, you may do so here.
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