Software Survey 2026

Team name

Tsinghua Hephaestus

Which division(s) are you applying for? If your used software differs between divisions, please fill out the survey once per division.

Large Size (height < 190 cm, weight < 80 kg)

Is your software fully or partially OpenSource? If so, where can it be found?

Yes□https://github.com/BoosterRobotics/robocup_demo.git

Are you using any software developed by other teams? If so, list every component that you are reusing and the team that originally developed it.

No

Are you using any datasets in your research? If you are using your own datasets, are they public?

No

Please list the scientific publications your team has made since the last application to RoboCup (or if not applicable in the last 2 years).

IROS2025□Chen, P., Wang, Y., Luo, C., Cai, W., & Zhao, M. (2025). Hifar: Multi-stage curriculum learning for high-dynamics humanoid fall recovery. arXiv preprint arXiv:2502.20061. (IROS2025 Accept, oral)
ROBIO2025: Luo, C., Wang, Y., Cai, W., & Zhao, M. (2025). AutoOdom: Learning Auto-regressive Proprioceptive Odometry for Legged Locomotion (ROBIO2025 Accept, oral)
Yushi Wang, Changsheng Luo, Penghui Chen, Jianran Liu, Weijian Sun, Tong Guo, Kechang Yang, Biao Hu, Yangang Zhang, Mingguo Zhao. Learning Vision-Driven Reactive Soccer Skills for Humanoid Robots. (Science Robotics, In Review)

Are there any other contributions you would like to share with the RoboCup community?

Which approach are you using to generate the robot walking motion?

RL

Which approach are you using to generate other motions of the robot (e.g. kicking, standing up)?

RL

Do you have a kinematic or dynamic model of your robot? If so, how did you create it (e.g. measure physical robot, export from CAD model)?

Yes, export from SolidWorks

What approaches are you using in your robot's visual perception?

Yolo

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 plan with objects in Cartesian space (field coordinates). We transform from image space to Cartesian using camera calibration (intrinsics/extrinsics) combined with depth sensors (ZED/RealSense) to convert UV coordinates 3D camera coordinates robot coordinates field coordinates.

Do you have some form of active vision (i.e. moving the robots camera based on information known about the world)?

Yes, we subscribe to /head_pose topic and use head position data for vision processing. The camera pose is updated based on robot head movement controlled by motion system.

What approach are you using to localize your robot?

We use field line detection with Kalman filtering for robot localization. Vision-detected field markers and lines are matched with known field geometry to estimate robot pose. Also, a learning-based odom is used.

Is your team performing team communication? Which communication protocol are you using?

Yes, we use SPLStandardMessage protocol for team communication. Robot poses, ball positions, and game states are broadcast between teammates via UDP.

What approach are you using for navigation? Are you avoiding obstacles?

We use potential field-based navigation with obstacle detection from depth cameras. Obstacles are tracked in a grid map and robots calculate avoidance directions during movement.

How is the behavior of your robots structured? (e.g. Behaviour Trees)

Our robot behavior is structured using BehaviorTree.CPP framework. Behaviors are defined in XML files loaded by the BrainTree system.

Are you simulating your robot? If so, which simulator are you using and for what purpose do you use simulations?

Isaacgym, Isaac Sim, and mujoco. Simulation is used for testing policies and strategies before deployment.

What operating system is running on your robot and which middleware are you using (for example Ubuntu 22.04 and ROS2 Galactic)?

We run ROS2 (middleware) on the robot platform. The system uses standard ROS2 packages with custom message interfaces for robocup-specific communication.

Is there anything else you would like to share that did not fit any previous question?