Software Survey 2025

Team Name

PMec Humanoid

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

Partialy is available here: https://github.com/HumanoidPequi

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)?

Yes, we have both kinematic and dynamic models. The kinematic model was created in Fusion 360 as a CAD design with movement constraints. The dynamic model was implemented in Gazebo, where we simulate physics, forces, and control interactions. The dynamic parameters were either estimated based on the CAD model or measured from the physical robot.

Are you using Inverse Kinematics? If so what solution (analytic, (pseudo)inverse jabcobian, etc...) are you using?

Yes. Analytic one.

Are you simulating your robot? If so what are you using simulation for?

We're using Gazebo to test algorithms in our robot more easily like walking, kicking and getting up.

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

We use an inverted pendulum model with Zero Moment Point (ZMP) control to generate the robot's walking motion.

What approach are you using to generate motions for standing up?

We used inverse kinematics to set key positions and then we interpolate between them.

What approach are you using to generate kicking motions?

We also inverse kinematics to set key positions and then we interpolate between them. We have a aproach involving ZMP, but we couldn't make it work on real robot

Do you use any other motions than the previously mentioned? If so, what approaches are you using to generate them?

No.

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

Currently, we're not using any dataset, but we used TORSO-21 for training and testing our vision model to detect the ball.

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

We're using YoloV5 to track the ball and a optical flow algorithm to predict where the ball is going to be.

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're planning with objects in image space.

How is your robot localizing?

Currently it's in development process. We pretend to use visual odometry with IMU or kinematics with IMU.

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)?

No.

How is the behavior of your robot's structured (e.g. Behavior Trees)? What additional approaches are you using?

We're using simple action server method from ROS1 Noetic to make the behaviour for our robot.

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

Yes. Our robot follows the ball with it's head while it's been detected.

Do you apply some form of filtering on the detected objects (e. g. Kalman filter for ball position)?

No.

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)?

We do not have any form of team communication for the moment.

Please list contributions your team has made to RoboCup

We never participated before in RoboCup, but we were 3rd place in the past 2 years, consecutively, in latin america edition.

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

We have two scientific publications. One about hardware and another about our ball tracking

Hardware: https://pequimecanico.com.br/wp-content/uploads/2025/01/PROJETO-ELETRONICO-PARA-UM-ROBO-HUMANOIDE-AUTONOMO-QUE-JOGA-FUTEBOL.pdf

Ball tracking: https://ieeexplore.ieee.org/document/10333050

Please list the approaches, hardware designs, or code your team is using which were developed by other teams.

We're using walking motion developed by ITAndroids. We watched and develop on top of the content provided in this video made by Dr. Marcos Maximo: https://www.youtube.com/watch?v=v2cxlF8oExE&pp=ygUTbWluaWN1cnNvIGNhbWlua

What operating system is running on your robot and which

middleware are you using (for example Ubuntu 22.04 and ROS2 Galactic)?

Ubuntu 20.04 and ROS1 Noetic

Is there anything else you would like to share that did not fit to the previous questions?

If you have additional materials you would like to show, please link to them here.