

Blenders Football Club: Global System

RoboCup Humanoid KidSize Soccer 2024

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1 Global system

The global system is conformed of ROBOTIS OP3 [1] humanoid robots. This is a small size commercial humanoid which we use for a team of 4 with no external modifications. They have 20 degrees of freedom between their legs (six degrees of freedom per leg), arms and head. It is also provided with a webcam that is used for the image processing and computer vision algorithms using OPENCV. Algorithms for our robots are developed within the ROS framework in C++ as well as Python. They're processed in the main controller, electronic board controls the servos through serial communication, and they communicate with a workstation through WiFi.

The algorithms work like a state machine where first. the robot is initialized from a secure home position and into a walking ready position. Once in this position, it searched for a ball [2] and if found, it will calculate an error between the camera's center and the ball's center. This distance will be reduced with a PID position controller that will move the head's pan and tilt. With the final tilt, it will calculate an approximate distance to the ball and calculate the number of footsteps it will take it there, if this is more than a threshold it will walk towards the ball in three dimensions. meaning, it can walk with a certain angle since we are calculating a dynamic model.

It will continuously calculate the distance and once it is close enough to kick, it will play this motion with the right or left leg, depending on the sign of the head's pan. It is also continuously reading the IMU signals, if the accelerometer pitch surpasses a threshold, it will detect a fall and play the motion of getting up depending on the direction of the fall. After a kick, and if with the kick, the robot fell and got up, it will repeat the search for the ball and so on the walking movement. The flow chart of our global operation can be seen in figure 1.

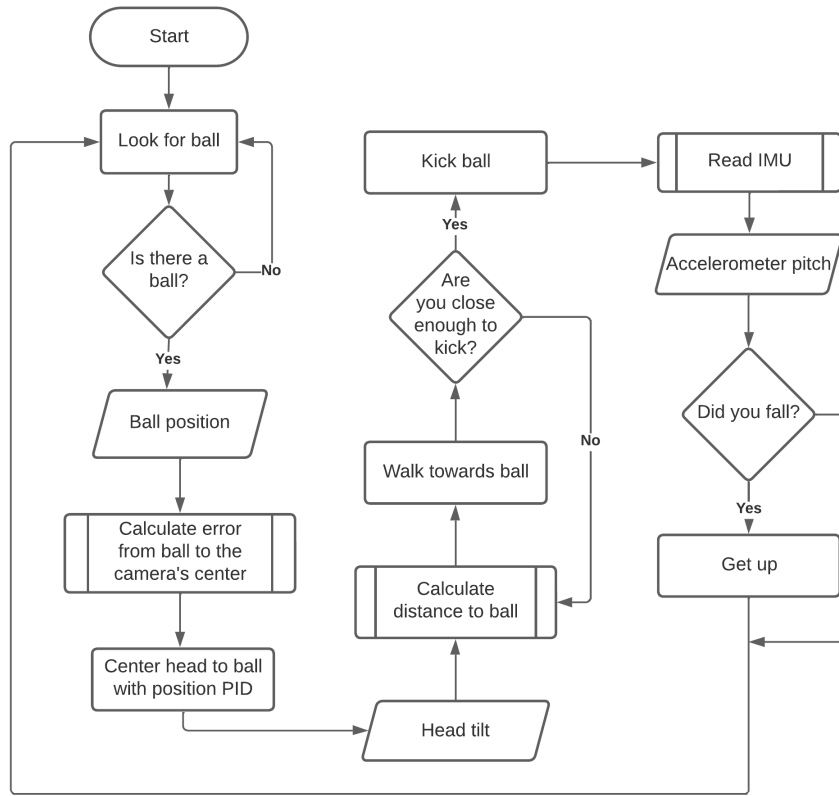


Fig. 1. Flow diagram of soccer algorithm.

References

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