Robot Leg Controller
User Manual
RobotControllers.com

Using the Controller

Activation, initialization, and calibration sequence

Activation of the robot leg controller is requested by setting RoCo_activeDesired. If the environmental conditions are okay (see below) and no error has been reported, the arm is activated. It then goes through a calibration sequence, where it tries to locate the position of the calibration position sensor (RoCo_angleAtMark_PARAM). Once that position has been found, the arm is moved to idle position (RoCo_idlePosition_PARAM). Then the robot leg controller is ready to receive commands.

RoCo_angleAtMark_PARAM	Absolute angle at which the calibration position sensor is located.
RoCo_initMoveSpeed_PARAM	The speed of the robot leg at which the calibration position is searched.
RoCo_initRampSlopePos_PARAM	Acceleration speed during initialization.
RoCo_initRampSlopeNeg_PARAM	Deceleration speed during initialization.
RoCo_initTimeout_PARAM	Maximum time in which the robot leg can reach the calibration position from any possible position.
RoCo_idlePosition_PARAM	Absolute angle at which the robot leg idle position is located.

Commands in normal operation mode

By setting the target angle in RoCo_desiredTargetAngle and setting RoCo_commandMoveToAngle to 1, the robot leg controller is requested to move the robot leg to this absolute angle.

Alternatively, by setting the delta angle in RoCo_desiredDeltaAngle and setting RoCo_commandMoveByAngle to 1, the robot leg controller is requested to move the robot leg by the given relative angle.

For both move commands, RoCo_moveFast tells the controller whether the robot leg should move fast or slow.

Finally, RoCo_commandShutOff makes the controller move the robot leg to idle position and deactivate the robot leg and controller.

Configuration

The robot leg controller can be configured to control both a robot leg that either has a restricted range of motion, and one that can rotate all around. This is defined by RoCo_hasMinMaxAngles_PARAM. If the range is restricted, RoCo_minAngle_PARAM and RoCo_maxAngle_PARAM determine the allowable range of motion.

Environment conditions

The robot leg controller can check a number of environmental conditions that have to be met for the robot leg to work:

- The robot leg only works in a certain temperature range, as specified by the robot leg manufacturer. The limits are defined in RoCo_envTempLowerLimit_PARAM and RoCo_envTempUpperLimit_PARAM.
- Some robots do not work if the humidity is too high (RoCo_humidityLimit_PARAM defines the upper limit). This condition is optional (RoCo_checkHumidity_PARAM).
- The battery has to have a certain minimum voltage (RoCo_batteryLowLimit_PARAM). If this is not the case for a certain time (RoCo_batteryLowDelay_PARAM), the robot leg controller is deactivated. This condition is optional (activated by RoCo_checkBatteryVoltage_PARAM).

Engine leg operation options

The following parameters tell the controller how to control the robot leg engine:

Engine_maxVoltage_PARAM Engine_minVoltage_PARAM	The allowable voltage range that may be applied to the robot leg engine.
RoCo_acceleration_CURVE RoCo_accelerationFast_CURVE	The voltage curve that is sent to the robot leg engine when starting a movement.
RoCo_deceleration_CURVE RoCo_decelerationFast_CURVE	The voltage curve that is sent to the robot leg engine when stopping a movement.
RoCo_timeSlopePos_PARAM RoCo_timeSlopeNeg_PARAM	Define how fast to move through the before mentioned curves.
RoCo_stepSpeed_PARAM	The speed at which detailed corrections are performed when the target position has not been exactly reached.
Engine_speedToVoltage_CURVE	Defines how desired speed translates to the necessary engine voltage to reach that speed.
LegSensorSignalToAngle_CURVE	Defines how the signal from the leg sensor (LegSensor_signal) corresponds to (relative) angle values.

Result and status messages

The robot leg controller sends a number of status and result messages:

RoCo_error	Set to 1 if an error has occurred. The controller has stopped in this case.
RoCo_isActive	Set to 1 if the controller is currently active and ready to receive commands.
RoCo_legAngle	The currently assumed position of the robot leg in degrees. This value is only valid when RoCo_legAngleValid is 1.
RoCo_legAngleValid	Set to 1 if the leg angle is known.
RoCo_engineVoltage	The voltage that should be sent to the robot leg engine.