F&P
Personal Robotics

myP ROS Examples

Version 1.3.0

(The version of this document corresponds to the version of the myP software.)

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This manual consists of original instructions from F&P Robotics AG and is intended for all users of myP. Before using the functions mentioned in this document together with myP and a P-Rob robotic arm or P-Grip robotic gripper, you must read the corresponding user manuals carefully, particularly paying attention to the safety instructions on the P- Rob user manual. Compliance with the instructions in all manuals is mandatory.

1 Sending Trajectories via ROS Services

1.1 ROS Services in myP

In myP a lot of ROS Services are available to control P-Rob and myP. These services are split in two categories:

- myP script functions
- myP control functions

Each ROS Service that myP provides is of type Generic_myP_Service.srv. This file is available from our myP package called **myp-ros**, which can be downloaded from the F&P Robotics webpage. The format of the services is as follows:

```
input String
---
output String
```

For safety reasons, you cannot execute both functions via ROS Services and via graphical user interface at the same time. While myP is connected to P-Rob via ROS Services, you are blocked from using functions via GUI and vice versa.

1.2 myP Script Functions

For each function described in the **myP Script Functions Manual**, there exists a ROS Service. In order to call a myP function, which in Python format is called by **func(*args, **kwargs)**, it must be sent in JSON string format **'{"func": func, "args": args, "kwarg1": value1, "kwarg2": value2, ...}'** to the appropriate ROS Service.

Example:
The myP script function

```
open_gripper(10, velocity=30)
```

becomes.

```
'{"func": "open_gripper", "args": [10], "velocity": 30}'
```

1.3 myP Control Functions

In addition to the script functions, myP provides the following special ROS Services for myP control:

- connect() # connects myP to P-Rob
- calibrate() # executes the default calibration procedure
- disconnect() # disconnects myP from P-Rob
- get_status() # returns the current status of myP, e.g. "ready" or "run"
- pause() # pauses an application
- resume() # resumes an application
- stop() # stops an application
- recover() # actively recovers if stuck in "stop" status
- release() # releases the joints and enables gravity-less mode
- hold() # holds the joints and disables gravity-less mode
- initialize_application() # initializes a myP application & enables script functions
- finalize_application() # stops a myP application & disables script functions

1.4 Sending a Trajectory

Using the above set of functions, the following order of functions executes trajectories via ROS Services:

```
connect()
calibrate()
initialize_application()
for trajectory in trajectories:
    run_advanced_path(trajectory)
finalize_application()
```

The trajectory takes a very distinct format, which is explained in the following example.

1.5 Trajectory Example

Here’s an example of a trajectory, how it is used with the function **run_advanced_path**. Note that the very first trajectory point defines the current position of the joints with zero velocity and duration. Also note that the very last trajectory point defines the end point of the trajectory with zero velocity. The control boards will interpolate all trajectory points such that the **position (in degrees for each joint)** with the given **velocity (in degrees per second for each joint)** is reached after the given **duration (in seconds)**.

Example Trajectory Code:

```
[ {
"duration": 0,
"position": [0.0,-48.912953028643656,96.41856219500882,0.0,-47.50560916636523,0.0],
"velocity": [0.0,0.0,0.0,0.0,0.0,0.0]
}, {
"duration": 0.23717082451262847,
"position": [0.0,-48.08322872815558,96.37234213344252,0.0,-48.28911340528697,0.0],
"velocity": [0.0,7.039548702318296,-0.4753198282846157,0.0,-6.564228874033651,0.0]
}, {
"duration": 0.0982394254243508,
"position": [0.0,-47.2434868780819,96.30583758757047,0.0,-49.062350709488626,0.0],
"velocity": [0.0,10.072973512021678,-0.9140793095291019,0.0,-9.158894202492833,0.0]
}, {
"duration": 0.13893143678556347,
"position": [0.0,-45.53523895422193,96.1120083819746,0.0,-50.57676942775273,0.0],
"velocity": [0.0,14.561565669222059,-1.9763480545865635,0.0,-12.585217614635436,0.0]
}, {
"duration": 0.10660581520856988,
"position": [0.0,-43.79076802233152,95.83716134410821,0.0,-52.04639332177667,0.0],
"velocity": [0.0,18.19523132298304,-3.2567589941687736,0.0,-14.938472328813532,0.0]
}, {
"duration": 0.13056497160677283,
"position": [0.0,-41.11163664753069,95.27323876754734,0.0,-54.1616021200l657,0.0],
"velocity": [0.0,22.88896933896274,-5.521905746711555,0.0,-17.367063592251366,0.0]
}, {
"duration": 0.11348755093182604,
"position": [0.0,-38.364858484859305,94.5277473810664,0.0,-56.16288889620714,0.0],
"velocity": [0.0,24.6933693096313,-7.432465853962672,0.0,-17.260903455671095,0.0]
}, {
"duration": 0.11249997615814375,
"position": [0.0,-35.558115524244954,93.60115711061829,0.0,-58.04304158637336,0.0],
"velocity": [0.0,25.19424121809892,-9.040423911049416,0.0,-16.153817307048463,0.0]
}, {
"duration": 0.11250002384185848,
"position": [0.0,-32.6983829633649,92.49383464488507,0.0,-59.79545168152022,0.0],
"velocity": [0.0,25.63670845104256,-10.645957829784304,0.0,-14.990750621258348,0.0]
}, {
"duration": 0.11249998211860734,
"position": [0.0,-29.791774508323822,91.20590839218339,0.0,-61.41413388385961,0.0],
"velocity": [0.0,26.029143392806233,-12.251891970094455,0.0,-13.777251422711494,0.0]
}, {
"duration": 0.1125000417232521,
"position": [0.0,-26.84338758693237,89.73710065177382,0.0,-62.89371306484154,0.0],
"velocity": [0.0,26.381131732896115,-13.862632470537703,0.0,-12.518499262358128,0.0]
}, {
"duration": 0.11249995231628468,
"position": [0.0,-23.85718589362739,88.08654029173327,0.0,-64.22935439810595,0.0],
"velocity": [0.0,26.703346119693293,-15.484439105184727,0.0,-11.218907014508284,0.0]
}, {
```

```
"duration": 0.11250000000000018,
"position": [0.0,-20.835867549902428,86.25252927346396,0.0,-65.41666172356162,0.0],
"velocity": [0.0,27.0074786142692,-17.125757042298833,0.0,-9.881721571968946,0.0]
}, {
"duration": 0.11250002980232374,
"position": [0.0,-17.7807613874931,84.23227923847196,0.0,-66.45151785097892,0.0],
"velocity": [0.0,27.306271250575243,-18.797661379623964,0.0,-8.508609870951895,0.0]
}, {
"duration": 0.11249999403953587,
"position": [0.0,-14.691698740177046,82.02158291758906,0.0,-67.32988417741197,0.0],
"velocity": [0.0,27.613673614375834,-20.514460986737518,0.0,-7.099212627637511,0.0]
}, {
"duration": 0.11249997615814353,
"position": [0.0,-11.566856698337004,79.61440141933944,0.0,-68.04754472100245,0.0],
"velocity": [0.0,27.945187964230115,-22.29458583272915,0.0,-5.6506021315006585,0.0]
}, {
"duration": 0.1125000357627763,
"position": [0.0,-8.402553324434368,77.00233327643143,0.0,-68.5997799519971,0.0],
"velocity": [0.0,28.31846850718849,-24.161878987223844,0.0,-4.156589519963714,0.0]
}, {
"duration": 0.11556235544320317,
"position": [0.0,-5.192962032811514,74.17390900499888,0.0,-68.98094697218745,0.0],
"velocity": [0.0,26.24897332024263,-23.869363938435622,0.0,-2.3796093818053645,0.0]
}, {
"duration": 0.13693069814055064,
"position": [0.0,-1.92966344963112,71.11358953853195,0.0,-69.1839260889009,0.0],
"velocity": [0.0,21.38179683488977,-20.662575183957717,0.0,-0.7192216509318049,0.0]
}, {
"duration": 0.11470985226227454,
"position": [0.0,0.2813030606851181,68.9344463805152,0.0,-69.21574944120032,0.0],
"velocity": [0.0,17.14282987837735,-17.228294540102176,0.0,0.08546466172481393,0.0]
}, {
"duration": 0.1591514264903124,
"position": [0.0,2.5256942030205094,66.63504338736351,0.0,-69.16073759038412,0.0],
"velocity": [0.0,11.017308669434222,-11.504219980649557,0.0,0.4869113112149832,0.0]
}, {
"duration": 0.13693060672947915,
"position": [0.0,3.6620932347109743,65.43723946927113,0.0,-69.0993327039822,0.0],
"velocity": [0.0,5.543176769290702,-5.861150697666187,0.0,0.3179739283759947,0.0]
}, {
"duration": 0.13693060672947913,
"position": [0.0,4.043186649322578,65.03050283588392,0.0,-69.07368948520646,0.0],
"velocity": [0.0,0.0,0.0,0.0,0.0,0.0]
} ]
```