How to use scripts

Direct commands (starting with d_ prefix) execute single action directly, for example d_laser_duty(15) sets the rigol channel 1 duty to 15%. Complex commands consist of multiple other commands, either direct or complex. The command_name corresponds to command_name.txt file located in scripts/ or scripts/base/ directories. To use custom script, create script_name.txt file in scripts/ directory. Input desired commands to script_name.txt. Then, script_name can be used to call this particular script. To use custom arguments, write arg00, arg01… within script_name.txt file. To call script_name.txt with custom arguments, call script_name(1.25, 3.5), where 1.25 and 3.5 will correspond to arg00 and arg01 according to example below:

Content of move_m30.txt file:

```
d_move(arg00, arg01)
d_wait_move()
d_wait(0.5)
```

How to use move_m30 script in other scripts:

```
move_m30(1.25, 3.5)
```

Example script (example_script.txt):

```
# everything after a hash is a comment within given line and empty lines are
ignored

# the prefix d_ before command means it will be directly executed by the program
# commands with no prefix means the program will look for file command.txt in
scripts/ or scripts/base/
# the below line command executes script located in scripts/base/move_m30.txt
# the script in move_m30.txt file has 3 lines that 1. send move command to m30;
2. waits for the m30 to finish moving; 3. waits additional 0.5 seconds
move_m30(0, 0)  # move m30 stage to 0,0 position

# the content of move_m30.txt file is:
d_move(1, 2)  # send move command to m30 (this time to (1,2) coords
d_wait_move()  # waits for the m30 to finish moving
d_wait(0.5)  # waits additional 0.5 seconds

d_set_m30_params(0.25, 4)  # this sets the velocity and acceleration parameters
of M30 to 0.25 and 4 respectively
move_m30(0, 0)  # this moves the stage back to 0, 0 but very slowly

# this command will change sample name to 'example', for string arguments use '
not "
d_set_sample_name('example')  # equivalent of typing 'example' in Sample name
field

d_save_img()  # equivalent of pressing 'Save' button below camera feed

# this loads pattern image (should be 1024x768 resolution), current working
directory should be mikroskop2
d_load_img('patterns/test_pattern.png')  # equvalent of loading image though
Control->Load pattern

# executing illuminate_here.txt script (turn the laser on for 10s with duty
cycle of 25)
illuminate_here(25, 10)

# take another photo after illumination is finished
d_save_img()
```

```
# this will set the temperature to 55 deg
d_set_temp(55)

# this will wait for the temperature to reach 55 (margin of 2 deg)
d_wait_temp(2)
```

Another example script (example_illumination.txt):

```
# this script illuminates 4 different patterns in specified locations

move_m30(0, 0)  # moves stage to 0, 0 position (current vel and acc will be used
as displayed in GUI)
d_load_img('patterns/test_pattern.png')  # loads first pattern
illuminate_here(15, 8)  # displays pattern with 15% duty cycle for 8 seconds

move_m30(5, 0)
d_load_img('patterns/test_pattern2.png')
illuminate_here(25, 8)

d_load_img('patterns/test_pattern3.png')
illuminate_spot(35, 8, 5, 5)  # same as before but shorter

d_load_img('patterns/test_pattern4.png')
illuminate_spot(35, 8, 0, 5)
```

In order to run script you can:

1. Run it through Control → Execute script

2. Directly write command in the input field below console in GUI program (any command, either direct for example d_move(1,1) or complex: illuminate_here(30, 60)).

Direct commands (executed directly by program)

d_move(x, y, vel, acc)

x, y – numeric variable, coordinates

Moves the M30 stage to specified location.

d_wait_move()

Waits for M30 to finish moving

d_load_img(path)

path – path to image file within mikroskop2 folder

Loads specified image to be later displayed by DMD (.png file with resolution 1024x768 recommended)

d_laser_duty(duty)

duty – duty cycle in % (from 0 to 100)

Changes rigol duty cycle

d_laser_switch(state)

state – 1: turn on output, 0: turn off output

Enables or disables the output on rigol. For channel 2 in rigol use d_laser_duty2 and d_laser_switch2

d_wait(time)

time – time in seconds

Waits for specific amount of time

d_save_image()

Equivalent of pressing Save button, saves current camera frame to saved_images/ folder.

d_set_sample_name(name)

name – string variable, name of the sample.

Equvalent of writing the name to Sample name textbox

d_set_m30_params(vel, acc)

vel, acc – numeric variables, velocity and acceleration

This changes the current velocity and acceleration settings of M30.

d_set_temp(temp)

temp – numeric, temperature

Sets the temperature for TC300.

d_wait_temp(margin)

margin – numeric, acceptable temperature offset in deg

This will wait for the temperature to reach specified value (by d_set_temp) +/- margin, ie. if current temp is 34 and set temperature is 60, it will wait for 60-margin.

d_move_relz(value)

value – numeric value

This will move LabJack by relative amount in z direction.

d_move_absz(value)

value – numeric value

This will move LabJack to a specified z position, from 0 to 40.

d_wait_move_z()

Waits for LabJack to finish movement.

d_aux(pin, state)

pin – number from 2 to 15
state – number either 0 or 1

Sets the input state of specified pin in arduino mega board.

d_rigol_dm(direct_message)

direct_message – string, message to send to rigol

This can change the parameters of rigol. See rigol manual for list of commands. Example command to change the frequency and other parameters of generated wave:
‘:SOUR1:APPL:SQU 1000;5;2.5;0’
SOUR1 – changes will affect channel 1
APPL – apply?
SQU – square wave probably
1000 – frequency 1000 Hz
5 – amplitude
2.5 – offset
0 – maybe phase?

A command to rigol uses ‘,’ to separate variables, but here you should use ‘;’, they will be replaced by ‘,’ before sending the command to rigol.

Complex commands

Complex commands are executed in this manner:

1. find comannd_name.txt file in scripts/ or scripts/base/ path;
2. execute the content of command_name.txt

If no command_name.txt file is found an error will occur. Custom commands can be created and saved as .txt file in scripts/ folder. scripts/base/ folder stores common complex commands like move_m30(x, y). An example of content of move_m30.txt is shown below:

d_move(arg00, arg01)
d_wait_move()
d_wait(0.5)

This command will move the stage to location specified by arg00 and arg01 and wait for the stage to reach its destination. To call this command within any script write:

move_m30(5, 4.25) – this will execute move_m30.txt content with arg00=5 and arg01=4.25.

Some of complex commands are listed below:

move_m30(x,y)

x, y – numeric values, coordinates

Moves the stage to x,y position and waits for stage to finish movement.

illuminate_here(duty, time)

duty, time – numeric variables

Turns on the laser (rigol channel 1) for specified amount of time and specified duty cycle.

illuminate_here(duty, time, x, y)

duty, time – numeric variables

Goes to location specified by x, y and displays pattern for specified time and duty cycle

move_absz(val), move_relz(val)

val – numeric value

Moves LabJack to a specified absolute position (move_absz) or moves LabJack by a specified value (move_relz). Waits for the movement to finish.

set_temperature(temp, margin)

temp, margin – numeric values

Sets temp as temperature and waits until this temperature is reached (+/- margin). After that it waits additional 3 seconds.