

Use DLR Hands on Darias

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1 Preliminaries

1.1 The system

In this document we provide how to use the DLR hands (<https://www.ias.informatik.tu-darmstadt.de/Internal/DLRLHand>, <https://www.dlr.de/rm-neu/en/desktopdefault.aspx/tabcid-11886/#gallery/28915>) (Figure 1) on Darias.

1.2 Installing the Software

In order to control the DLR hand, it is necessary to install FFH on BOHR. Note that, in simulation, this program is not necessary as the hand control is simulated directly in SL. The FFH package is downloadable from https://git.ias.informatik.tu-darmstadt.de/dlrhithandii/ias_ffh.

1.3 Installing the Hardware

Installing the hand it is not an easy procedure. If it is your first time, ask to some colleague to show you. The correct procedure is to

1. Put the arm in a convenient position (for example using `gravity compensation mode` as in figure 2)
2. Plugin the hand by matching the hand and the connectors as in figure 3.
3. Make sure that the hand is really well connected (figure 5). This is usually not easy. You need to tilt a bit the hand and push, but without applying an excessive force that might harm the arm.
4. Once the hand is plugged, you need to turn the black bolt in counter-clockwise direction. Remember that you need to make sure that the hand is fixed, but keep in mind that another person after you might need to detach the hand, so don't apply an excessive force. The end should results like in Figure 5.



Figure 1: DLR Hand.

Figure 2: The hand connector in a comfortable orientation for the connection of the hand.

2 Starting the Hand

1. Make sure both the hands are correctly plugged in.
2. Turn on both the hands using the switches in figure 6.
3. Make sure the server for the hands is on (Figure 7).
4. Make sure both FRI and SL are not active.
5. Connect from BOHR to the server using `sudo ssh 192.168.13.1`. Until you need the hands, don't close the ssh connection.
6. Once you are connected to the server launch `.\ffh_start`. The output should be similar to the one in figure 8.
7. Start FFH on BOHR. You should find it in your `ias_ffh` folder. Type `cd ias_ffh\bin, .\ffh`. A window similar to the one in figure 9 should appear.
8. Click the button “Start FFH Operation”. The window should look like the one in figure 9, and the position/velocities of the joints should be flickering.
9. At this point, enable all the fingers. It should take few seconds, and after that the window will look like figure 10. We also suggest to press on `Gesture Control Mode` and try different gesture (like the five-finger grasp).
10. Close the FFH guy (but leave the ssh connection with the server open). Now you can start FRI and use the robot as always. Have fun!

If you have any problem feel free to contact `samuele@robot-learning.de`.



Figure 3: A, B and C should match.



Figure 4: On the left, he hand is not connected. Make sure there is no gap between the hand and the arm. On the right, the hand is well placed.



Figure 5: The hand is correctly connected.



Figure 6: The switches to turn on the hands. Figure 7: The computer on which we should run the FFH service.

```
# ./ffh_start.sh
DLR RM Real-Time target 0.6.1.1
built on Jan 1 2011 for model 'test_model'
    -> single rate running at priority 250
    -> external mode interface is enabled
    -> model supports signal logging to workspace/matfile

test_model : ** initializing the model **

test_model : ** starting the model **

pci_attach_device could not get BASE0 address of hand card: No such process
cpu base0 from pci register: feaf8000
hand card base0 is at pci feaf8000
hand card base0 is at cpu feaf8000
hand card is at interrupt 7
enabling interrupt
test_model : **May run forever. Model stop time set to infinity.**
```

Figure 8: The output of the service `ffh_service` on the server.

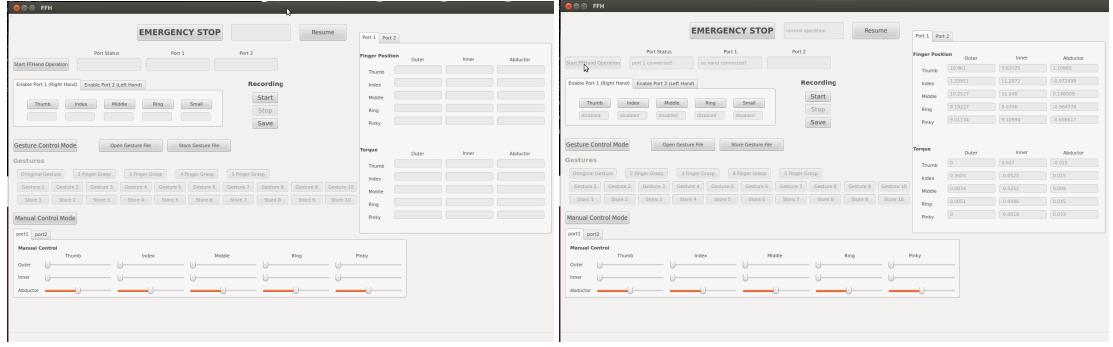


Figure 9: This is the FFI interface. On the left it is how it looks like before the “FFH start operation”, and on the right, after the connection. Notice that the output can be different.

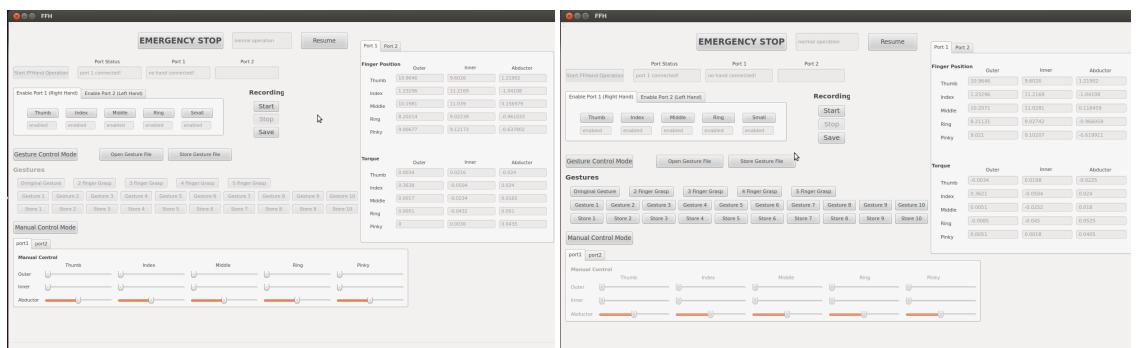


Figure 10: On the left it is possible to see that the finger have been **enabled**. On the right the gesture mode is also enabled.