How to work Nachi - A few key pieces of information.

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This is a short document outlining key steps required to start and use the Nachi robot. For more information, please see the documentation created by Hadi Navabi on the following git hub link <https://github.com/hadeneh/nachos/tree/main>.

# To turn on robot.

* Turn on the power to the robot by the big switch on the wall.
* Unlock padlock on the robot control box and switch it on.
* Wait for the teach pad to load.
* To use the display monitor or router to connect to the nachi, switch them on at the wall.

# Creating a waypoints file using a laptop.

Access the Nachos code builder created by Hadi: <https://nachios.vercel.app/home>. There you will be able to make a simple program by adding step by step position or joint coordinates space waypoints. You can then generate the code and uploaded it to your computer. Note that you must be careful to ensure that all coordinates you give are valid and safe coordinates especially now that the robot has moved to a smaller room with a restricted workspace.

As a rough guide, here are some coordinates of the boundaries of safe positions reachable by Nachi in the current room. The positional descriptors are relative to a person standing in the middle of the room looking at the robot with ‘back’ meaning towards the back wall behind the robot, and ‘front’ meaning towards the person, with the robot arm extended. ‘Right’ means the robot arm is on the person’s right side and ‘left’ means the robot arm is on the person’s left side.

**Dimensions of safe Nachi Robot positions:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Position** | **X** | **Y** | **Z** |
| Top left back | 1005.4 | -1508.6 | 2005.7 |
| Bottom left back | 1005.4 | -1508.6 | 300 |
| Top left front | 2006.8 | -1508.6 | 1997.9 |
| Top right front | 2006.8 | 1400.5 | 1997.9 |
| Top right back | 1200 | 1400.5 | 1997.9 |
| Bottom right back | 1200 | 1400.5 | 300 |
| Middle top front | 2600 | 0 | 2000 |
| Middle bottom front | 2600 | 0 | 300 |
| Middle bottom back | 1500 | 0 | 300 |

# How to access and transfer files between a laptop and the Nachi robot.

This will require installation of the file transfer program FileZilla.

* Turn on the Netgear Wi-Fi router at the wall. Username and password as given below:
  + Username: NETGEAR73
  + Password: brightcarrot372
* Open FileZilla and connect with:
  + Host: 192.168.1.110
  + Username: radmin
  + Password: Robotics5508

From here the internal files of the robot should be accessible. After creating a .0XX file in Nachos, (i.e., ST133TF1-A.001) drag and drop the files into the Nachi file system under program files.

**Make sure you refresh Nachi controller by turning the robot on and off before moving on to the next step.**

# How to compile transferred file on the Nachi controller/teach pad (Source –> exe):

* Open the main screen.
* Go to service utility by pressing f6. (Button on side of screen)
* Go to 9, program conversion.
* Go to 8, language.
* Use left and right arrow keys.
* There will be a top screen and a bottom screen. Do all the following steps on the top screen.
* Select Source 🡪 exe, and press the enter key to confirm.
* Use left and right buttons to get to the file list and use up and down go to file you have just uploaded using FileZilla.
* Go down until your reach file.
* It will be name something like ST133TF1-A.0xx.
* Enter (enter for more files if need).
* Execute (Press f12).
* It may overwrite another file but select yes.
* Will then display any syntax errors if any, otherwise it should say ‘normal, end’.
* Press, enter.
* File should be compiled to ST133TF1.0xx
* Go back to the home screen (press reset button 3 times to go back to home screen).

# How to run the uploaded program.

* On home screen press on program at the top of the touchscreen.
* Type in program number of uploaded program. (Should be the .0xx number at the end of the file.)
* Then press enter.
* To run it.
* Hold dead man switch at the back of the controller and hold check go.
* If there are comments at the start of the program, to get past these, press step at the top and type in first step with move commands. Then the program will run starting at that step.
* **Ensure that the robot speed is slow before testing a program for the first time, so you have time to let go of the dead-man switch before anything unexpected happens.**

# How to create source code from a program made on the teach pad (exe -> source)

* On home screen press on program at the top of the touchscreen.
* Type in program number (you may edit a previously made program or type in a program number without any executable code to create a new program)
* Move the robot using commands with speeds adjustable near the top left
* Press REC to record the position of the robot
* Press FN and to see the list of functions that you can use to operate the robot
* FN32 and FN34 are set and reset for outputs 6 and 7 which close and open the gripper respectively.
* FN92 ends the program
* The program automatically saves.
* Go to service utility by pressing f6. (Button on side of screen)
* Go to 9, program conversion.
* Go to 8, language.
* Use left and right arrow keys.
* There will be a top screen and a bottom screen. Do all the following steps on the top screen.
* Select exe 🡪 source, and press the enter key to confirm.
* Use left and right buttons to get to the file list and use up and down go to file you have just made on the teachpad by manually moving the robot
* Go down until your reach file.
* Enter (enter for more files if need).
* Execute (Press f12).
* It may overwrite another file but select yes.
* Press, enter.
* File should be compiled to ST133TF1-A.0xx
* Go back to the home screen (press reset button 3 times to go back to home screen).
* You may now download the ST133TF1-A.0xx file through filezilla to see the code version of the program that was just made