

ETH ROBOTICS SUMMER SCHOOL

LINUX & ROS CHEAT SHEET

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LAST UPDATED: MAY 9, 2020

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File Commands

\$ ls	list contents of current directory
\$ ls -a	list hidden contents of current directory
\$ cd \$DIR	change working directory to \$DIR
\$ cd	change working directory to home
\$ mkdir \$DIR	create a directory named \$DIR
\$ pwd	print working directory
\$ rm \$FILE	remove \$FILE
\$ rm -r \$DIR	remove \$DIR
\$ rm -f \$FILE	force remove \$FILE
\$ rm -rf \$DIR	force remove \$DIR
\$ cp \$FILE \$DIR	copy \$FILE to \$DIR
\$ cp -r \$DIR1 \$DIR2	copy \$DIR1 to \$DIR2 recursively
\$ mv \$FILE \$DIR	move \$FILE to \$DIR
\$ ln -s \$FILE \$LINK	create symbolic link \$LINK to \$FILE
\$ touch \$FILE	create \$FILE
\$ cat \$FILE	view content of \$FILE
\$ cat > \$FILE	write input into \$FILE
\$ echo \$STRING/\$VAR	print \$STRING/value of \$VAR
\$ more \$FILE	print content of \$FILE
\$ head \$FILE	print the first 10 lines of \$FILE
\$ tail \$FILE	print the last 10 lines of \$FILE
\$ gedit \$FILE	edit \$FILE using GUI text editor
\$ vim \$FILE	edit \$FILE using Vim

System Information

\$ env	print environment variables
\$ date	print system date and time
\$ man \$COMMAND	print user manual of \$COMMAND
\$ whereis \$APP	print locations of \$APP
\$ which \$APP	print executable file of \$APP
\$ ps	print process status
\$ ps -aux	print all running process
\$ htop	print currently running processes and more
path symbolic links	. current directory .. parent directory ~ home directory \ root directory
output direction	> to a file (rewrite) >> to a file (append) pipe output of first command to second

Linux Shell

Ctrl+Alt+T	launch a new terminal
Ctrl+C	kill the current process
Ctrl+Z	suspend the current process
fg	resume the suspended process in foreground
bg	resume the suspended process in background
Ctrl+D	log out of the current session
Ctrl+W	erase one word in the current line
Ctrl+U	erase the whole current line
Ctrl+R	reverse search in the previous commands
Ctrl+A	go to the beginning of the line
Ctrl+E	go to the end of the line
!!	execute the last command
exit	log out of the current session
clear	clear the terminal screen

Use **Ctrl+R** to reverse search, type part of a command and hit **Ctrl+R** repeatedly. **Ctrl+A** is especially useful when you forget to add **sudo** before the command.

Terminator

Ctrl+Shift+E	split terminals vertically
Ctrl+Shift+O	split terminals horizontally
Ctrl+Shift+T	open a new tab
Ctrl+Shift+I	open a new window

Secure Shell (SSH)

\$ ssh \$USER@\$HOST	connect to \$HOST as \$USER
\$ ssh \$IP_ADDRESS	connect to \$IP_ADDRESS
\$ ssh -p \$PORT \$USER@\$HOST	connect to \$HOST on \$PORT as \$USER
\$ ssh-copy-id \$USER@\$HOST	add the key to \$HOST as \$USER

Package

\$ apt-get update	synchronize package index files from sources
\$ apt-get upgrade	install latest versions of installed packages
\$ apt-get install \$PACKAGE	install \$PACKAGE
\$ dpkg -i \$PACKAGE.deb	install a Debian package \$PACKAGE.deb
\$./configure	configure building settings
\$ make	build the program from source code
\$ make install	install the program

Searching

\$ grep \$PATTERN \$FILES	search for \$PATTERN in \$FILES
\$ grep -r \$PATTERN \$DIR	search for \$PATTERN recursively in \$DIR
\$ grep -n \$PATTERN \$FILES	search for \$PATTERN and print line numbers
\$ grep -C1 \$PATTERN \$FILES	search for \$PATTERN and print 1-line context
\$ \$CMD grep \$PATTERN	search for \$PATTERN in \$CMD 's output
\$ locate \$FILE_NAME	find files whose name contain \$FILE_NAME

Git

\$ git clone \$URL	clone the repository from \$URL
\$ git status	print current branch status \$BRANCH
\$ git branch \$BRANCH	create a new branch named \$BRANCH
\$ git checkout \$BRANCH	switch to the branch named \$BRANCH
\$ git merge \$BRANCH	combine \$BRANCH into the current one
\$ git fetch	download all history from GitHub
\$ git merge	combine remote branches into local branch
\$ git push	upload all local branch commits to GitHub
\$ git pull	update local branch from GitHub
\$ git log	list version history for current branch
\$ git log --follow \$FILE	list version history for \$FILE
\$ git show \$COMMIT	output content changes of \$COMMIT
\$ git add \$FILE	stage \$FILE
\$ git commit -m "\$MESSAGE"	commit staged file with \$MESSAGE
\$ git reset \$FILE	reset \$FILE
\$ git reset --hard	reset all uncommitted changes
\$ git clean -fd	recursively force remove unstaged files

Tips

Hitting **Tab** while typing a command, file name, and option will auto-complete it.

sudo (superuser do) runs command with elevated privilege.

tar (tape archive) deal with tape drives backup.

Appending **--help** after a command will print command usage help.

Docker

[illegible]

ROS Catkin Workspace

\$ roscd \$PACKAGE	change directory to \$PACKAGE
\$ catkin build	build the whole workspace
\$ catkin build \$PACKAGE	build \$PACKAGE
\$ catkin clean	clean the whole workspace
\$ catkin clean \$PACKAGE	clear \$PACKAGE
\$ catkin config \$arg1	
\$ wstool init	
\$ wstool merge \$arg1	
\$ wstool up	

Always remember to **\$ source /catkin_ws/devel/setup.bash**.

ROS Run

\$ roscore	invoke the core of ROS
\$ roslaunch \$PACKAGE \$LAUNCHFILE	launch \$LAUNCHFILE in \$PACKAGE
\$ rosrun \$PACKAGE \$EXECUTABLE (\$PARAM:- \$VALUE)	
run node \$EXECUTABLE from \$PACKAGE (with \$PARAM set to \$VALUE)	

ROS Environmental Variables

ROS_ROOT	location of core ROS packages
ROS_MASTER_URI	location of the master
ROS_PACKAGE_PATH	locations for more ROS packages
ROS_HOSTNAME	network address of a node
ROS_IP	IP address of a node

ROS Node

\$ rostopic ping \$NODE	test connectivity to \$NODE
\$ rostopic list	list active nodes
\$ rostopic info \$NODE	print information about \$NODE
\$ rostopic machine	list nodes running on the machine
\$ rostopic kill \$NODE	kill a running node

ROS Service

\$ rosservice list	list active services
\$ rosservice call \$SERVICE \$ARGS	call \$SERVICE with \$ARGS
\$ rosservice find \$TYPE	find services with \$TYPE
\$ rosservice info \$SERVICE	print information about \$SERVICE
\$ rosservice type \$SERVICE	print type of \$SERVICE
\$ rosservice uri \$SERVICE	print uri of \$SERVICE
\$ rossrv show \$TYPE	print structure of \$TYPE

ROS Topic

\$ rostopic list	print information about active topics
\$ rostopic bw \$TOPIC	display bandwidth used by \$TOPIC
\$ rostopic echo \$TOPIC	print messages from \$TOPIC
\$ rostopic find \$TYPE	find topics with \$TYPE
\$ rostopic hz \$TOPIC	display publishing rate of \$TOPIC
\$ rostopic info \$TOPIC	print information about \$TOPIC
\$ rostopic pub \$TOPIC	publish data to \$TOPIC
\$ rostopic type \$TOPIC	print type of \$TOPIC
\$ rosmmsg show \$TYPE	print structure of \$TYPE

ROS Parameter

\$ rosparam list	list all parameter names
\$ rosparam set \$PARAM \$VAL	set \$PARAM to \$VAL
\$ rosparam get \$PARAM	print value of \$PARAM
\$ rosparam load \$YAML	load parameters from \$YAML
\$ rosparam dump \$YAML	dump parameters to \$YAML
\$ rosparam delete \$PARAM	delete \$PARAM

ROS Bag

\$ rosbag record \$TOPIC	record \$TOPIC into bag
\$ rosbag info \$BAG	print content summary of \$BAG
\$ rosbag play \$BAG	play back content of \$BAG
\$ rosbag check \$BAG	check play-ability of \$BAG in current system
\$ rosbag compress \$BAG	compress \$BAG using BZ2
\$ rosbag decompress \$BAG	decompress \$BAG using BZ2

When simulating in ROS, remember **\$ set use_sim_time true** and to append **--clock**.

ROS Packge Structure

package.xml	manifest, dependencies and plugins
CMakeLists.txt	description of compilation procedure
src/	C and C++ source codes
build/	generated makefiles and support files
devel/	compiled binaries, libraries, headers
include/	C and C++ header files
scripts/	Python and bash scripts
config/	ymal configuration files
cfg/	dynamics reconfigure scripts
launch/	launch files

ROS Visualization Tools

\$ rviz	3D visualization of data and models
\$ gzclient	Gazebo GUI
\$ rqt	powerful GUI tool
\$ rqt_plot	simple and lightweight plotting
\$ rqt_bag	visualize content of a bag
\$ rqt_image_view	visualize camera images
\$ rqt_graph	visualize computation graph

ROS Launch File

SMB Workspace

Key Packages		
rovio		robust visual inertial odometry framework
maplab		visual-inertial mapping framework
voxblox		volumetric mapping library
apriltag		visual fiducial system
elevation_mapping		produce elevation map around robot
traversability_estimation		traversability mapping for rough terrain
icp_mapper		iterative closest point based slam system
smb_local_planner		path planning system for SMB
Configuration		

Launch Files
Always remember to charge your SMB after each use.

Quaternion

ROS TF2

TODO

is git reset unstage or reset?

roscpp machine

CMakeList

what should I annotate on \$ catkin clean?

What does TMUX mean? Replace Terminator section?

publisher / subscriber service / client

ros variable okay?

Compression

\$ tar cf \$FILE.tar \$FILES	convert \$FILES into \$FILE.tar
\$ tar xf \$FILE.tar	extract files from \$FILE.tar
\$ tar czf \$FILE.tar.gz \$FILES	compress \$FILES into \$FILE.tar.gz using Gzip
\$ tar xzf \$FILE.tar.gz	extract files from \$FILE.tar.gz using Gzip
\$ gzip \$FILE	compress \$FILE and rename it as \$FILE.gz
\$ gzip -d \$FILE.gz	decompress \$FILE.gz back to \$FILE

Network

\$ ip address	print all internet protocol addresses
\$ ping \$HOST	ping \$HOST and print results
\$ whois \$DOMAIN	print information about \$DOMAIN
\$ dig \$DOMAIN	print DNS of \$DOMAIN
\$ dig -x \$HOST	reverse lookup \$HOST
\$ wget \$FILE	download \$FILE