build the car hardware components

flash sd card with jetpack image (Jetson Nano 4GB, jetpack version 4.5 jetbot version 0.4.3)

**!!!read the warning on jetbot page and follow the instructions otherwise you will need to use nvidia sdkmanager to force a hardware reset!!!**

<https://jetbot.org/master/software_setup/sd_card.html>

fully configured image

<https://drive.google.com/file/d/1mWZjc8-brGvSh6vjDiBh1T7aNiDZtwn4/view?usp=sharing>

boot up jetson nano with keyboard and mouse

enable gui

sudo systemctl set-default graphical.target

sudo reboot

connect to wifi and make sure that the time settings are correct

sudo nmcli device wifi connect <SSID> password <PASSWORD>

OR use gui to connect

optional disable sudo password prompt

you will be using sudo a lot so you can disable sudo prompt to make it faster

sudo -i

sudo vim /etc/sudoers

add jetbot ALL=(ALL) NOPASSWD:ALL to the end of the file

:wq to save

for mvapich2 MPI

change the hostname and ip in hosts file

sudo vim /etc/hosts

change the ip below local host to the jetbot’s ip (use ifconfig to get ip)

1 127.0.0.1 localhost

2 XXX.XX.XX.XXX jetbotN-nano-4gb-jp45.localdomain jetbotN-nano-4gb-jp45

repeat for hostname file

sudo vim /etc/hostname

add sshd:ALL to the bottom of this file

sudo vim /etc/hosts.allow

sudo reboot

Storage resizing IF storage size does not match system

first check the size

free -m

if it does not match the size of sd card

cd ~/jetcard

git pull

git checkout jetpack\_4.5.1

./scripts/jetson\_install\_nvresizefs\_service.sh

cd

rm -rf jetcard

sudo reboot

o

fix bootloader issue

**!!!sudo apt-get will not work without this step!!!**

sudo vim /usr/sbin/l4t\_payload\_updater\_t210

go to def \_skip\_check\_old\_ver(self) and bypass it by inserting return True

sudo apt-get update && sudo apt update

sudo apt-get upgrade && sudo apt upgrade

The next two steps are necessary for MPI. If these steps are skipped it will prompt for password and fingerprint when running MPI

ssh keygen

establish hosts fingerprint for remote hosts

installing mvapich 2

<https://mvapich.cse.ohio-state.edu/downloads/>.

cd ~/

wget <http://mvapich.cse.ohio-state.edu/download/mvapich/mv2/mvapich2-2.3.7.tar.gz>

gzip -dc mvapich2-2.3.7.tar.gz | tar -x

cd mvapich2-2.3.7

./configure --with-device=ch3:sock --disable-fortran --enable-g=dbg --enable-debuginfo

make -j4

sudo make install

installing jetson inference

sudo apt-get update

sudo apt-get install git cmake libpython3-dev python3-numpy

git clone --recursive https://github.com/dusty-nv/jetson-inference

cd jetson-inference

mkdir build

cd build

cmake ../

make -j$(nproc)

sudo make install

sudo ldconfig

test

cd aarch64/bin

detectnet --flip-method=rotate-180

installing packages

sudo apt-get update && sudo apt-get upgrade

sudo apt-get install python3-pip

pip3 install traitlets

pip3 install packaging

pip3 install ipywidgets

sudo apt-get install libopenblas-base libopenmpi-dev libomp-dev python3-opencv

pip3 install Cythonhe search pattern.

Press Enter

pip3 install numpy torch-1.8.0-cp36-cp36m-linux\_aarch64.whl

pip3 install adafruit-circuitpython-motorkit

pip3 install Adafruit\_motorHAT

pip3 install keyboard

sudo apt-get install python3-pip

## wget https://bootstrap.pypa.io/pip/3.6/get-pip.py

python3 get-pip.py

sudo pip3 uninstall Pillow && pip3 install Pillow==8.0.1

pip3 install --upgrade setuptools

pip3 install keyboard inputs traitlets packaging ipywidgets Adafruit\_MotorHAT

cd $HOME

git clone https://github.com/NVIDIA-AI-IOT/torch2trt

cd torch2trt

sudo python3 setup.py install

copy the jetbot folder from the drive

copy jetbot folder from drive

<https://drive.google.com/drive/folders/1fGPe5tbin4NGT4uRbY1TnEIWCgNs2pCX?usp=sharing>

code for operation is in src

cd src

camera and video capture code

cd data-collection/

controlling motors

cd basic-op/

running combined

cd engine/

End of setup

At this point if everything is setup correctly the following steps should work without any problem

Testing to see if detection models work through ssh and rtp streaming

open two terminals

terminal 1

ssh jetbot@jetbot-ip

password is jetbot

cd jetbot/src/implementation

vim detection.py

find line

“display = jetson.utils.videoOutput("rtp://10.131.84.74:1234", argv=sys.argv + is\_headless)”

replace 10.131.84.74 with laptop receiving the rtp stream’s ip

sudo python3 detection.py --flip-method=rotate-180 --headless

install gstreamer on receiving computer

<https://gstreamer.freedesktop.org/documentation/installing/index.html?gi-language=c>

terminal 2

gst-launch-1.0 -v udpsrc port=1234 caps = "application/x-rtp, media=(string)video, clock-rate=(int)90000, encoding-name=(string)H264, payload=(int)96" ! rtph264depay ! decodebin ! videoconvert ! autovideosink

Final code is in ~/jetbot/src/engine. Individually MPI and computer vision works but when incorporated together the massive overhead in processing data (road following) causes it to fail.

running combined

cd engine/

python3 process-engine.py --flip-method=rotate-180