Project Document 5

内容部署

[04/24] 测试 PythonCode 文件夹中的程序；尝试改进功能

[04/25] 按照 TensorFlow 官方指导编译安装包

[04/26] 由于 TensorFlow 的安装遇到阻碍，先测试 PythonCode 文件夹中不涉及该框架的程序

进展

04/27

1. 调试 PythonCode 文件夹中的下列程序运行正常：(测试日志见附件 1、2)

   infrared.py　　main_obstacle_avoidance.py

   即实现了红外线循迹的二值化输入和基于红外线避障的决策以及即时的超声波测距

04/30

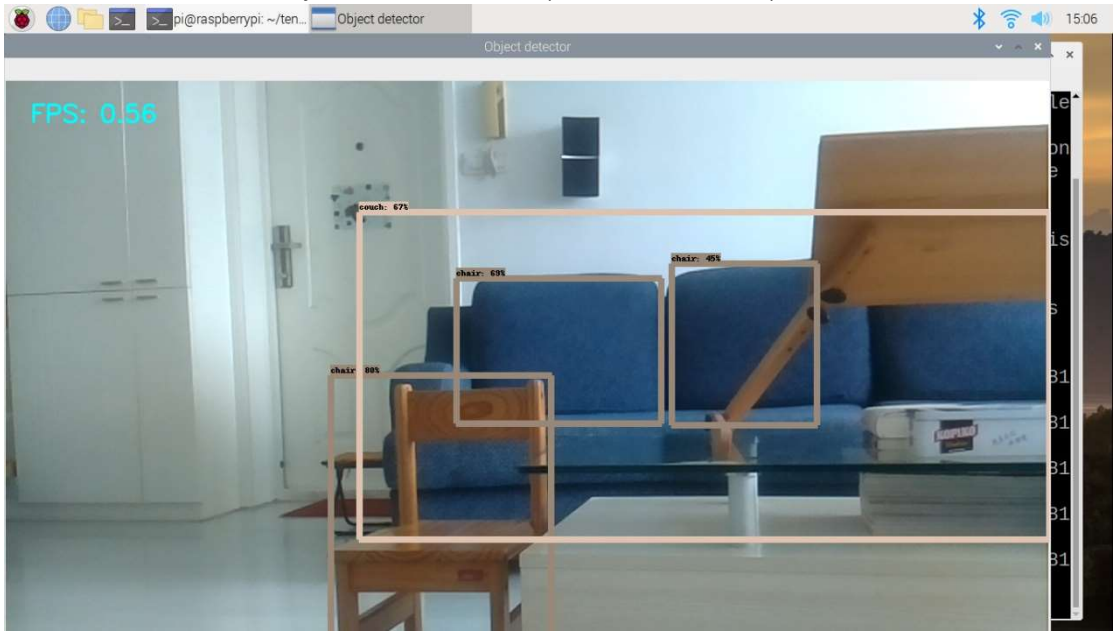
1. 成功安装 TensorFlow;
2. 调试 PythonCode 文件夹中的下列程序运行正常：(测试日志见附件 3)

   camera.py　　pc_receiver.py

   即实现了树莓派 picamera 图象发送到 PC 端显示

05/01

1. 成功配置 TensorFlow Object detection API；(测试日志见附件 4)



2. 调试 PythonCode 文件夹中的下列程序运行正常：(测试日志见附件 5)

   main_object_detection.py

   即实现了基于 TensorFlow Object detection API 的目标识别，并把识别结果连同摄像头数据发送到 PC 端显示

遇到的问题

04/25

A. 使用

```
~$ sudo pip3 install tensorflow
```

遇到此 issue: https://github.com/tensorflow/tensorflow/issues/36141:

```
pi@raspberrypi:~ $ python3
Python 3.7.3 (default, Dec 20 2019, 18:57:59)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import tensorflow
2020-04-25 11:58:42.114516: E tensorflow/core/platform/hadoop/hadoop_fil
e_system.cc:132] HadoopFileSystem load error: libhdfs.so: cannot open sh
ared object file: No such file or directory
>>>
```

04/26

A. 安装好编译需要的开发环境后，开始编译，由于依赖国外源的下载，编译十分缓慢，在 4 个小时的编译之后出现了错误，反复尝试依然在同一位置出现错误(错误日志见附件 5)。由于该编译过程是官方给出的，无法进行修改或人工干预，此问题无解，只能绕道而行。

04/27

A. 在调试 main_obstacle_avoidance.py 时发现程序做出的响应与实际情况不符

04/30

A. 解决 TensorFlow 安装问题(见对应解决方案)；

B. 调整 camera.py 和 pc_receiver.py 的参数；

C. 强行终止 camera.py 后无法再次启动 picamera。

05/01

A. 运行 main_object_detection.py 时报错：

```
pi@raspberrypi ~/RaspberryCar/PythonCode $ python3 main_object_detectio
n.py
2020-05-01 10:11:34.163270: E tensorflow/core/platform/hadoop/hadoop_fil
e_system.cc:132] HadoopFileSystem load error: libhdfs.so: cannot open sh
ared object file: No such file or directory
Traceback (most recent call last):
  File "main_object_detection.py", line 11, in <module>
    from object_detection.utils import label_map_util
ModuleNotFoundError: No module named 'object_detection'
```

解决方案

04/25

a. 参考该 issue: https://github.com/tensorflow/tensorflow/issues/36141：该问题需要通过不同的 TensorFlow 安装方式来解决：需要按照 TensorFlow 官网给出的针对树莓派安装 TensorFlow 的指导(https://www.tensorflow.org/install/source_rpi)，通过源码编译安装包来安装。

04/27

a. 检查接线：发现接线错误，修正后程序与实际情况相符合

04/30

a. 通过

```
~$ sudo pip3 install tensorflow
```

安装 TensorFlow 后，如下进行测试：

```
pi@raspberrypi:~ $ python3
Python 3.7.3 (default, Dec 20 2019, 18:57:59)
[GCC 8.3.0] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>> import tensorflow
2020-04-30 19:40:11.029189: E tensorflow/core/platform/hadoop/hadoop_fil
e_system.cc:132] HadoopFileSystem load error: libhdfs.so: cannot open sh
ared object file: No such file or directory
>>> import tensorflow as tf
>>> hello = tf.costant('Hello TensorFlow')
>>> sess = tf.Session()
>>> print(sess.run(hello))
b 'Hello TensorFlow'
>>>
```

可见该错误信息并非致命错误，只是一个警告，TensorFlow 在工作时不受到该错误信息的影响。仅在第一次 python 程序引入该框架时报错一次，不会终止 python 程序运行；

b. 在 camera.py 和 pc_receiver.py 中需修改 HOST 的值为同一局域网下 PC 的 ip 地址；

c. 结束 camera.py 必须运行 CameraCleanup，要运行该指令，只需要在树莓派终端按下^C (ctrl+C)，camera.py 将会以 KeyboardInterrupt 的形式进入 CameraCleanup，关闭摄像头，并且下次运行 Camera.py 时一切正常。

05/01

a. 将 TensorFlow Object detection API 中的 object_detection 文件夹拷贝至 PythonCode 文件夹下，再运行 main_object_detection.py，报错如下

```
pi@raspberrypi:~/RaspberryCar/PythonCode $ python3 main_object_detectio
n.py
2020-05-01 10:25:35.301065: E tensorflow/core/platform/hadoop/hadoop_fil
e_system.cc:132] HadoopFileSystem load error: libhdfs.so: cannot open sh
ared object file: No such file or directory
Traceback (most recent call last):
  File "main_object_detection.py", line 18, in <module>
    from detect import CarDetect
ModuleNotFoundError: No module named 'detect'
```

根据文件，将 18 行的 detect 改为 detect_new，再运行 main_object_detection.py，报错如下

```
pi@raspberrypi:~/RaspberryCar/PythonCode $ python3 main_object_detectio
n.py
2020-05-01 10:30:37.372539: E tensorflow/core/platform/hadoop/hadoop_fil
e_system.cc:132] HadoopFileSystem load error: libhdfs.so: cannot open sh
ared object file: No such file or directory
OpenCV: FFMPEG: tag 0x44495658/'XVID' is not supported with codec id 12
and format 'mp4 / MP4 (MPEG-4 Part 14)'
OpenCV: FFMPEG: fallback to use tag 0x7634706d/'mp4v'
Model does not exsist !
Loading...
WARNING:tensorflow:From main_object_detection.py:59: The name tf.GraphDe
f is deprecated. Please use tf.compat.v1.GraphDef instead.

WARNING:tensorflow:From main_object_detection.py:60: The name tf.gfile.G
File is deprecated. Please use tf.io.gfile.GFile instead.

Traceback (most recent call last):
  File "main_object_detection.py", line 61, in <module>
    serialized_graph = fid.read()
  File "/usr/local/lib/python3.7/dist-packages/tensorflow_core/python/li
b/io/file_io.py", line 122, in read
    self._preread_check()
  File "/usr/local/lib/python3.7/dist-packages/tensorflow_core/python/li
b/io/file_io.py", line 84, in _preread_check
    compat.as_bytes(self.__name), 1024 * 512)
tensorflow.python.framework.errors_impl.NotFoundError: ssdlite_mobilenet
_v2_coco_2018_05_09/frozen_inference_graph.pb; No such file or directory
```

将 43 行改为

```
video_out = cv2.VideoWriter('out.avi', fourcc, 0.8, (640, 480))
```

47 到 48 行改为

```
PATH_TO_CKPT = 'object_detection/' + MODEL_NAME + '/frozen_inference_gra
ph.pb'
PATH_TO_LABELS = 'object_detection/data/mscoco_label_map.pbtxt'
```

再运行 main_object_detection.py，则正常。

附件 1

```
pi@raspberrypi ~/RaspberryCar/PythonCode $ python3 infrared.py
1 1
1 1
1 1
1 0
1 0
1 0
0 0
0 0
0 1
0 1
1 1
1 1
1 1
^CMeasurement stopped by User
```

附件 2

```
pi@raspberrypi:~/RaspberryCar/PythonCode $ python3 main_obstacle_avoi
dance.py
Distance 101.62008285522461
Distance 121.6039047241211
...
(Multiple similar lines left out for simplicity)
...
Distance 126.26450872846048
Going right
...
(Multiple similar lines left out for simplicity)
...
Distance 121.63742817491833
Going back
...
(Multiple similar lines left out for simplicity)
...
Distance 124.30054829653166
Going left
...
(Multiple similar lines left out for simplicity)
...
Distance 126.40891174677374
^CMeasurement stopped by User
Traceback (most recent call last):
  File "main_obstacle_avoidance.py", line 35, in <module>
    dist_mov_ave = car.DistMeasureMovingAverage()
  File "/home/pi/RaspberryCar/PythonCode/ultrasound.py", line 47, in
DistMeasureMovingAverage
    dist_current = self.DistMeasure()
  File "/home/pi/RaspberryCar/PythonCode/ultrasound.py", line 37, in
DistMeasure
    while GPIO.input(self.GPIO_ECHO) == 1:  # the duration of high lev
el of ECHO is the time between the emitting the pulse and receiving t
he echo
KeyboardInterrupt

During handling of the above exception, another exception occurred:

Traceback (most recent call last):
  File "main_obstacle_avoidance.py", line 69, in <module>
    car.AllStop()
  File "main_obstacle_avoidance.py", line 24, in AllStop
    CarCamera.CameraCleanup(self)
  File "/home/pi/RaspberryCar/PythonCode/camera.py", line 43, in Came
raCleanup
    self.server.sendall(struct.pack('c',1)) #发送关闭消息
struct.error: char format requires a bytes object of length 1
```

附件 3

```
pi@raspberrypi:~/RaspberryCar/PythonCode $ python3 camera.py
have sent one frame
have sent one frame
...
(Multiple similar lines left out for simplicity)
...
have sent one frame
^CTraceback (most recent call last):
  File "/usr/lib/python3/dist-packages/picamera/camera.py", line 1702, i
n capture_continuous
    if not encoder.wait(self.CAPTURE_TIMEOUT):
  File "/usr/lib/python3/dist-packages/picamera/encoders.py", line 393,
in wait
    result = self.event.wait(timeout)
  File "/usr/lib/python3.7/threading.py", line 552, in wait
    signaled = self._cond.wait(timeout)
  File "/usr/lib/python3.7/threading.py", line 300, in wait
    gotit = waiter.acquire(True, timeout)
KeyboardInterrupt

During handling of the above exception, another exception occurred:

Traceback (most recent call last):
  File "camera.py", line 53, in <module>
    for raw_frame in camera.capture_continuous(rawCapture, format="bgr",
use_video_port=True):
  File "/usr/lib/python3/dist-packages/picamera/camera.py", line 1710, i
n capture_continuous
    encoder.close()
  File "/usr/lib/python3/dist-packages/picamera/encoders.py", line 431,
in close
    self.stop()
  File "/usr/lib/python3/dist-packages/picamera/encoders.py", line 419,
in stop
    self._close_output()
  File "/usr/lib/python3/dist-packages/picamera/encoders.py", line 349,
in _close_output
    mo.close_stream(output, opened)
  File "/usr/lib/python3/dist-packages/picamera/mmalobj.py", line 371, i
n close_stream
    stream.flush()
  File "/usr/lib/python3/dist-packages/picamera/array.py", line 238, in
flush
    self.array = bytes_to_rgb(self.getvalue(), self.size or self.camera.
resolution)
  File "/usr/lib/python3/dist-packages/picamera/array.py", line 127, in
bytes_to_rgb
    'Incorrect buffer length for resolution %dx%d' % (width, height))
picamera.exc.PiCameraValueError: Incorrect buffer length for resolution
640x480
```

附件 4

```
pi@raspberrypi ~/tensorflow_dir/models/research/object_detection $ pytho
n3 Object_detection_picamera.py
2020-05-01 14:56:47.481208: E tensorflow/core/platform/hadoop/hadoop_fil
e_system.cc:132] HadoopFileSystem load error: libhdfs.so: cannot open sh
ared object file: No such file or directory
WARNING:tensorflow:From /home/pi/tensorflow_dir/models/research/object_d
etection/utils/label_map_util.py:138: The name tf.gfile.GFile is depreca
ted. Please use tf.io.gfile.GFile instead.

WARNING:tensorflow:From Object_detection_picamera.py:82: The name tf.Gra
phDef is deprecated. Please use tf.compat.v1.GraphDef instead.

WARNING:tensorflow:From Object_detection_picamera.py:88: The name tf.Ses
sion is deprecated. Please use tf.compat.v1.Session instead.

^CTraceback (most recent call last):
  File "/usr/lib/python3/dist-packages/PIL/ImageFont.py", line 280, in t
ruetype
    return FreeTypeFont(font, size, index, encoding, layout_engine)
  File "/usr/lib/python3/dist-packages/PIL/ImageFont.py", line 145, in _
_init__
    layout_engine=layout_engine)
OSError: cannot open resource

During handling of the above exception, another exception occurred:

Traceback (most recent call last):
  File "Object_detection_picamera.py", line 155, in <module>
    min_score_thresh=0.40)
  File "/home/pi/tensorflow_dir/models/research/object_detection/utils/v
isualization_utils.py", line 865, in visualize_boxes_and_labels_on_image
_array
    use_normalized_coordinates=use_normalized_coordinates)
  File "/home/pi/tensorflow_dir/models/research/object_detection/utils/v
isualization_utils.py", line 161, in draw_bounding_box_on_image_array
    use_normalized_coordinates)
  File "/home/pi/tensorflow_dir/models/research/object_detection/utils/v
isualization_utils.py", line 208, in draw_bounding_box_on_image
    font = ImageFont.truetype('arial.ttf', 24)
  File "/usr/lib/python3/dist-packages/PIL/ImageFont.py", line 307, in t
ruetype
    for walkroot, walkdir, walkfilenames in os.walk(directory):
  File "/usr/lib/python3.7/os.py", line 410, in walk
    yield from walk(new_path, topdown, onerror, followlinks)
  File "/usr/lib/python3.7/os.py", line 410, in walk
    yield from walk(new_path, topdown, onerror, followlinks)
  File "/usr/lib/python3.7/os.py", line 359, in walk
    entry = next(scandir_it)
KeyboardInterrupt
```

附件 5

```
pi@raspberrypi ~/RaspberryCar/PythonCode $ python3 main_object_detection.py
2020-05-01 14:49:21.089651: E tensorflow/core/platform/hadoop/hadoop_file_system.cc:132] Hadoo
pFileSystem load error: libhdfs.so: cannot open shared object file: No such file or directory
Loading...
WARNING:tensorflow:From main_object_detection.py:59: The name tf.GraphDef is deprecated. Please
 use tf.compat.v1.GraphDef instead.

WARNING:tensorflow:From main_object_detection.py:60: The name tf.gfile.GFile is deprecated. Ple
ase use tf.io.gfile.GFile instead.

Finish Load Graph
WARNING:tensorflow:From main_object_detection.py:79: The name tf.Session is deprecated. Please
use tf.compat.v1.Session instead.

Running detection..
2020-05-01 14:50:18.736542: W tensorflow/core/framework/cpu_allocator_impl.cc:81] Allocation o
f 8640000 exceeds 10% of system memory.
Done.  Visualizing..
have sent one frame
FPS:  0.045148707005795354
...
(Multiple similar lines left out for simplicity)
...
Running detection..
Done.  Visualizing..
have sent one frame
FPS:  0.6540230338512694
...
(Multiple similar lines left out for simplicity)
...
Running detection..
Done.  Visualizing..
have sent one frame
FPS:  0.7407418396263569
Running detection..
^CMeasurement stopped by User
Traceback (most recent call last):
  File "main_object_detection.py", line 92, in <module>
    feed_dict={image_tensor: image_np_expanded})   # 使用 API 来 Detect
  File "/usr/local/lib/python3.7/dist-packages/tensorflow_core/python/client/session.py", line
 956, in run
    run_metadata_ptr)
  File "/usr/local/lib/python3.7/dist-packages/tensorflow_core/python/client/session.py", line
 1179, in _run
    feed_dict_tensor, options, run_metadata)
  File "/usr/local/lib/python3.7/dist-packages/tensorflow_core/python/client/session.py", line
 1357, in _do_run
    run_metadata)
  File "/usr/local/lib/python3.7/dist-packages/tensorflow_core/python/client/session.py", line
 1363, in _do_call
    return fn(*args)
  File "/usr/local/lib/python3.7/dist-packages/tensorflow_core/python/client/session.py", line
 1348, in _run_fn
    target_list, run_metadata)
  File "/usr/local/lib/python3.7/dist-packages/tensorflow_core/python/client/session.py", line
 1441, in _call_tf_sessionrun
    run_metadata)
KeyboardInterrupt

During handling of the above exception, another exception occurred:

Traceback (most recent call last):
  File "main_object_detection.py", line 116, in <module>
    car.AllStop()
  File "main_object_detection.py", line 34, in AllStop
    CarCamera.CameraCleanup(self)
  File "/home/pi/RaspberryCar/PythonCode/camera.py", line 43, in CameraCleanup
    self.server.sendall(struct.pack('c',1)) #发送关闭消息
struct.error: char format requires a bytes object of length 1
```

附件 6

附件 6.txt 位于同一文件夹下