Udacity. Intel Edge Computing Nanodegree: Computer Pointer Controller Project

Control mouse cursor by gaze estimation using Intel OpenVino models

Details	
Programming Language:	Python 3.7.4
OpenVINO Version:	2020.2
OpenVINO Models:	face-detection-adas-binary-0001
	landmarks-regression-retail-0009
	head-pose-estimation-adas-0001
	gaze-estimation-adas-0002
Hardware:	1.7 GHz Dual-Core Intel Core i7
OS:	MacOS Catalina 10.15.1

Project Set Up and Installation

Directory Structure

```
$tree

.
├── README.md
├── debug.log
├── inputs
│   ├── demo.mp4
│   └── demo.png
├── models
│   └── intel
│       ├── face-detection-adas-binary-0001
│       ├── gaze-estimation-adas-0002
```

```
|         |      └── FP32
|         |          ├── gaze-estimation-adas-0002.bin
|         |          └── gaze-estimation-adas-0002.xml
|         ├── head-pose-estimation-adas-0001
|         |      └── FP32
|         |          ├── head-pose-estimation-adas-0001.bin
|         |          └── head-pose-estimation-adas-0001.xml
|         └── landmarks-regression-retail-0009
|                └── FP32
|                    ├── landmarks-regression-retail-0009.bin
|                    └── landmarks-regression-retail-0009.xml
├── requirements.txt
└── src
    ├── face_detection.py
    ├── facial_landmarks_detection.py
    ├── gaze_estimation.py
    ├── head_pose_estimation.py
    ├── inference.py
    ├── input_feeder.py
    ├── main.py
    ├── model.py
    ├── mouse_controller.py
    └── test.py

11 directories, 21 files
```

Project Setup

Clone the repo using git clone. Then install dependecies using this pip

```
pip3 install -r requirements.txt
```

Using OpenVINO model downloader:
~/opt/intel/openvino/deployment_tools/tools/model_downloader/downloader.py download all
necesary IR models. In this case only FP32 precision.

1. face-detection-adas-binary-0001
2. landmarks-regression-retail-0009
3. head-pose-estimation-adas-0001
4. gaze-estimation-adas-0002

How to run demo:

```
$ python3 src/main.py -fdm models/intel/face-detection-adas-binary-
0001/FP32-INT1/face-detection-adas-binary-0001.xml -lmm
models/intel/landmarks-regression-retail-0009/FP32/landmarks-regression-
retail-0009.xml -hpm models/intel/head-pose-estimation-adas-0001/FP32/head-
pose-estimation-adas-0001.xml -gem models/intel/gaze-estimation-adas-
0002/FP32/gaze-estimation-adas-0002.xml -i inputs/openvino_demo.mp4 --print
--no_move
```

Documentation

```
usage: main.py [-h] -fdm FDMODEL -hpm HPMODEL -lmm LMMODEL -gem GEMODEL -i
                INPUT [-l CPU_EXTENSION] [-d DEVICE] [-pt PROB_THRESHOLD]
                [--print] [--no_move] [--no_video]
optional arguments:
  -h, --help            show this help message and exit
  -fdm FDMODEL, --fdmodel FDMODEL
                        Path to a face detection xml file with a trained
                        model.
  -hpm HPMODEL, --hpmodel HPMODEL
                        Path to a head pose estimation xml file with a
trained
                        model.
  -lmm LMMODEL, --lmmodel LMMODEL
                        Path to a facial landmarks xml file with a trained
                        model.
  -gem GEMODEL, --gemodel GEMODEL
                        Path to a gaze estimation xml file with a trained
                        model.
  -i INPUT, --input INPUT
                        Path video file or CAM to use camera
  -l CPU_EXTENSION, --cpu_extension CPU_EXTENSION
                        MKLDNN (CPU)-targeted custom layers.Absolute path
to a
                        shared library with thekernels impl.
  -d DEVICE, --device DEVICE
                        Specify the target device to infer on: CPU, GPU,
FPGA
                        or MYRIAD is acceptable. Sample will look for a
                        suitable plugin for device specified (CPU by
default)
  -pt PROB_THRESHOLD, --prob_threshold PROB_THRESHOLD
```

```
                              Probability threshold for detections filtering(0.5
   by

                              default)
    --print                   Overlay inference output over frame
    --no_move                 Don't move mouse based on gaze estimation output
    --no_video                Don't show video window
```

Performance

DEVICE: CPU

	Face Detection	Landmarks Detetion	Headpose Estimation	Gaze Estimation
Load Time FP32	223ms	101ms	102ms	128ms
Inference Time FP32	7.5ms	0.45ms	1ms	1.1ms