Traffic Analysis System

Progress Report: 21/04/2021

RTSP Recorder - FFMPEG (HLS)

HLS = HTTP Live Streaming

ffmpeg -rtsp_transport tcp

-i "rtsp://url:port/chID=1&streamtype=main"

-vcodec copy -an -map 0

-f **hls** -hls_time **180** -hls_flags **temp_file**

-reset_timestamps 1 -segment_atclocktime 1 -strftime 1

-hls_segment_filename '**cctv#-%s.ts**' stream.m3u8

TS-Segment	#frame	seconds	fps
101-1618976871.ts	2184	181.9094	12.0060
101-1618977050.ts	2160	179.9708	12.0019
101-1618977230.ts	2160	179.9623	12.0025
101-1618977411.ts	2160	179.9884	12.0008
101-1618977590.ts	2160	179.9624	12.0025
101-1618977771.ts	2136	177.9800	12.0013
101-1618977949.ts	2160	179.9849	12.0010
101-1618978129.ts	2160	179.9662	12.0023
101-1618978309.ts	2160	180.0006	12.0000
101-1618978488.ts	2160	180.0018	11.9999
101-1618978668.ts	2160	179.9623	12.0025
101-1618978848.ts	2160	179.9718	12.0019

Database update

cctv_id	cctv_ts	object_no	class	score	x1	y1	x2	y2
101	2021-04-21 11:23:48	0	0	0.9921875	1161	220	1269	320
101	2021-04-21 11:23:48.083329	0	0	0.9921875	1165	230	1278	335
101	2021-04-21 11:23:48.166658	0	0	0.99609375	1165	237	1283	352
101	2021-04-21 11:23:48.249987	0	0	0.994140625	1166	246	1298	371
101	2021-04-21 11:23:48.249987	1	3	0.5712890625	350	189	483	308
101	2021-04-21 11:23:48.333316	0	0	0.998046875	1173	257	1302	391
101	2021-04-21 11:23:48.333316	1	3	0.322021484375	311	210	451	329
101	2021-04-21 11:23:48.416645	0	0	0.98095703125	1173	271	1312	413
101	2021-04-21 11:23:48.499974	0	0	0.9833984375	1179	291	1315	438
101	2021-04-21 11:23:48.583304	0	0	0.9873046875	1182	325	1339	480
101	2021-04-21 11:23:48.583304	1	3	0.76708984375	109	255	310	441
101	2021-04-21 11:23:48.666633	0	0	0.9951171875	1188	341	1353	505
101	2021-04-21 11:23:48.666633	1	3	0.45849609375	19	288	252	488
101	2021-04-21 11:23:48.749962	0	0	0.9853515625	1196	364	1364	540
101	2021-04-21 11:23:48.749962	1	3	0.5517578125	6	319	175	538
101	2021-04-21 11:23:48.833291	0	0	0.9970703125	1205	401	1379	585
101	2021-04-21 11:23:48.91662	0	0	0.97607421875	1212	424	1375	634
101	2021-04-21 11:23:48.999949	0	0	0.89501953125	1220	464	1371	695
101	2021-04-21 11:23:49.083278	0	0	0.86376953125	1222	478	1445	799
101	2021-04-21 11:23:49.166607	0	0	0.65087890625	1228	516	1442	892

Traffic Analysis System
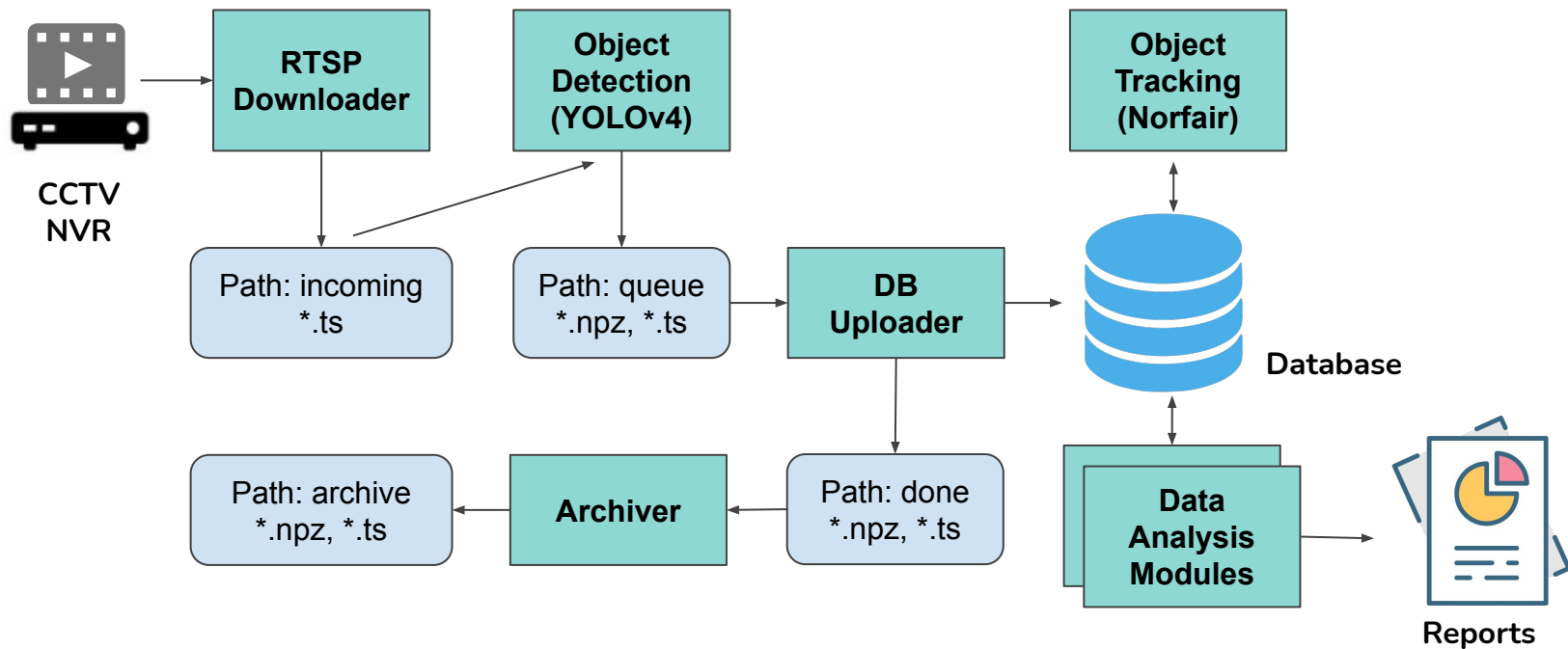
Concurrent processing [cctv groups]

Configuration file

```
[cctv]
groups = 3
group1 = 101-109,110,120
group2 = 201-209
group3 = 301-309
```

Main processors

monitor <path={incoming|queue|done}> [group_id]

incoming   ➔   detect
queue   ➔   upload
done   ➔   archive

monitor <u>incoming</u>

├── **monitor** <u>incoming</u> 1
│   └── **detect** <file.ts>
│
├── **monitor** <u>incoming</u> 2
│
└── **monitor** <u>incoming</u> 3

monitor <u>queue</u>

├── **monitor** <u>queue</u> 1
│   └── **upload** <file.ts>
│
├── **monitor** <u>queue</u> 2
│
└── **monitor** <u>queue</u> 3

monitor <u>done</u>

├── **monitor** <u>done</u> 1
│   └── **archive** <file.ts>
│
├── **monitor** <u>done</u> 2
│
└── **monitor** <u>done</u> 3

Object Detection Performance

Model: **YOLOv4-Tiny 608x608 [OpenCV + DNN + CUDA]**

Load: 1 process = 25% GPU-Util / 515 MB memory usage

```
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 430.64       Driver Version: 430.64       CUDA Version: 10.1      |
|-------------------------------+----------------------+----------------------+
| GPU  Name         Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp   Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
|===============================+======================+======================|
|   0  GeForce RTX 208...  Off   | 00000000:07:00.0 Off |                  N/A |
| 38%   27C    P2    79W / 331W  |    515MiB / 11016MiB |     25%      Default |
+-------------------------------+----------------------+----------------------+

+-----------------------------------------------------------------------------+
| Processes:                                                       GPU Memory |
|  GPU       PID   Type   Process name                             Usage      |
|=============================================================================|
|   0      6485     C   /root/miniconda3/bin/python                    505MiB |
+-----------------------------------------------------------------------------+
```

Object Tracking Options

Options

1. **Stand-by tracking process per cctv id**

   => Easy and Fast

   track   <cctv_id> [-start 'YYYY-MM-DD HH:MM:SS']

2. Duration tracking process

   => Need to modify Norfair data structure for previous tracked objects

To-do List

- Download: Multiple RTSP Downloader
- Download: Video Downloader - Method (wait for NVR)
- Tracking: Fix Norfair distance function / Reset Object ID ?
- Modules: More Reports and Modules (lane_speed => TB)
- DB: Status, Logs and Monitoring
- SYS: Full loop testing
- Detection: Custom trained YOLOv4-Tiny model
- Archiver: Backup and Archive plan