TT Objects Tracker

detects & keeps track of objects with video tracking

A project of the subject C Programming

by

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(Proposal) Description and Features

The TT Objects Tracker is an application which objective is to detect what object was moving as the video source was recorded from a static camera and then export features of the objects detected and the time it was found in the form of an output file. As a result, it can safe a great amount of time to find some specific objects that move pass through the frame by looking at the output product and seek for just a specific seconds in the video instead of spending time seeking the whole.

Pseudo code of the application's main structure

```
//getting input and input validation
1.  source_path = InputSourcePath( )
2.  source = LoadSource( source_path )
3.  if ( loading is failed ) -> go to step 1

//pre-processing
4.  bg = ExtractBackgroundFrame ( source )
5.  tracking_objects [ ]

//object detection in each frame
//will get regions of interest (ROI) as the result
6.  for each frame in source
7.      mask = ExtractForegroundMask ( frame , bg )
8.      ROIs[ ] = ExtractROIs ( mask , frame )

//find the features of object in the ROI
//match the features with tracked features of detected objects
//update changes to the
9.      for each ROI in ROIs
10.         if ( ROI is not proper ) -> go out of the loop
11.         features = ExtractFeatures ( ROI )
12.         UpdateObjectTracking ( features , tracking_objects )

//export product of the processes
13.  ExportDataFile ( tracking_objects )
```

Requirements

Data structures / Class

ROI

- image of its region
- rectangle
- size
- center

features

- size
- color domination
- vector speed

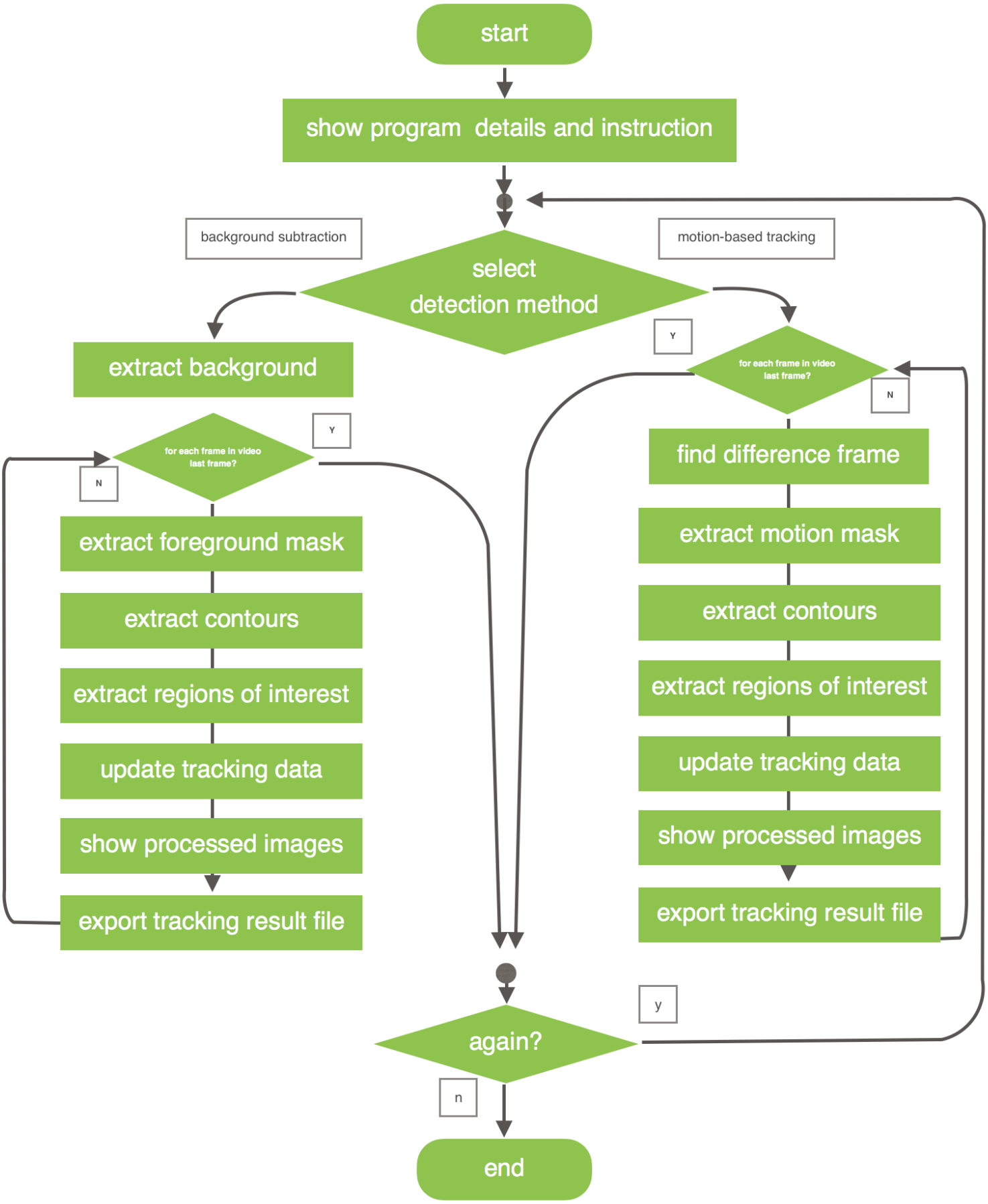
track

- time in/out , duration
- features
- path

Functions

```
char*       InputSourcePath ( )
video       LoadSource ( source_path )
image       ExtractBackgroundFrame ( video_source )
image       ExtractForegroundMask ( image_source , image_background )
ROI[ ]      ExtractROIs ( image_source , image_background )
features    ExtractFeatures ( ROI_object )

void        UpdateObjectTracking ( features , ref tracking_object_array )
void        ExportDataFile ( tracking_object_array )
```

FLOW CHART


start
show program details and instruction
background subtraction
motion-based tracking
select detection method
extract background
Y
for each frame in video last frame?
N
find difference frame
extract motion mask
extract contours
extract regions of interest
update tracking data
show processed images
export tracking result file
Y
for each frame in video last frame?
N
extract foreground mask
extract contours
extract regions of interest
update tracking data
show processed images
export tracking result file
y
again?
n
end

Library used in this project

C Standard Library

- stdlib.h -> used for memory management
- ctype.h -> used for lower case conversion
- stdio.h -> standard input output
- string.h -> string operations
- time.h -> used for getting current time

C++ Standard Library

- vector<> -> dynamic array class

OpenCV 3.1 Library

- core.hpp -> base classes / definition
- highgui.hpp -> image display utilities
- improc.hpp -> image processing algorithm

Boost Library

filesystem.hpp -> file and path management


Debug — master-motion-tracking — 80×36
Admins-MacBook-Pro:Debug admin$ ./master-motion-tracking
Zzzzz
Welcome to T-T objects tracker
a program for video tracking :3
Punch return key to continue . . .


Debug — master-motion-tracking — 80×36
Zzzzz
OVERALL INSTRUCTION
how to use this program :3
OVERALL INSTRUCTION
- to use this program -
1. pick a video
2. choose object detection method
3. enter detection configurations
-> you can choose to go through tracking processes for fun or skip it to save time
-> the tracking result will be saved in <result> folder locate next to this program (- w -)
Punch return key to continue . . .

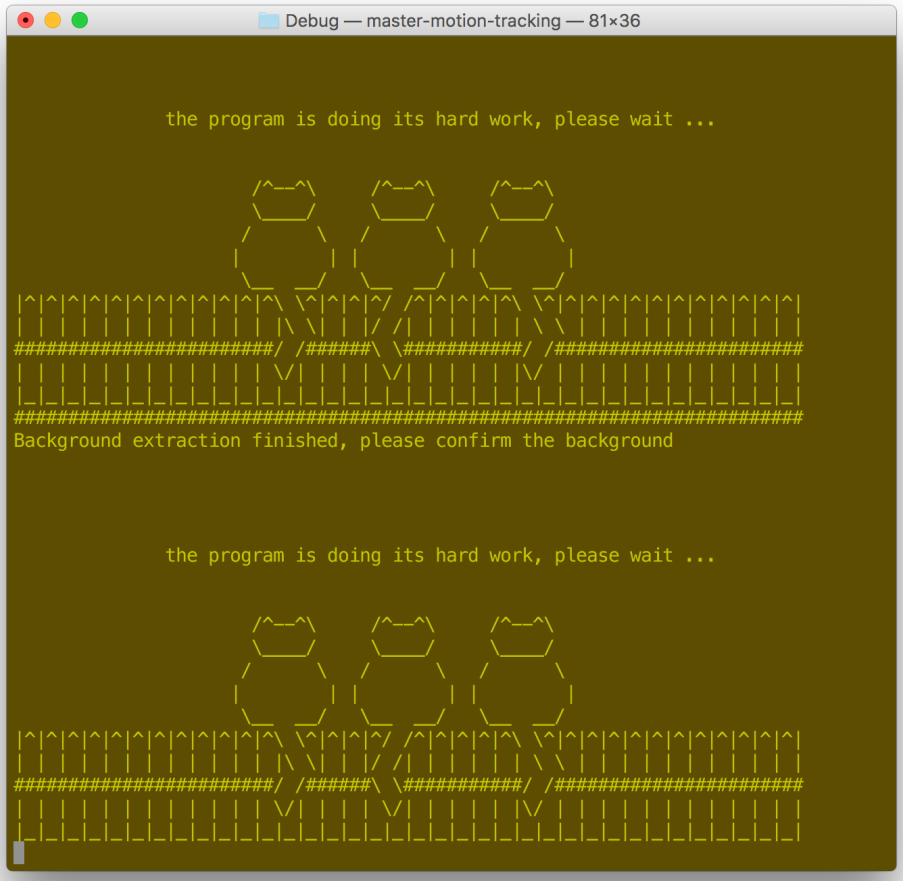
Debug — master-motion-tracking — 81×36

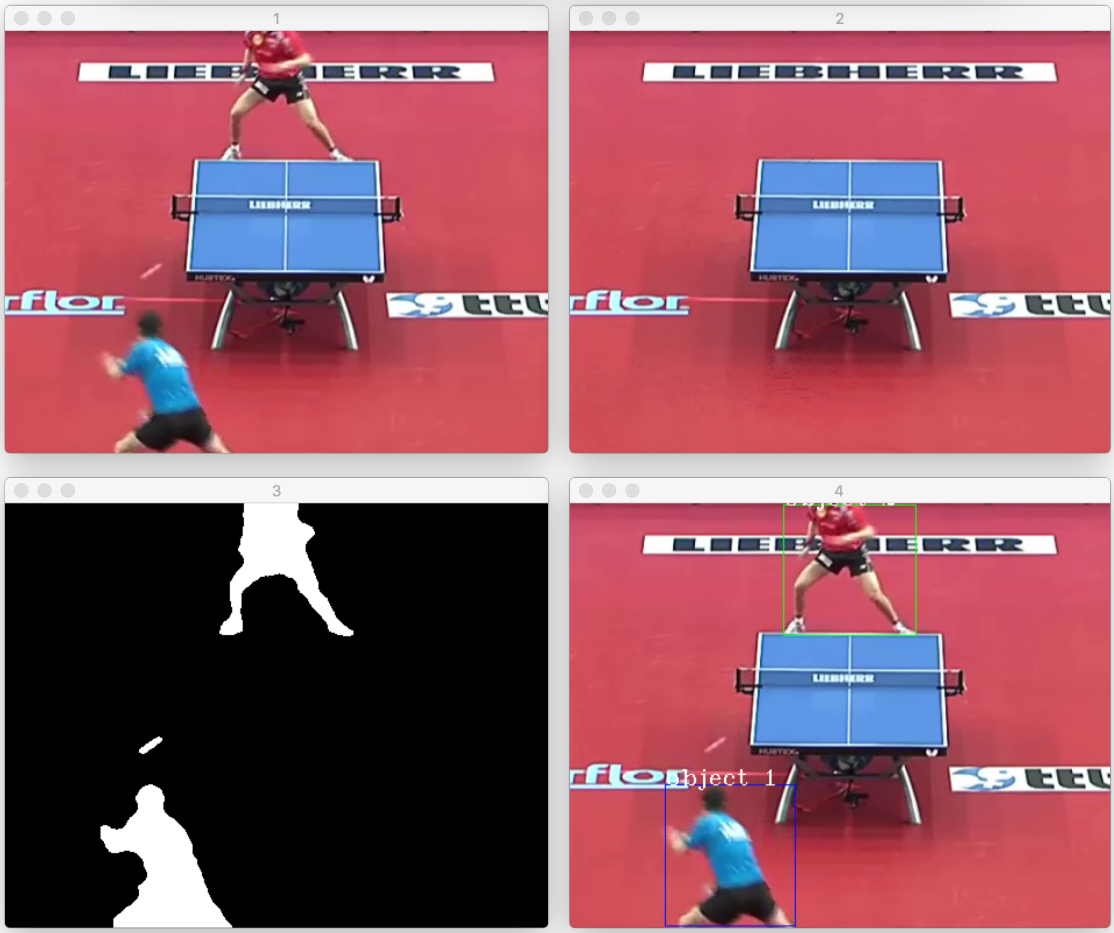
```
Please enter path to the video source you want to use in this program (q to quit)
-> video/crop.mp4

                    ( _ W _) LOADED SOURCE INFO (_ W _ )
                     ---------------------------------
                    (  resolution  : 466  x 364        )
                    (  frame count : 500               )
                    (  fps         : 29                )
                    (  duration    : 17.24    s        )
                     ---------------------------------

              ( _ W _) OBJECT DETECTION METHODS AVAILABLE (_ W _ )
               -------------------------------------------------
              (       1 : background substraction mode          )
              (       2 : motion-based detection mode           )
               -------------------------------------------------

Please enter id of method from the list above you want to use ( 1 / 2 )
 -> 1

              +-----------------------------------------------+
              | ( _ W_) USING BACKGROUND SUBSTRACTION (_ W _ ) |
              +-----------------------------------------------+

Do you want to display images during tracking evaluation?
by showing images during evaluation the process will be slow down ( y / n )
 -> y

Do you want to use sensitive configuration for this method?
by using sensitive config, small objects with less accuracy ( y / n )
 -> n

The selected method required background extraction
please enter the quality of background extraction ( 1 ... 100 )
 ->
```

extracted background

guide

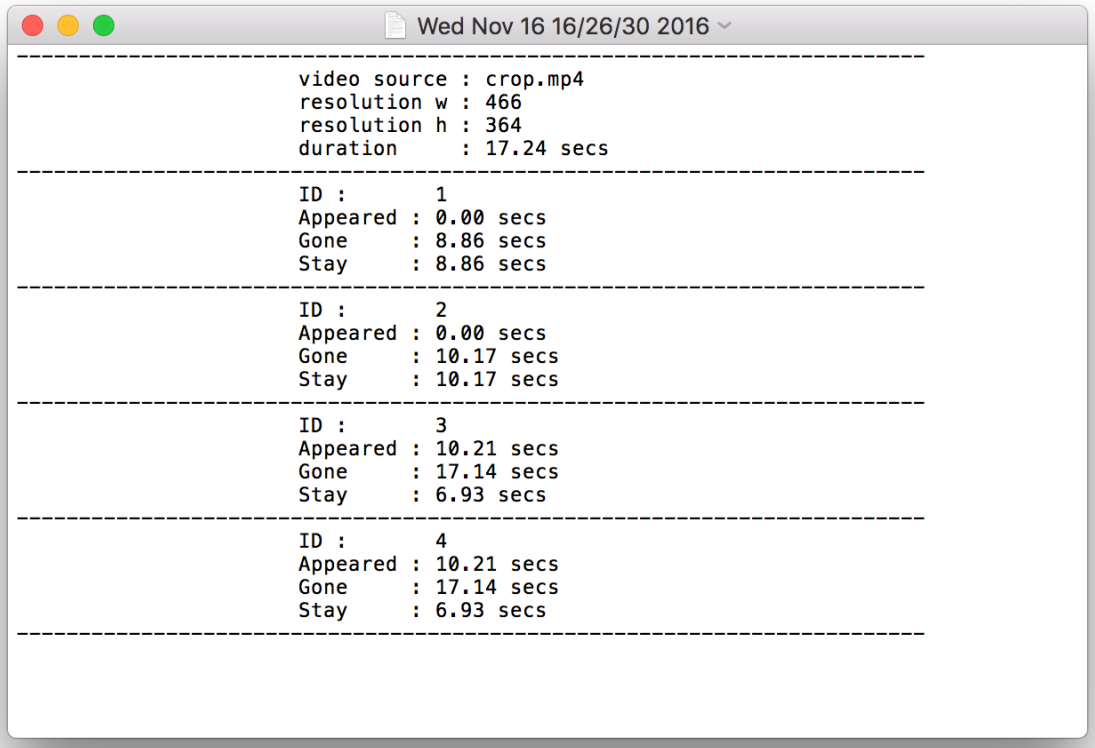
confirm using the extracted background? [Y] | [N]


Debug — master-motion-tracking — 81×36
the program is doing its hard work, please wait ...
Background extraction finished, please confirm the background
the program is doing its hard work, please wait ...


1
2
3
4
Object 1


guide
EXTRACTING BACKGROUND FRAME : [_] pause / [H] hide / [Q] abort


Debug — master-motion-tracking — 81×36
Background extraction finished, please confirm the background
the program is doing its hard work, please wait ...
Zzzzz
All tracking processes saved in
the result folder next to me
Do you want pick another video for object tracking processing
otherwise it is time to say goodbye (y / n)
-> n


Wed Nov 16 16/26/30 2016
video source : crop.mp4
resolution w : 466
resolution h : 364
duration : 17.24 secs
ID : 1
Appeared : 0.00 secs
Gone : 8.86 secs
Stay : 8.86 secs
ID : 2
Appeared : 0.00 secs
Gone : 10.17 secs
Stay : 10.17 secs
ID : 3
Appeared : 10.21 secs
Gone : 17.14 secs
Stay : 6.93 secs
ID : 4
Appeared : 10.21 secs
Gone : 17.14 secs
Stay : 6.93 secs