find frame in video

framepos.sh

```
#!/bin/bash

# function framepos()

# search image in video
# 1. extract frames from video file
# 2. wait for N frames
# 3. search pattern in N frames
# 4. return frame position

# why step 2?
# cos calling findimagedupes is slow
# and buffering makes search much faster by factor 8

# dependencies:
# 1. ffmpeg aka avconv
# 2. findimagedupes, with "old school" perl backend

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# warranty: none. never trust my code
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# usage:
#
# see sample code at end of this file
#
# if you want to detect clips like intros and outros
# you must find "good key frames"
# who have strong contrast to other frames
# [ideally no animation]
# and who are encoded similar across many files,
# so you can use a lower threshold value.
#
# from these key frames,
# you can calculate cutting positions,
# by manual "edge detection" [video and audio]
# or you can run blackdetect or silencedetect filters
# near the key frames.
#
# to make search faster,
# limit your "search space" to where you expect a match.
```

```
# todo:
# * loop seems to hang in some cases [done?]
# * search backward, from end of video or from position
# * replace findimagedupes with imagemagick?
# * get all matches
# * rewrite in python
#   --> use openCV?
#   --> integrate into pyLoad?
#
https://realpython.com/fingerprinting-images-for-near-duplicate-detecti
on/#what-libraries-will-we-need
# * use "frame exact" positions, avoid rounding errors [done]
# * round float seconds to %.3f ?
# * rewrite time2sec (etc) functions as "pipeline filters"
#   so we can write: s=$(echo 01:23:45.678 | time2sec)
# * make calls to ffprobe more robust
#   for example dont grep in file comments
# * add audiodetect, to search for audio clips
#   similar to "voice/speech recognition"
#   problem: search too fuzzy? library overkill?
#   and: we need offset values = timestamps
#   https://stackoverflow.com/questions/47121644
#     audio-file-speech-recognition-in-python-location-of-word-in-
seconds
#   https://github.com/mozilla/DeepSpeech
#   https://github.com/Uberi/speech_recognition
#     https://realpython.com/python-speech-recognition/
#   simple:
#     https://github.com/worldveil/dejavu
#     https://github.com/tyiannak/pyAudioAnalysis/wiki/5.-Segmentation



# context:
# https://superuser.com/questions/663731
#   find-video-file-position-using-an-image-match
# https://video.stackexchange.com/questions/11980
#   is-there-a-program-for-automatic-clip-creation
#   from-scene-detection-recognition
# https://github.com/Breakthrough/PySceneDetect
#   python + openCV
# ffmpeg scene detect
#   ffmpeg -i "$in" -filter:v "select='gt(scene,0.1)',showinfo" -f null
-
# https://superuser.com/questions/378639
#   automatic-scene-detection
# kdenlive: scene recognition
```

```
# settings

# how much "similar" should matches be?
#threshold=90%
threshold=85%

# how long to wait for next extraction-progress check
# if your memory is limited, use smaller steps
step_duration=0.5
#step_duration=1

# compare at least N frames at once
# if your memory is limited, use smaller buffer
# average frame size: 6 MB for 1080p, 3 MB for 720p
frames_bufsize=100

#ffmpeg_cmd=avconv
ffmpeg_cmd=ffmpeg
ffprobe_cmd=ffprobe

# prefix for temp files. faster on a tmpfs filesystem
tmp_pre=/tmp/mv-$(date +%s).

# directory to save video files
# terminate with slash, or leave empty
v_out_prefix="video_out/"



# framepos()
# search images in video, print first position
# to search a "still image range"
# similar to the "blackdetect" filter in ffmpeg
#   set $4 to 1
#   and read "$time_first_frame $time_last_frame"
#   sample:
#   IFS=' ' read t1 t2 < <(framepos "$vid" "$img" 0 0 1)

function framepos() {

    V="$1" # video file
    T1="${2-0}" # time from
    T2="${3-0}" # time to

    R="${4-0}" # match still image range? 0 or 1

    # image files
    ARGV=("$@")
    I=("${ARGV[@]:4}") # image files = $5 $6 $7 ...
```

```
    #echo "V = $V" >&2

    # get frame rate
    fps=$(get_fps "$V")

    echo fps = $fps >&2

    dur=$(time2sec $(get_dur "$V"))

    echo "dur = $dur" >&2

    echo near T1 = $T1 >&2
    echo near T2 = $T2 >&2

    # get exact frame times
    # T_exact = round(T_near * fps) / fps
    # round(F) = int(F + 0.5)
    [[ "$T1" != '0' ]] && {
        if [[ "${T1:0:1}" = "-" ]]
        then
            #echo "got negative t1 $T1" >&2
            T1=$(echo $T1 $fps $dur \
                | awk '{printf "%.4f\n", int(($3 + $1) * $2 + 0.5) /
$2}')
        else
            T1=$(echo $T1 $fps \
                | awk '{printf "%.4f\n", int($1 * $2 + 0.5) / $2}')
        fi
        echo exact T1 = $T1 >&2
    }
    [[ "$T2" != '0' ]] && {
        if [[ "${T2:0:1}" = "-" ]]
        then
            #echo "got negative t2 $T2" >&2
            T2=$(echo $T2 $fps $dur \
                | awk '{printf "%.4f\n", int(($3 + $1) * $2 + 0.5) /
$2}')
        else
            T2=$(echo $T2 $fps \
                | awk '{printf "%.4f\n", int($1 * $2 + 0.5) / $2}')
        fi
        echo exact T2 = $T2 >&2
    }

    # extract frames. run in background
    # bmp format is faster than png or jpg
    echo extract frames to ${tmp_pre}frame-%04d.bmp >&2
    ff_args=''
    [[ "$T1" != '0' ]] && ff_args+=" -ss $T1 "
    [[ "$T2" != '0' ]] && ff_args+=" -to $T2 "
    # input seek = time arguments are before -i
```

```
    $ffmpeg_cmd \
        $ff_args -i "$V" \
        ${tmp_pre}frame-%04d.bmp \
        2>/dev/null &
    pid=$!

    # print with custom delimiter
    # assert that filenames dont contain delimiter
    script_include=$(cat <<-'EOF'
        VIEW () {
            for f in "$@"
            do
                echo -n "$f"
                echo -ne "\t\t\t\t"
            done
            echo
        }
EOF
    )

    n2=0
    found_first=0

    #todo better?
    t_last=-1
    t=-2

    doing_extract=false

    while true
    do

        n=$(ls ${tmp_pre}frame-*.bmp 2>/dev/null | wc -l)
        #echo found $n frames in "${tmp_pre}"'frame-*.bmp' >&2

        #echo n = $n >&2

        $doing_extract || {
            # $doing_extract is false
            echo -n "extract ... " >&2
            doing_extract=true
        }

        (( $n == 0 )) && {
            kill -0 $pid 2>/dev/null || {
                # extract done
                echo debug found no match >&2
                break
            }

            kill -SIGCONT $pid
```

```
            sleep $step_duration
            continue
        }
        (( $n == 1 )) && {
            # only one frame extracted.
            # if ffmpeg is still extracting, this file is incomplete
            kill -0 $pid 2>/dev/null && {
                # extract running
                # last frame is incomplete --> $n-1 complete frames
                #echo extract continue with $(($n - 1)) frames >&2
                echo -n "$(($n - 1)) " >&2
                kill -SIGCONT $pid
                sleep $step_duration
                continue
            }

            n2=1
        }
        (( 1 < $n && $n <= $frames_bufsize )) && {
            # frame buffer not full
            # if extract is running, then wait before compare
            kill -0 $pid 2>/dev/null && {
                # extract running
                echo -n "$(($n - 1)) " >&2
                #echo extract continue with $(($n - 1)) frames >&2
                kill -SIGCONT $pid
                sleep $step_duration
                continue
            }
            n2=$(( $n - 1 ))
        }
        (( $n > $frames_bufsize )) && {
            #echo found $n frames
            # pause frame extraction to save space
            # extract is faster than compare
            echo $(($n - 1)) >&2
            #echo extract pause with $(($n - 1)) frames >&2
            kill -SIGSTOP $pid

            n2=$(( $n - 1 ))
        }

        echo compare $n2 frames from $(ls ${tmp_pre}frame-*.bmp | head
-n 1) >&2

        #todo fail if $I is empty, or files not found

        doing_extract=false

        break_while=false
        for I_cur in "${I[@]}"
```

```
        do
            echo "search for $I_cur" >&2

            # we need the "real path" for findimagedupes
            pattern=$(readlink -f "$I_cur")

            # call findimagedupes
            # to find "visually similar images"
            res=$(
                ls ${tmp_pre}frame-*.bmp \
                | head -n $n2 \
                | xargs findimagedupes -t $threshold \
                    -i "$script_include" "$pattern" \
                | grep -a "$pattern"
            )

            if [ ! -z "$res" ]
            then
                res=$(
                    echo "$res" \
                    | sed 's/\t\t\t\t/\n/g' \
                    | grep -v '^$' \
                    | grep -v "$pattern" \
                    | sort \
                    | head -n 1 \
                    | sed -E 's/^.*frame-(.*?)\.bmp$/\1/'
                )

                # get frame time
                # note: frame numbers start with 1

                # matching frame:
                #echo "compare res get t, fps is $fps" >&2
                #t=$(
                #    echo $T1 $res $fps \
                #    | awk '{printf "%.4f\n", $1 + ( ( $2 - 1 ) / $3 )
}'
                #)

                # frame minus one:
                t=$(
                    echo $T1 $res $fps \
                    | awk '{printf "%.4f\n", $1 + ( ( $2 - 2 ) / $3 )
}'
                )

                echo "match t = $t" >&2


                # no range search
                (( $R == 0 )) \
```

```
                && {
                    # return
                    echo $t

                    # stop extracting
                    kill -9 $pid 2>/dev/null

                    # remove all temp files
                    rm ${tmp_pre}frame-*.bmp

                    break_while=true
                    break
                } \
                || {
                    # range search
                    (( $found_first == 0 )) \
                    && {
                        # range start
                        t_first=$t
                    }
                    found_first=1
                }
            fi

            #todo range search might be broken
            # range search and
            # found first frame and
            # current frame is no match
            (( $R == 1 && $found_first == 1 && $t == $t_last )) \
            && {
                # t_last is last frame of still image range

                # return
                echo "$t_first $t_last"

                # stop extracting
                kill -9 $pid 2>/dev/null

                # remove all temp files
                rm ${tmp_pre}frame-*.bmp

                break_while=true
                break
            }

        done

        $break_while && break

        #todo combine range search and multi image?
        # only use first match as "range image"?
```

```
        t_last=$t

        # remove processed temp files
        (( $n2 > 0 )) \
        && ls ${tmp_pre}frame-*.bmp | head -n $n2 | xargs rm
    done
}



# convert HH:MM:SS.NNN to float seconds
function time2sec () {
    date -u -d "1970-01-01 $1" +%s.%3N
}

# convert float seconds to HH:MM:SS.NNN
function sec2time () {
    date -u -d "0+$1sec" +%T.%3N
}

# get video duration
function get_dur() {
    $ffprobe_cmd -i "$1" 2>&1 | grep Duration | cut -d' ' -f4 | cut -d,
-f1
}

# get video frame rate
function get_fps() {
    $ffprobe_cmd "$1" 2>&1 \
        | grep 'Video: ' \
        | head -n 1 \
        | sed -E 's/^.* (.*?) fps.*$/\1/' \
        | sed 's/^23.98$/23.976/'
    # ffprobe prints wrong fps, change 23.98 to 23.976
}



# sample use

# video + image from argv
# call this script like: ./framepos.sh video.mp4 image.png
v="$1"
i="$2"

# search range. negative = seek from end
a=-12
b=-8

# get frame position
```

```
t=$(framepos "$v" $a $b 0 "$i")

# multi image search
#t=$(framepos "$v" $a $b 0 "$i_1" "$i_2" "$i_3")

if [ ! -z "$t" ]
then
    v_out="${v_out_prefix}${v%.*}.cut.${v##*.}"
    echo "cut video to $v_out"

    # if you need absolute paths ...
    #script_dir=$(readlink -f "$0")
    #script_dir="${script_dir%/*}"

    # create dst directory
    if [[ ${v_out_prefix: -1} == "/" ]]
    then
        mkdir -p -v "$v_out_prefix"
    fi
    v_out_dir="${v_out%/*}"
    mkdir -p -v "$v_out_dir" 2>/dev/null

    # cut video
    # use '-map 0' to copy all streams
    $ffmpeg_cmd -i "$v" -ss 0 -to "$t" -c copy -map 0 "$v_out"

else
    echo error frame not found
fi
```

https://github.com/milahu/random/blob/master/framepos.sh

https://superuser.com/questions/663731/find-video-file-position-using-an-image-match