

**CPS621 Winter2022**  
**Lab04 Report**  
**Name: Tusaif Azmat, Student#: 500660278.**

**Work to Do:**

**Part 1 – Download a short music video**

I have downloaded the music video with duration of 3:19 (just over 3 minutes). The video was taken from YouTube and downloaded in mp4 format in 1080P resolution and 60fps.

The following website was used to download the video:

<https://www.y2mate.com/en68>.

Video Link:

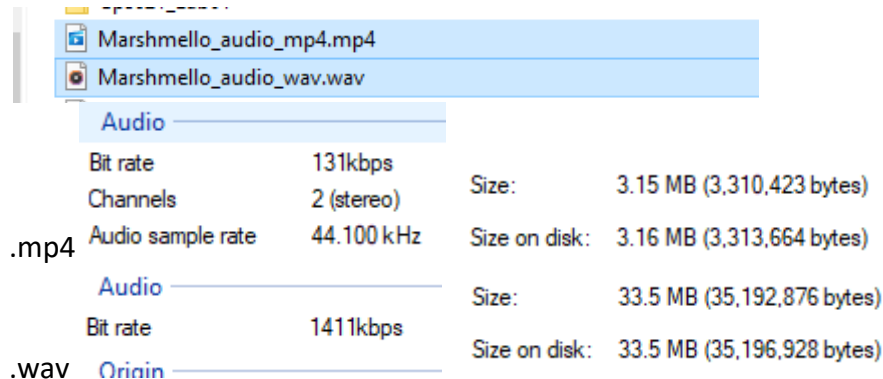
<https://www.youtube.com/watch?v=ALZHF5UqnU4>

**Part 2 – Extract the audio track of the video using matlab functions**

Following is the source code for Part 2. This code extracts the audio from the video and saves it as a .wav and .mp4 files.

**% Part 2: Extract the audio track of the video using matlab functions**

```
[y,Fs] = audioread(['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...  
    'CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4']);  
y = y/max(abs(y(:))); %normalize (limit the range between -1 to +1)  
audiowrite('Marshmello_audio_wav.wav',y,Fs);  
audiowrite('Marshmello_audio_mp4.mp4',y,Fs);  
clear;
```



Audio			
Bit rate	131kbps	Size:	3.15 MB (3,310,423 bytes)
Channels	2 (stereo)		
Audio sample rate	44.100 kHz	Size on disk:	3.16 MB (3,313,664 bytes)
.mp4			
Audio			
Bit rate	1411kbps	Size:	33.5 MB (35,192,876 bytes)
.wav			
Origin			

**Part 3 – Get info on the downloaded video**

The following is the source code for Part 3. This code gets info in the video's frame rate, number of frames, width, height, and duration.

**% Part 3: Get info on the downloaded video**

```
video_name = ['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...  
    'CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4'];  
video = VideoReader(video_name);  
fprintf("Name: %s \n", video_name);  
fprintf("The video's Frame Rate: %0.2f \n", video.FrameRate);  
fprintf("The video's Number of Frames: %d \n", video.NumFrames);  
fprintf("The video's Width: %d \n", video.Width);  
fprintf("The video's Height: %d \n", video.Height);  
fprintf("The video's Duration: %0.3f seconds\n", video.Duration);  
clear;
```

```

Name: C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4
The video's Frame Rate: 23.98
The video's Number of Frames: 4782
The video's Width: 1920
The video's Height: 1080
The video's Duration: 199.506 seconds
fx >>
Video
Length      00:03:19
Frame width 1920
Frame height 1080
Data rate   1610kbps
Total bitrate 1737kbps
Frame rate  23.98 frames/second
Size:      41.5 MB (43,592,456 bytes)
Size on disk: 41.5 MB (43,597,824 bytes)
Audio
Bit rate      127kbps
Channels       2 (stereo)
Audio sample rate 44.100 kHz

```

## Part 4 – Read each frame of the video and resize each frame to ½ width and ½ height

The source code for reading each frame and resizing it to ½ width and ½ height. Then saving them into a folder named 'images'.

```

% Part 4: Read each frame of the video and resize each frame to ½ width and ½ height
video = VideoReader(['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...
'CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4']);
i = 1;
directory = './';
mkdir(directory, 'images')
while hasFrame(video)
img = imresize(readFrame(video), 0.5);
filename = [sprintf('%05d',i) '.jpg'];
fullname = fullfile(directory, 'images', filename);
imwrite(img, fullname)
i = i+1;
end
clear;

```

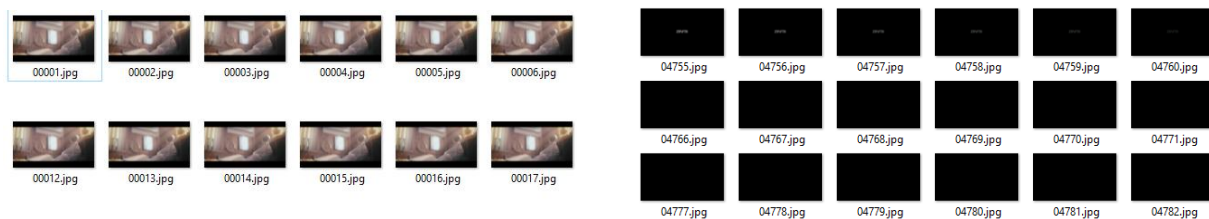


Image		
Image ID		
Dimensions	960 x 540	
Width	960 pixels	Size: 150 MB (157,615,871 bytes)
Height	540 pixels	Size on disk: 159 MB (167,301,120 bytes)
Horizontal resolution	96 dpi	Contains: 4,782 Files, 0 Folders
Vertical resolution	96 dpi	
Bit depth	24	

There are a total 4782 images inside the folder. The width is now 960 pixels and height is 540 pixels. The new dimensions are 960x540; the original was 1920x1080.

## Part 5 – Generate two new videos in 'uncompressed AVI' format

### Part A) (1) all resized frames with doubled frame rate

The source code for saving all the frames into an uncompressed AVI formatted video file. The frame rate is doubled. File name is 'Marshmello\_Video\_540P\_double\_framerate.avi.avi'. The resolution is 540P. It's getting all the information about the double frame rate video generated from all the images.

```

% Part 5: Generate two new videos from the resized frames from Part 4

```

```
% A) all resized frames with doubled frame rate, 'uncompressed AVI' format
video = VideoReader(['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...
    'CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4']);
directory = '.';
imageNames = dir(fullfile(directory, 'images', '*.jpg'));
imageNames = {imageNames.name};
result = VideoWriter(fullfile(directory, 'Marshmello_Video_540P_double_framerate.avi'));
result.FrameRate = 2 * video.FrameRate;
open(result)
for i = 1:length(imageNames)
    img = imread(fullfile(directory, 'images', imageNames{i}));
    writeVideo(result, img)
end
close(result)
clear;
video_name = 'Marshmello_Video_540P_double_framerate.avi';
video = VideoReader(video_name);
fprintf("Name: %s \n", video_name);
fprintf("The video's Frame Rate: %0.2f \n", video.FrameRate);
fprintf("The video's Number of Frames: %d \n", video.NumFrames);
fprintf("The video's Width: %d \n", video.Width);
fprintf("The video's Height: %d \n", video.Height);
fprintf("The video's Duration: %0.3f seconds\n", video.Duration);
clear;
```

Video		
Name: Marshmello_Video_540P_double_framerate.avi	Length	00:01:39
The video's Frame Rate: 47.95	Frame width	960
The video's Number of Frames: 4782	Frame height	540
The video's Width: 960	Data rate	12659kbps
The video's Height: 540	Total bitrate	12659kbps
The video's Duration: 99.725 seconds	Frame rate	47.95 frames/second

Size:	150 MB (157,810,058 bytes)
Size on disk:	150 MB (157,810,688 bytes)

## Part B) (2) only the odd frames.

The source code below is for saving only the odd frames into an uncompressed AVI video file. The frame rate remains the same, but the total numbers of frames is cut in half since we are only taking the odd frames. Duration is same as from Part A of Part 5.

```
% B) all resized odd frames only, 'uncompressed AVI' format
video = VideoReader(['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...
    'CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4']);
directory = '.';
imageNames = dir(fullfile(directory, 'images', '*.jpg'));
imageNames = {imageNames.name};
result = VideoWriter(fullfile(directory, 'Marshmello_Video_540P_odd_frames.avi'));
result.FrameRate = video.FrameRate;
open(result)
for i = 1:length(imageNames)
    if (rem(i, 2) ~= 0) %checks if odd then proceed
        img = imread(fullfile(directory, 'images', imageNames{i}));
        writeVideo(result, img)
    end
end
close(result)
clear;
video_name = 'Marshmello_Video_540P_odd_frames.avi';
video = VideoReader(video_name);
fprintf("Name: %s \n", video_name);
fprintf("The video's Frame Rate: %0.2f \n", video.FrameRate);
fprintf("The video's Number of Frames: %d \n", video.NumFrames);
fprintf("The video's Width: %d \n", video.Width);
fprintf("The video's Height: %d \n", video.Height);
```

```
fprintf("The video's Duration: %0.3f seconds\n", video.Duration);
clear;
```

```
Name: Marshmello_Video_540P_odd_frames_avi.avi
The video's Frame Rate: 23.98
The video's Number of Frames: 2391
The video's Width: 960
The video's Height: 540
The video's Duration: 99.725 seconds
Size: 75.3 MB (78,966,858 bytes)
Size on disk: 75.3 MB (78,970,880 bytes)
```

Video	
Length	00:01:39
Frame width	960
Frame height	540
Data rate	6334kbps
Total bitrate	6334kbps
Frame rate	23.98 frames/second

## Part 6 – Repeat Part 5 but save videos using ‘MPEG-4’ compressed.

### Part A) (1) all resized frames with doubled frame rate

The following source code is for saving all the frames with doubled frame rate into a ‘MPEG-4’ compressed .mp4 video file and it’s getting all the information about the double frame rate video for Part 6 Part A.

```
%Part 6: Repeat Part 5 but save videos using ‘MPEG-4’ compressed format.
%A) all resized frames with doubled framerate, ‘MPEG-4’ compressed format
video = VideoReader(['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...
' CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4']);
directory = '.';
imageNames = dir(fullfile(directory, 'images', '*.jpg'));
imageNames = {imageNames.name};
result = VideoWriter(fullfile(directory, 'Marshmello_video_2x.mp4'), 'MPEG-4');
result.FrameRate = 2 * video.FrameRate;
open(result)
for i = 1:length(imageNames)
img = imread(fullfile(directory, 'images', imageNames{i}));
writeVideo(result, img)
end
close(result)
clear;
video_name = 'Marshmello_video_2x.mp4';
video = VideoReader(video_name);
fprintf("Name: %s \n", video_name);
fprintf("The video's Frame Rate: %0.2f \n", video.FrameRate);
fprintf("The video's Number of Frames: %d \n", video.NumFrames);
fprintf("The video's Width: %d \n", video.Width);
fprintf("The video's Height: %d \n", video.Height);
fprintf("The video's Duration: %0.3f seconds\n", video.Duration);
clear;
```

```
Name: Marshmello_video_2x.mp4
The video's Frame Rate: 47.95
The video's Number of Frames: 4782
The video's Width: 960
The video's Height: 540
The video's Duration: 99.725 seconds
Size: 88.6 MB (92,939,906 bytes)
Size on disk: 88.6 MB (92,942,336 bytes)
```

Video	
Length	00:01:39
Frame width	960
Frame height	540
Data rate	7430kbps
Total bitrate	7430kbps
Frame rate	47.95 frames/second

### Part B) (1) odd frames only, ‘MPEG-4’ compressed format

The following source code is for saving only the odd frames into a ‘MPEG-4’ compressed .mp4 video file and its getting all the information about the odd frames only video for Part 6 Part B.

```
%Part B) (1) odd frames only, %MPEG-4’ compressed format
video = VideoReader(['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...
' CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4']);
directory = '.';
```

```

imageNames = dir(fullfile(directory, 'images', '*.jpg'));
imageNames = {imageNames.name};
result = VideoWriter(fullfile(directory, 'Marshmello_video_odd.mp4'), 'MPEG-4');
result.FrameRate = video.FrameRate;
open(result)
for i = 1:length(imageNames)
if (rem(i, 2) ~= 0) %checks if odd then proceed
img = imread(fullfile(directory, 'images', imageNames{i}));
writeVideo(result, img)
end
end
close(result)
clear;
video_name = 'Marshmello_video_odd.mp4';
video = VideoReader(video_name);
fprintf("Name: %s \n", video_name);
fprintf("The video's Frame Rate: %0.2f \n", video.FrameRate);
fprintf("The video's Number of Frames: %d \n", video.NumFrames);
fprintf("The video's Width: %d \n", video.Width);
fprintf("The video's Height: %d \n", video.Height);
fprintf("The video's Duration: %0.3f seconds\n", video.Duration);
clear;

```

```

Name: Marshmello_video_odd.mp4
The video's Frame Rate: 23.98
The video's Number of Frames: 2391
The video's Width: 960
The video's Height: 540
The video's Duration: 99.725 seconds

```

```

Size:      51.7 MB (54,285,800 bytes)
Size on disk: 51.7 MB (54,288,384 bytes)

```

Video	
Length	00:01:39
Frame width	960
Frame height	540
Data rate	4340kbps
Total bitrate	4340kbps
Frame rate	23.98 frames/second

## Report: Q&A

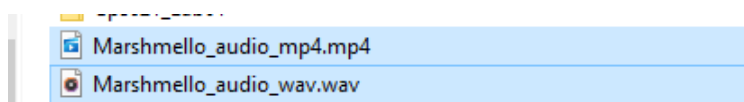
- For step 2, please make a brief review of the two audio file formats, then compare the size and quality of the two generated files. Do you see a difference and why? Make a brief analysis.

Answer: The audio from the video file is extracted into two audio files, one is .mp4 and the other one is .wav. The .wav file is uncompressed and thus has a larger file size. The .mp4 is compressed and so it has a small file size. Also, since the .mp4 audio file is compressed, the quality of the sound is a bit degraded but this is not noticeable for me.

For .mp4 audio file, the file size is 3.15 MB. The reason it's smaller than .wav file is because the 'MPEG-4' compression is applied to the audio file. The audio also has higher peaks compared to the .wav file and so the .mp4 audio is a bit louder.

For .wav audio file, the file size is 33.5 MB. The reason it's larger than the .mp4 file is because the .wav audio file is uncompressed. The audio has few peaks reaching +1 and -1 and so the audio is a bit less loudly compared to the .mp4 file.

**Overall**, there is no noticeable difference between the .mp4 and .wav audio files. Both are stereo and have the same sampling rate of 44.1 KHz. The .mp4 file is more commonly used for video and is generally used for audio only data.



Audio			
Bit rate	131kbps	Size:	3.15 MB (3,310,423 bytes)
Channels	2 (stereo)		
Audio sample rate	44.100 kHz	Size on disk:	3.16 MB (3,313,664 bytes)
Audio		Size:	33.5 MB (35,192,876 bytes)
Bit rate	1411kbps	Size on disk:	33.5 MB (35,196,928 bytes)
.wav			

**2. For step 3, report the duration of your video, the total number of frames, frame rate, and the frame resolution.**

Answer: The video's frame rate is 23.98 FPS. The number of frames is 4782 and width is 1920 and height is 1080. The duration is 199.506 seconds. This is 1080P 60FPS video. The file size is 41.5 MB.

```
-----
Name: C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4
The video's Frame Rate: 23.98
The video's Number of Frames: 4782
The video's Width: 1920
The video's Height: 1080
The video's Duration: 199.506 seconds
fx >>
```

Video				Audio	
Length	00:03:19			Bit rate	127kbps
Frame width	1920			Channels	2 (stereo)
Frame height	1080			Audio sample rate	44.100 kHz
Data rate	1610kbps	Size:	41.5 MB (43,592,456 bytes)		
Total bitrate	1737kbps	Size on disk:	41.5 MB (43,597,824 bytes)		
Frame rate	23.98 frames/second				

**3. For step 4, report the total storage space occupied by the saved frames.**

Answer: The total storage space occupied by the saved frames is 150-160 MB. There are total of 4782 frames. You can see each frame image properties below along with total size of all frames:

Image			
Image ID			
Dimensions	960 x 540	Size:	150 MB (157,615,871 bytes)
Width	960 pixels	Size on disk:	159 MB (167,301,120 bytes)
Height	540 pixels		
Horizontal resolution	96 dpi	Contains:	4,782 Files, 0 Folders
Vertical resolution	96 dpi		
Bit depth	24		

**4. For step 5, report the duration and file size of the two generated files. Watch and compare the quality of the two videos. What differences do you observe between the two videos? Make a brief analysis.**

Answer: As you can see below (1. and 2.) the both files have the same Width, Height, and Duration. The odd frames only file has a total of 2391 frames while the double frame rate file has 4782 frames. The odd frames only file has a frame rate of 23.98 FPS while the double frame rate file has a frame rate of 47.95 FPS. The double frame rate file has double the frame rate of odd frames only file. The file size of the double frame rate file is 150MB while the odd frames only file has a file size of 75.3 MB. The duration of both files remain the same.



Also watching both videos I honestly couldn't tell if there was any quality difference between them if there was any to begin with. The double frame rate video has the frame rate but is speed up while the odd frames only video has half the frames of the original video file and so the video is definitely missing frames. Both videos look same to me. I would prefer to watch the double frame rate video as its not missing frames like the odd frames only video.

1.

Name: Marshmello_Video_540P_double_framerate_avi.avi	Video	
The video's Frame Rate: 47.95	Length	00:01:39
The video's Number of Frames: 4782	Frame width	960
The video's Width: 960	Frame height	540
The video's Height: 540	Data rate	12659kbps
The video's Duration: 99.725 seconds	Total bitrate	12659kbps
	Frame rate	47.95 frames/second
	Size:	150 MB (157,810,058 bytes)
	Size on disk:	150 MB (157,810,688 bytes)

2.

Name: Marshmello_Video_540P_odd_frames_avi.avi	Video	
The video's Frame Rate: 23.98	Length	00:01:39
The video's Number of Frames: 2391	Frame width	960
The video's Width: 960	Frame height	540
The video's Height: 540	Data rate	6334kbps
The video's Duration: 99.725 seconds	Total bitrate	6334kbps
	Frame rate	23.98 frames/second
	Size:	75.3 MB (78,966,858 bytes)
	Size on disk:	75.3 MB (78,970,880 bytes)

**5. For step 6, report the duration and file size of the two generated files. Watch and compare the quality with the corresponding videos generated in step 5. Do you see a difference and why? Make a brief analysis.**

Answer: As you can see below (1. and 2.) the both files have the same Width, Height, and Duration. The odd frames only file has a total of 2391 frames while the double frame rate file has 4782 frames. The odd frames only file has a frame rate of 23.98 FPS while the double frame rate file has a frame rate of 47.95 FPS. The double frame rate file has double the frame rate of odd frames only file. These specifications are similar to step 5 files.

The file size of the double frame rate file is 88.6 MB while the odd frames only file has a file size of 51.7 MB. The duration of both files remain the same. The files sizes are smaller compared to their Step 5 counter parts because of the MPEG-4 compression.

On paper, since MPEG-4 compress is loosely, there should be a noticeable difference between the video files of step 5 and step 6. On paper, step 5 video file are of better quality compared to step 6 video files. But watching the videos with my eyes, I couldn't really see any difference between them; this could be because the MPEG-4 compression does not degrade the quality for the videos by a significant amount. The file size difference between the double frame rate video from step 5 and step 6 is significant. File size was reduced from 150 MB to 88.6 MB for the double frame rate videos. However for the odd frames only, the file size is less impressive. File size was reduced from 75.3 MB to 51.7 MB.

1.

Name: Marshmello_video_2x.mp4	Video	
The video's Frame Rate: 47.95	Length	00:01:39
The video's Number of Frames: 4782	Frame width	960
The video's Width: 960	Frame height	540
The video's Height: 540	Data rate	7430kbps
The video's Duration: 99.725 seconds	Total bitrate	7430kbps
	Frame rate	47.95 frames/second
	Size:	88.6 MB (92,939,906 bytes)
	Size on disk:	88.6 MB (92,942,336 bytes)

2.

```

Name: Marshmello_video_odd.mp4
The video's Frame Rate: 23.98
The video's Number of Frames: 2391
The video's Width: 960
The video's Height: 540
The video's Duration: 99.725 seconds
Size: 51.7 MB (54,285,800 bytes)
Size on disk: 51.7 MB (54,288,384 bytes)

```

Video	
Length	00:01:39
Frame width	960
Frame height	540
Data rate	4340kbps
Total bitrate	4340kbps
Frame rate	23.98 frames/second

## 6. Include the source code of each step in your report.

Answer: Full code below:

```

#####
% CPS 621 Winter2022
% Lab04
% Name: Tusaif Azmat Student#: 500660278.
#####

% Part 2: Extract the audio track of the video using matlab functions
[y,Fs] = audioread(['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...
    'CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4']);
y = y/max(abs(y(:))); %normalize range between -1 to +1
audiowrite('Marshmello_audio_wav.wav',y,Fs);
audiowrite('Marshmello_audio_mp4.mp4',y,Fs);
clear;

% Part 3: Get info on the downloaded video
video_name = ['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...
    'CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4'];
video = VideoReader(video_name);
fprintf("Name: %s \n", video_name);
fprintf("The video's Frame Rate: %0.2f \n", video.FrameRate);
fprintf("The video's Number of Frames: %d \n", video.NumFrames);
fprintf("The video's Width: %d \n", video.Width);
fprintf("The video's Height: %d \n", video.Height);
fprintf("The video's Duration: %0.3f seconds\n", video.Duration);
clear;

% Part 4: Read each frame of the video and resize each frame to % width and % height
video = VideoReader(['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...
    'CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4']);
i = 1;
directory = './';
mkdir(directory,'images')
while hasFrame(video)
    img = imresize(readFrame(video), 0.5);
    filename = [sprintf('%05d',i) '.jpg'];
    fullname = fullfile(directory,'images',filename);
    imwrite(img,fullname)
    i = i+1;
end
clear;

% Part 5: Generate two new videos from the resized frames from Part 4
% A) all resized frames with doubled framerate, 'uncompressed AVI' format
video = VideoReader(['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...
    'CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4']);
directory = './';
imageNames = dir(fullfile(directory,'images','*.jpg'));
imageNames = {imageNames.name};

```



```

result = VideoWriter(fullfile(directory, 'Marshmello_Video_540P_double_framerate.avi.avi'));
result.FrameRate = 2 * video.FrameRate;
open(result)
for i = 1:length(imageNames)
img = imread(fullfile(directory, 'images', imageNames{i}));
writeVideo(result, img)
end
close(result)
clear;
video_name = 'Marshmello_Video_540P_double_framerate.avi.avi';
video = VideoReader(video_name);
fprintf("Name: %s \n", video_name);
fprintf("The video's Frame Rate: %0.2f \n", video.FrameRate);
fprintf("The video's Number of Frames: %d \n", video.NumFrames);
fprintf("The video's Width: %d \n", video.Width);
fprintf("The video's Height: %d \n", video.Height);
fprintf("The video's Duration: %0.3f seconds\n", video.Duration);
clear;

% B) all resized odd frames only, 'uncompressed AVI' format
video = VideoReader(['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...
    'CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4']);
directory = '.';
imageNames = dir(fullfile(directory, 'images', '*.jpg'));
imageNames = {imageNames.name};
result = VideoWriter(fullfile(directory, 'Marshmello_Video_540P_odd_frames.avi.avi'));
result.FrameRate = video.FrameRate;
open(result)
for i = 1:length(imageNames)
if (rem(i, 2) ~= 0) %checks if odd then proceed
img = imread(fullfile(directory, 'images', imageNames{i}));
writeVideo(result, img)
end
end
close(result)
clear;
video_name = 'Marshmello_Video_540P_odd_frames.avi.avi';
video = VideoReader(video_name);
fprintf("Name: %s \n", video_name);
fprintf("The video's Frame Rate: %0.2f \n", video.FrameRate);
fprintf("The video's Number of Frames: %d \n", video.NumFrames);
fprintf("The video's Width: %d \n", video.Width);
fprintf("The video's Height: %d \n", video.Height);
fprintf("The video's Duration: %0.3f seconds\n", video.Duration);
clear;

%Part 6: Repeat Part 5 but save videos using 'MPEG-4' compressed format.
%A) all resized frames with doubled framerate, 'MPEG-4' compressed format
video = VideoReader(['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...
    'CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4']);
directory = '.';
imageNames = dir(fullfile(directory, 'images', '*.jpg'));
imageNames = {imageNames.name};
result = VideoWriter(fullfile(directory, 'Marshmello_video_2x.mp4'), 'MPEG-4');
result.FrameRate = 2 * video.FrameRate;
open(result)
for i = 1:length(imageNames)
img = imread(fullfile(directory, 'images', imageNames{i}));
writeVideo(result, img)
end
close(result)

```

```

clear;
video_name = 'Marshmello_video_2x.mp4';
video = VideoReader(video_name);
fprintf("Name: %s \n", video_name);
fprintf("The video's Frame Rate: %0.2f \n", video.FrameRate);
fprintf("The video's Number of Frames: %d \n", video.NumFrames);
fprintf("The video's Width: %d \n", video.Width);
fprintf("The video's Height: %d \n", video.Height);
fprintf("The video's Duration: %0.3f seconds\n", video.Duration);
clear;

%Part B) (1) odd frames only, %MPEG-4' compressed format
video = VideoReader(['C:\Users\Zanara\Documents\Ryerson\Winter2022\CPS621\' ...
    'CPS621_winter2022\Labs\lab04\Marshmello_Video_1080p.mp4']);
directory = '.';
imageNames = dir(fullfile(directory, 'images', '*.jpg'));
imageNames = {imageNames.name};
result = VideoWriter(fullfile(directory, 'Marshmello_video_odd.mp4'), 'MPEG-4');
result.FrameRate = video.FrameRate;
open(result)
for i = 1:length(imageNames)
    if (rem(i, 2) ~= 0) %checks if odd then proceed
        img = imread(fullfile(directory, 'images', imageNames{i}));
        writeVideo(result, img)
    end
end
close(result)
clear;
video_name = 'Marshmello_video_odd.mp4';
video = VideoReader(video_name);
fprintf("Name: %s \n", video_name);
fprintf("The video's Frame Rate: %0.2f \n", video.FrameRate);
fprintf("The video's Number of Frames: %d \n", video.NumFrames);
fprintf("The video's Width: %d \n", video.Width);
fprintf("The video's Height: %d \n", video.Height);
fprintf("The video's Duration: %0.3f seconds\n", video.Duration);
clear;
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

```

## 7. Submit the two generated videos in step 6.

Answer: I have added the Google drive link here to all the files created during this lab below:

<https://drive.google.com/drive/folders/1a3rmssKWeRYLTUU3YuWhF89FUnsQZnbo?usp=sharing>

## References:

- [1] Lab 4 Manual by Guanghui (Richard) Wang. (Accessed: 2021 March 17th)
- [2] Lab 4 Sample Matlab file. (Accessed: 2021 March 17th)
- [3] Read Video Files - MATLAB & Simulink. (n.d.). Matlab Read Video Files. Retrieved March 17, 2021, from [https://www.mathworks.com/help/matlab/import\\_export/read-video-files.html](https://www.mathworks.com/help/matlab/import_export/read-video-files.html)
- [4] Convert Between Image Sequences and Video - MATLAB & Simulink. (n.d.). Convert Frames to Video File. Retrieved March 17, 2021, from [https://www.mathworks.com/help/matlab/import\\_export/convert-between-image-sequences-and-video.html](https://www.mathworks.com/help/matlab/import_export/convert-between-image-sequences-and-video.html)
- [5] Odd and even numbers - MATLAB Answers - MATLAB Central. (n.d.). MATLAB - Help. Retrieved March 17, 2021, from <https://www.mathworks.com/matlabcentral/answers/264769-odd-and-even-numbers>
- [6] Supported Video and Audio File Formats - MATLAB & Simulink. (n.d.). MPEG-4 File Format. Retrieved March 17, 2021, from [https://www.mathworks.com/help/matlab/import\\_export/supported-video-file-formats.html](https://www.mathworks.com/help/matlab/import_export/supported-video-file-formats.html)