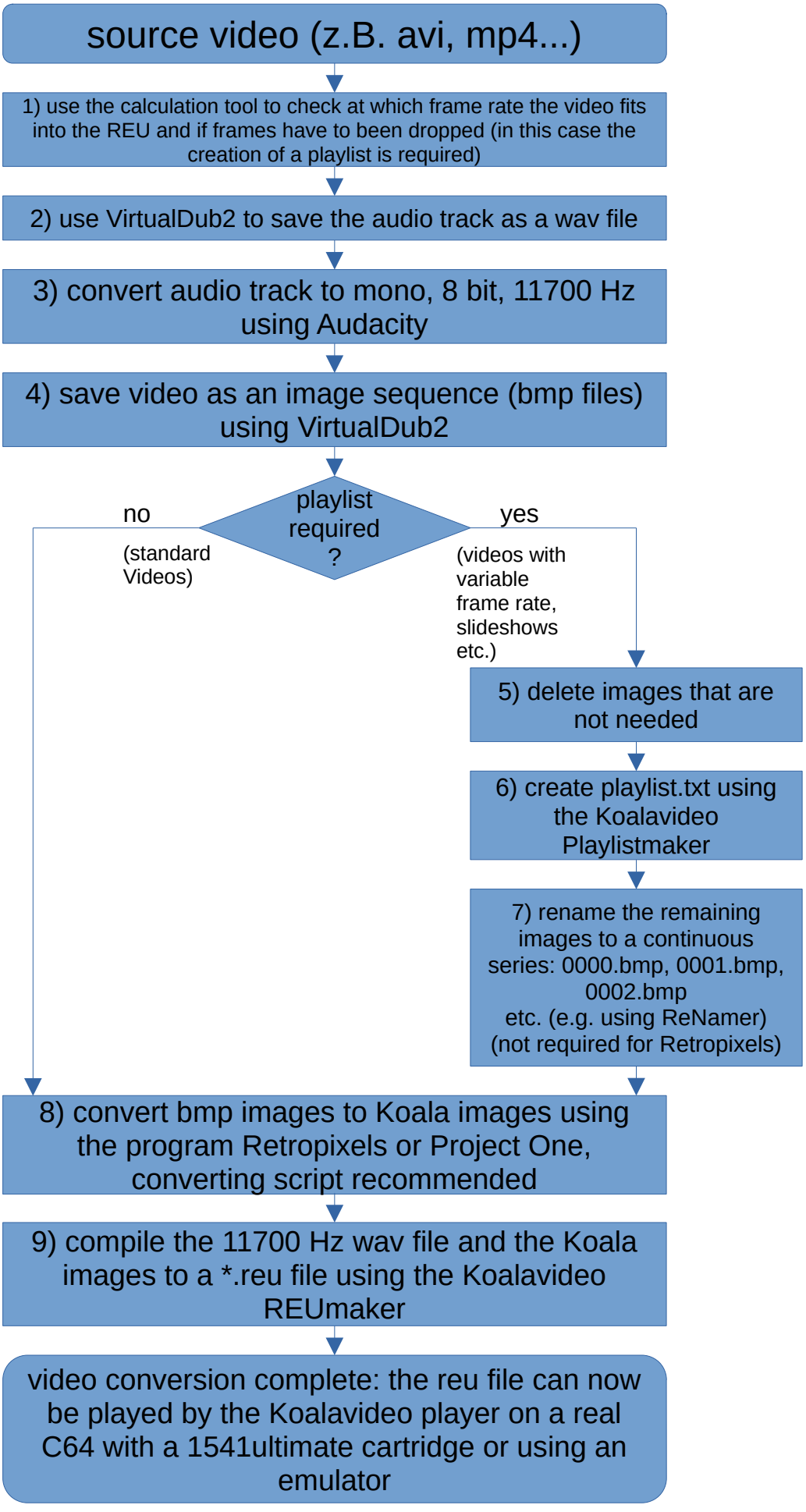
Steps required to convert a video to the Koalavideo format



How to create a Koalavideo

1. Calculation of the file size / maximum frame rate

Before starting the conversion of the video, you should check which frame rate the video can have to fit in the REU (16 MiB).

For standard videos that do not require a play list, you can read from the following table which play times are possible at which frame rate and decide which frame rate to use to fit the video into the REU (play times in minutes:seconds):

image format ---------->		16:10 320x200 (160x200)	16:9 320x184 (160x184)	4:3 256x192 (128x192)	2.35:1 / 21:9 320x136 (160x136)
fps ↓	divider ↓				
25	50/2	-	-	-	1:36
16,67	50/3	1:38	1:46	2:05	2:20
12,5	50/4	2:08	2:18	2:42	3:01
10	50/5	2:37	2:49	3:17	3:39
8,333	50/6	3:04	3:18	3:51	4:15
7,143	50/7	3:30	3:46	4:22	4:49
6,25	50/8	3:55	4:12	4:52	5:21
5,556	50/9	4:19	4:38	5:20	5:52
5	50/10	4:43	5:02	5:47	6:20
0,33 (slide show 3s/image)	50/150	18:48	19:07	19:46	20:09

If you want to create a video that requires a play list (e.g. video with variable frame rates, slide shows, dropped frames to save storage space), you can use the calculation tool for LibreOffice Calc (can be found in the “Tools” directory of the downloaded archive). In this tool you enter the length of the video and audio track and the desired frame rate. The tool calculates if the video fits completely into the REU (which would not require a play list) and if not how many images you have to drop at least to fit the video into the REU (more details in chapter 5).

Important: all files created during the following steps have to be stored in the same directory (in the following chapters called “project directory”) for the following steps to work properly.

2. Extract audio track from the video

Using the programm VirtualDub2 you extract the audio track from the source video as a wav file.
Open the source video with VirtualDub2 (also works using drag & drop) and then select the options “File” -> “Save audio...” in the menu.
In the following dialogue enter the file name of the wav file, select “Windows audio (*.wav, *.w64)” and click on “save”.
Leave the programm VirtualDub2 open with the loaded video as it will be needed for step 4 again.

3. Conversion of the audio track using Audacity

Now you have to open Audacity, open the extracted audio track (also works using drag & drop) and save it as a wav file with the properties Unsigned 8 Bit, 11700 Hz, Mono ab:

If the audio track is in stereo you have to convert it to a mono audio track. This can be down using the menu options “Tracks” -> “Mix” -> “Downmix Stereo Down to Mono”. If this option is greyed out and you have a stereo track, you first have to select it by clicking on it to make the option available.

The sample rate of 11700 Hz can be set by using the input box “Project Rate (Hz)” in the bottom left corner: put in the value 11700 there.

Save the audio track using the menu “File” -> “Export” -> “Export Audio...”. In the dialogue box “Export Audio” go to your project directory, enter a file name and set the following format options:

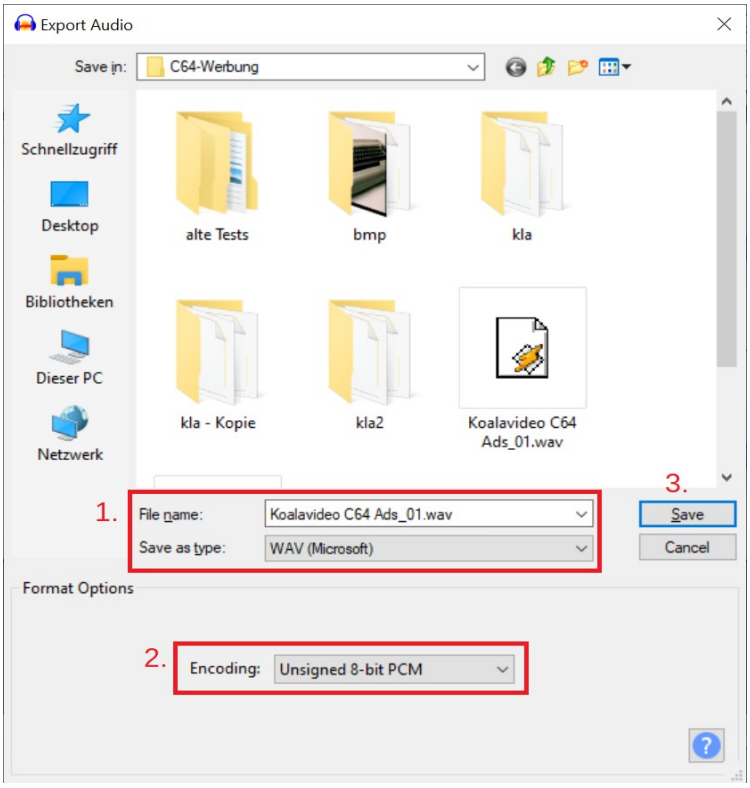
- Save as type: WAV (Microsoft)
- Encoding: Unsigned 8-bit PCM

Then click on “Save”.

In the following dialogue box “Edit Metadata Tags” just click on “OK”.

The new wav file will be saved.

Important: the original (unconverted) wav file must not remain in the project directory (if you saved it to it) to avoid an error message when using the Koalavideo REUmaker in the last step.

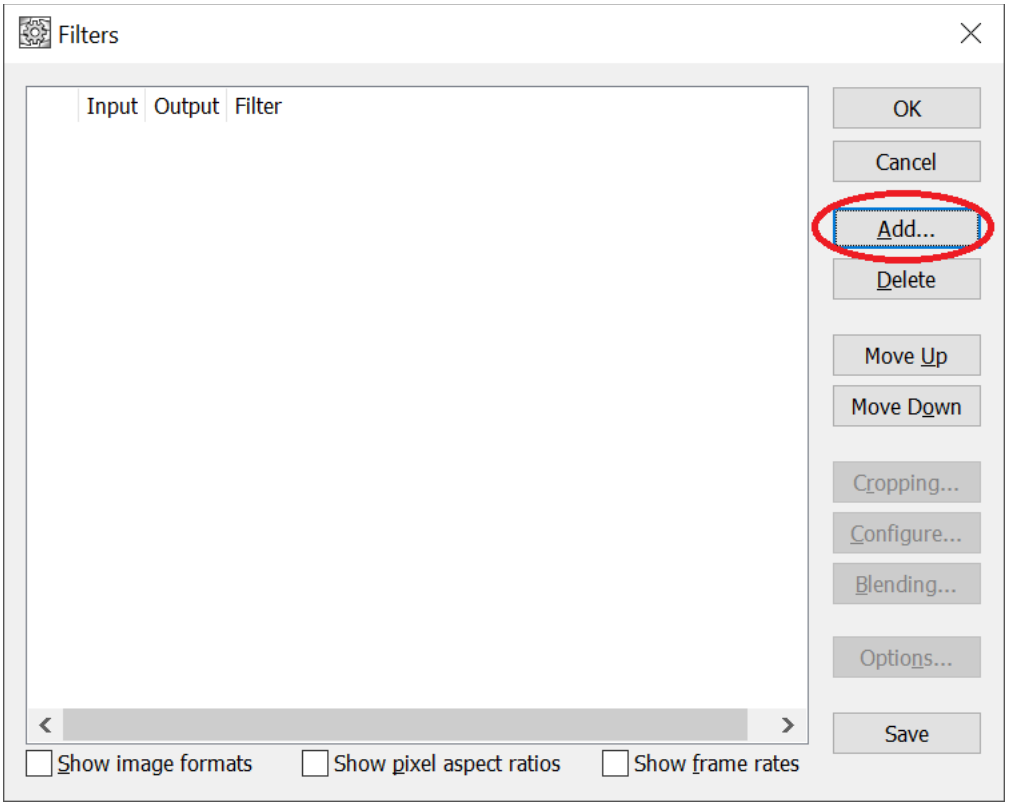


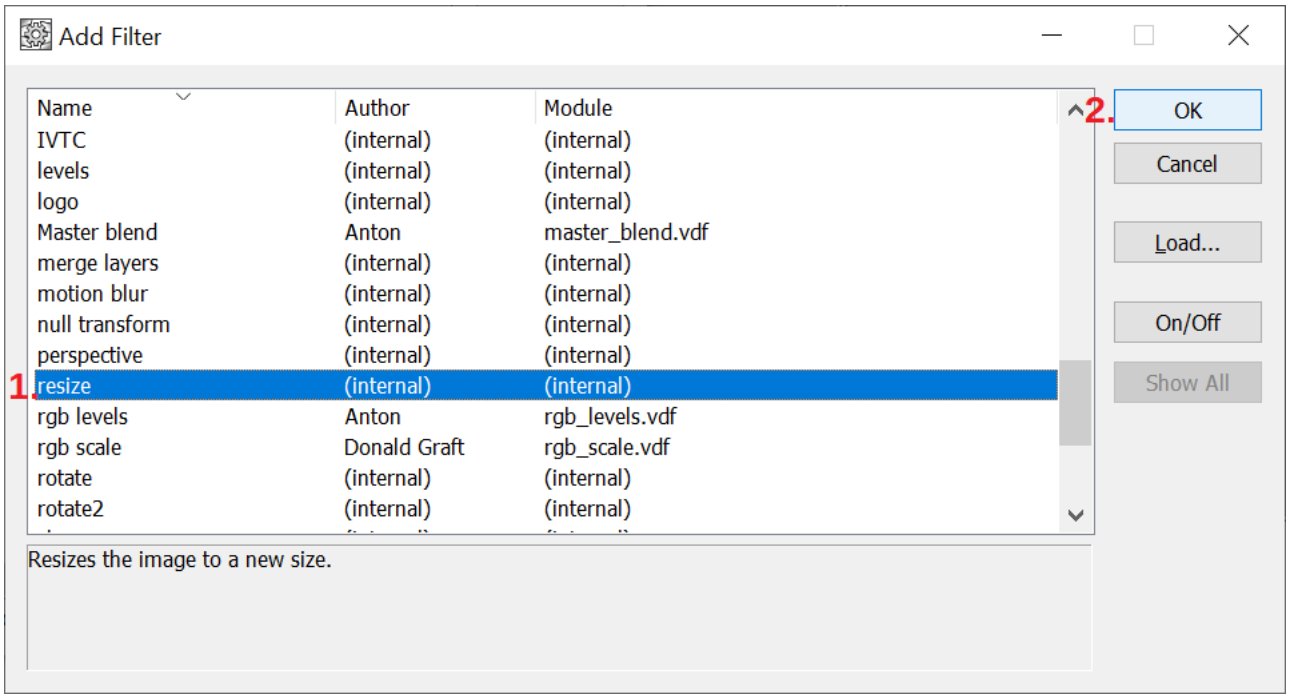
4. Set video resolution and frame rate, export the video as image sequence

Now you have to change the video resolution and frame rate and export the video as an image sequence. To do this multiple steps are required in VirtualDub2:

4.1 Set video resolution

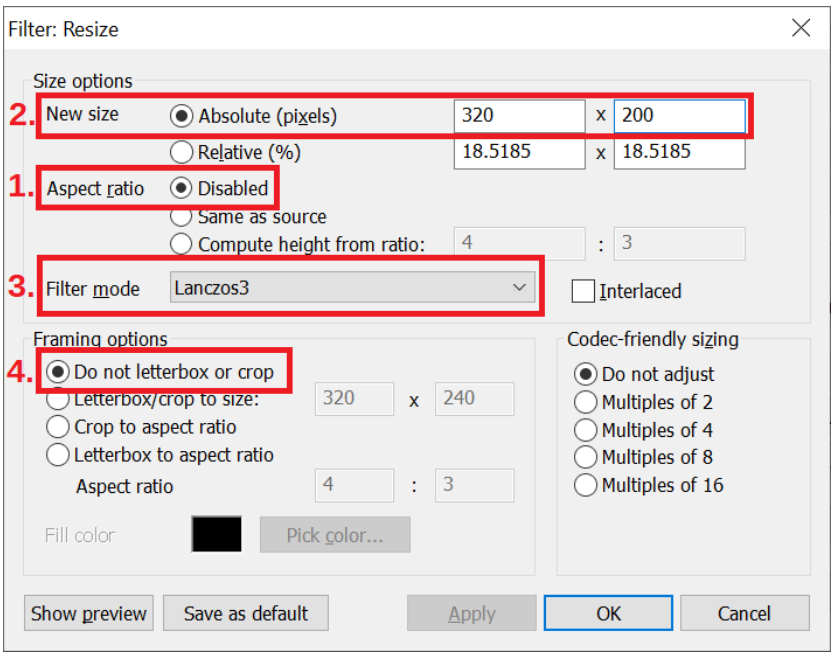
First you have to select the menu options “Video“ -> “Filters“
In the dialogue box “Filters”, click on “Add...”, in the following dialogue select the filter “resize” and click on “OK”.



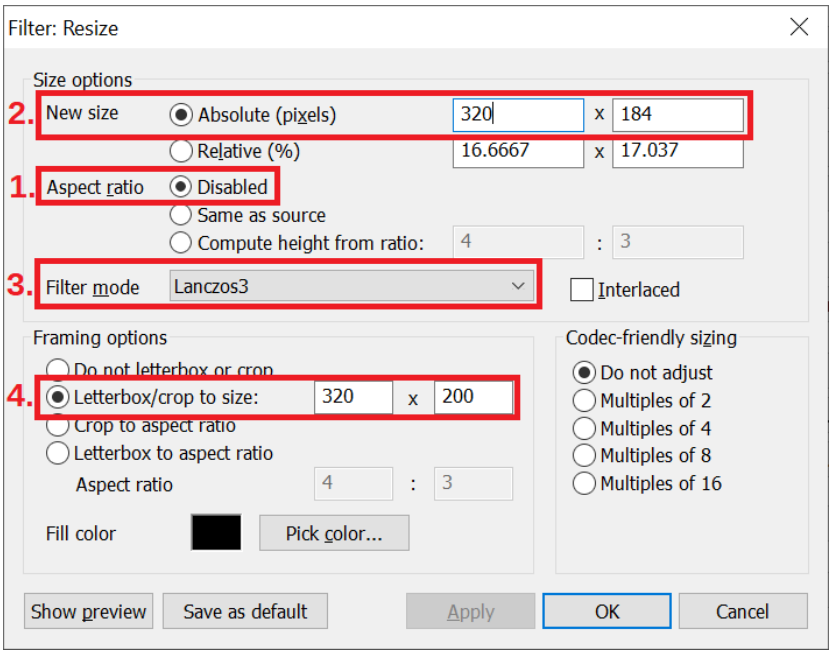


Depending on the desired video format / aspect ratio you have to make different settings:

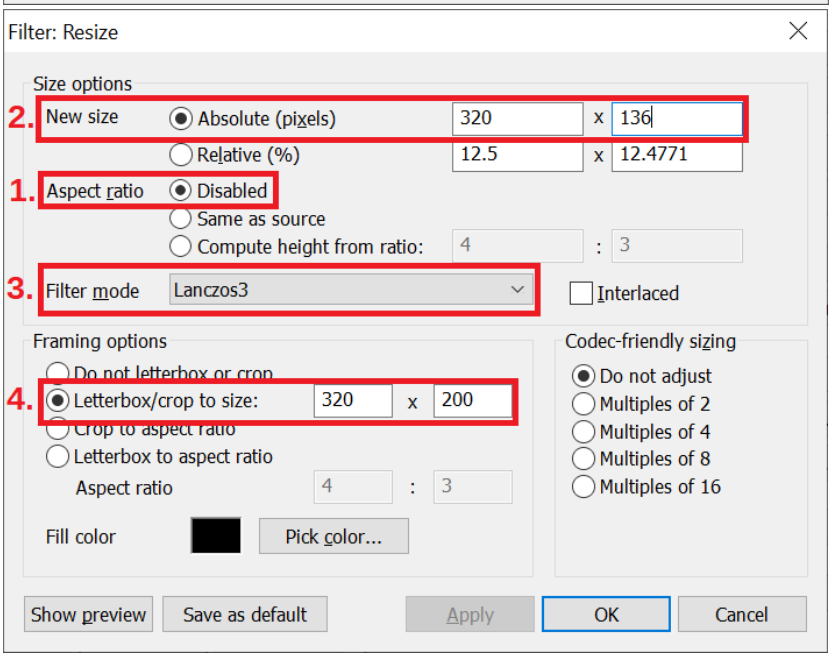
settings for 16:10 videos:



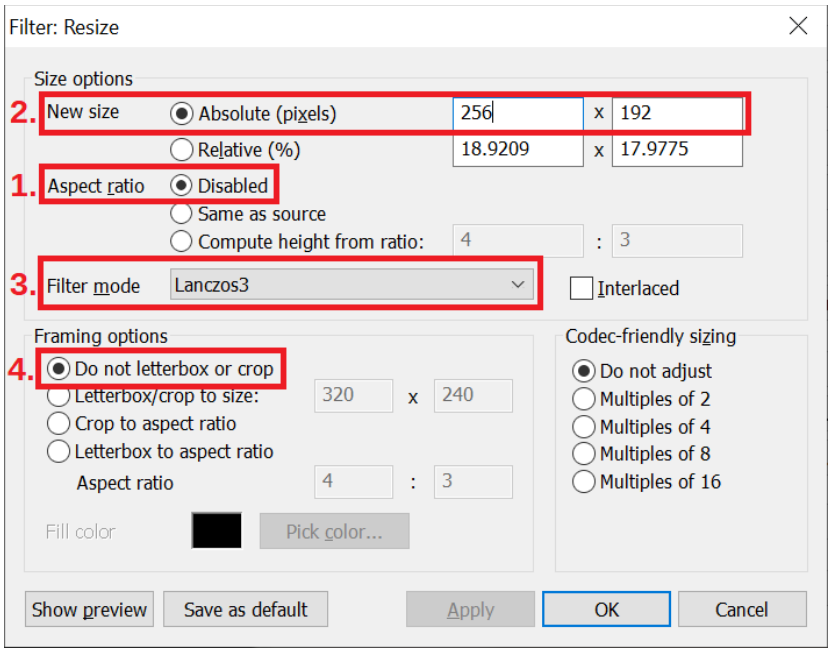
settings for 16:9 videos:



settings for for 2.35:1 / 21:9 videos:

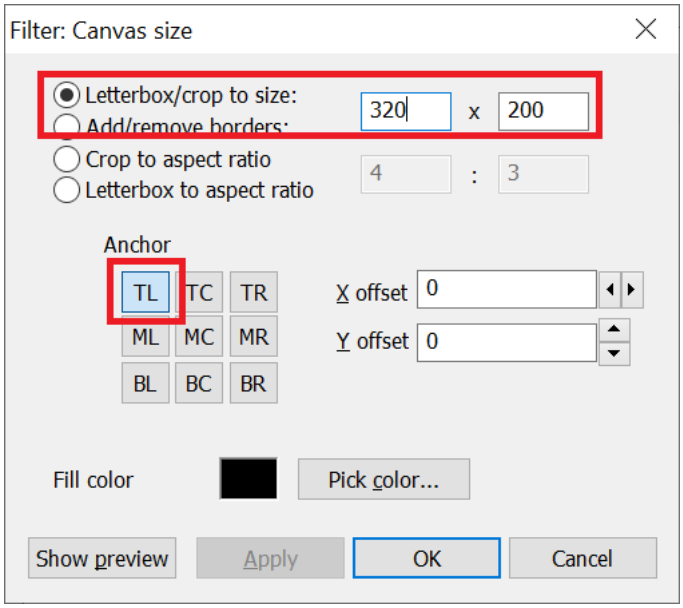


settings for
for 4:3 videos:



After the settings were made, they have to be confirmed by clicking on “OK” and you will get back to the “Filters” menu.

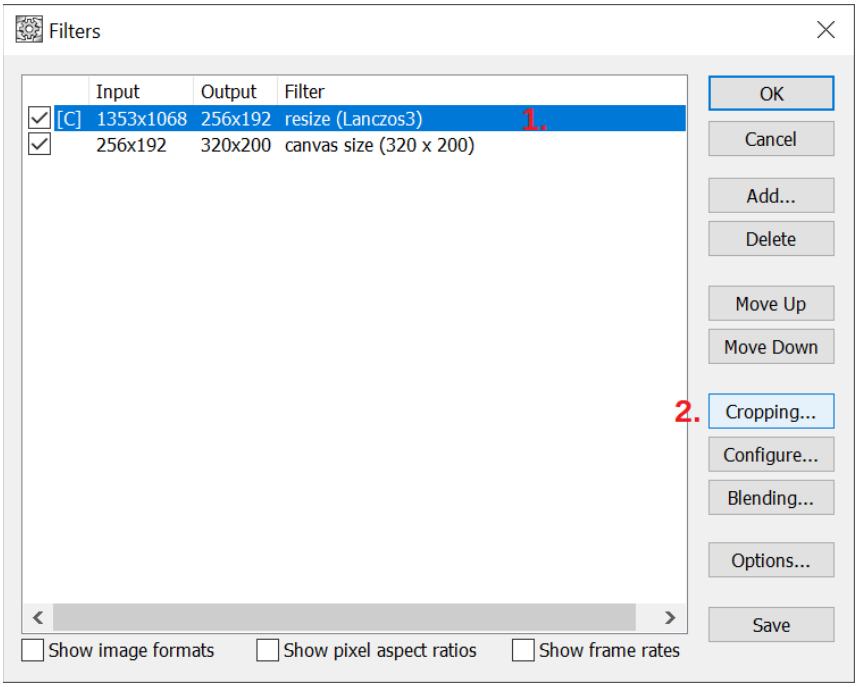
For 4:3 videos, another filter is needed: “canvas size” which has to be added by using the “Add...” command too. The following settings have to be made and confirmed by clicking on “OK”:



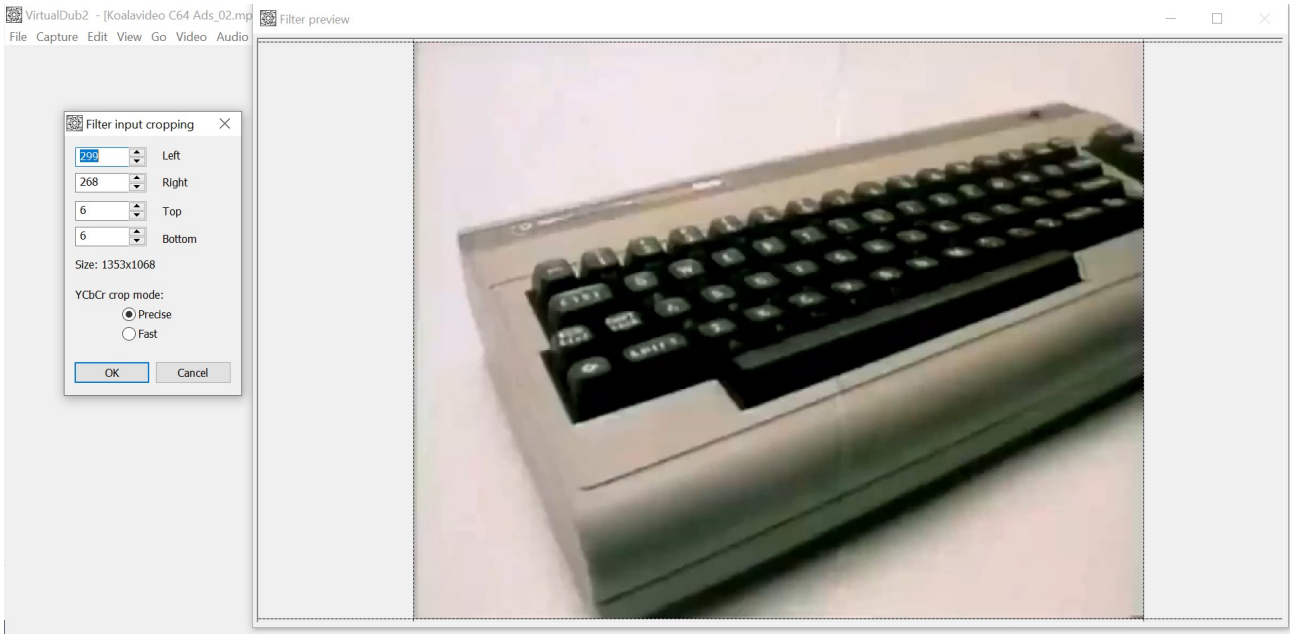
4.2 crop black borders or parts of the image that are not needed

If the source video contains black bars on the borders, you should crop them.
If you want to convert a 16:9 video into a 16:10 video by cropping a total of 10% of the image on the left and/or right side, the following step is requires too.
This step can be skipped if nothing has to be cropped. In this case you can continue with step 4.3.

In the menu “Filters” select the resize filter and click on “Cropping...”:

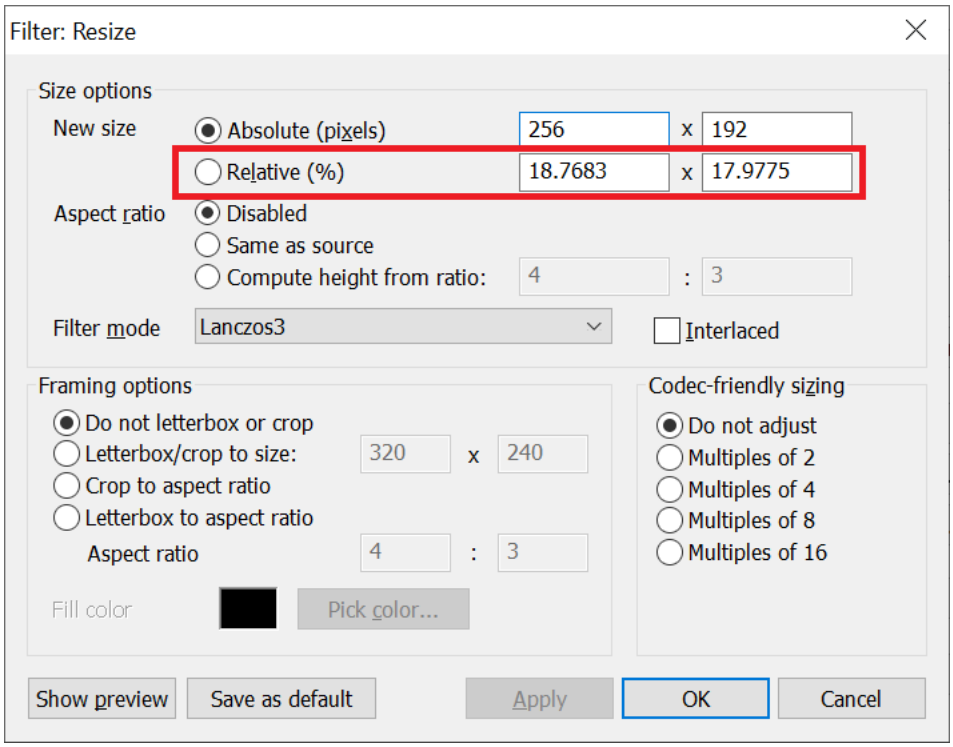


In the menu “Filter input cropping” you can set how many pixels you want to crop for each side. In the window “Filter preview” you can see what parts of the image remain after cropping. You also can use this window to directly set the cropping by grabbing the cutting lines and drag them while holding the left mouse button.



If you are happy with the cropping, leave the menu by clicking on “OK”.

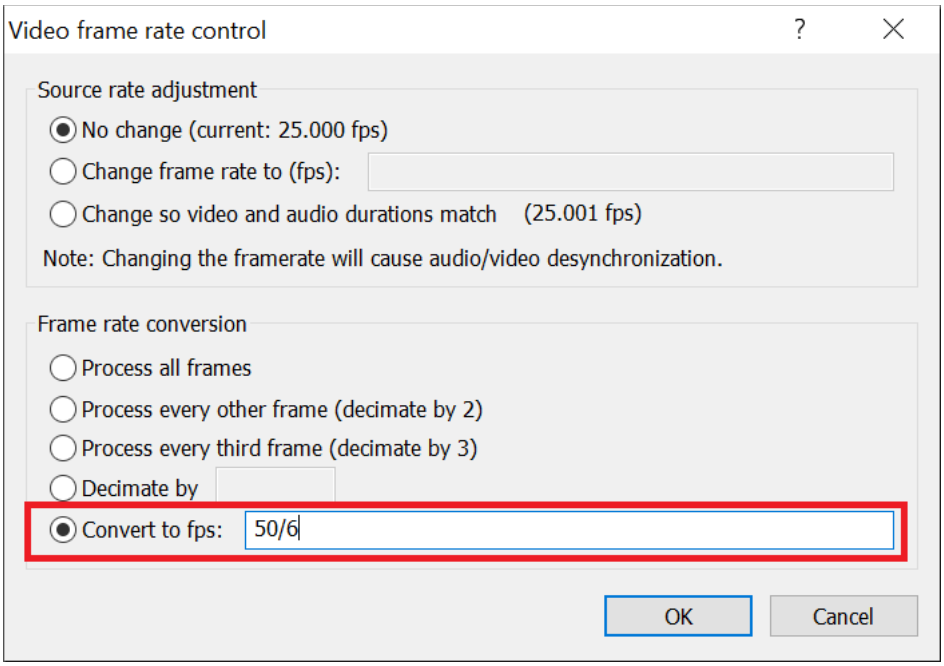
After setting the cropping it is recommended to open the “resize” filter again (by double clicking on it in the “Filters” menu) and check if the aspect ratio is ok (just look on it, do not change anything here !):



The values “Relative (%)” should be nearly equal. In this example they have a deviation of around 4.4% (18.7683 / 17.9775 ≈ 1.044) which is OK. The deviation should be less than 10% because on bigger deviations you will see an obvious deformation of the resulting image.
After all filter settings are made, confirm all windows by clicking on “OK”. This saves all settings and closes the windows.

4.3 adjust the frame rate

The frame rate settings can be found in the menu “Video” -> “Frame Rate...”.
In the following window select “Convert to fps:” and enter the frame rate you determined in the first step. Instead of entering an “uneven” frame rate you also can enter the divider from the table of step 1 (e.g. “50/6” for 8.333 fps). This way the frame rate is set more accurately.



Confirm the settings by clicking on “OK”.
If you entered a divider you can check the result by entering the “Frame Rate...” menu again. The program will show the calculated value, e.g.:

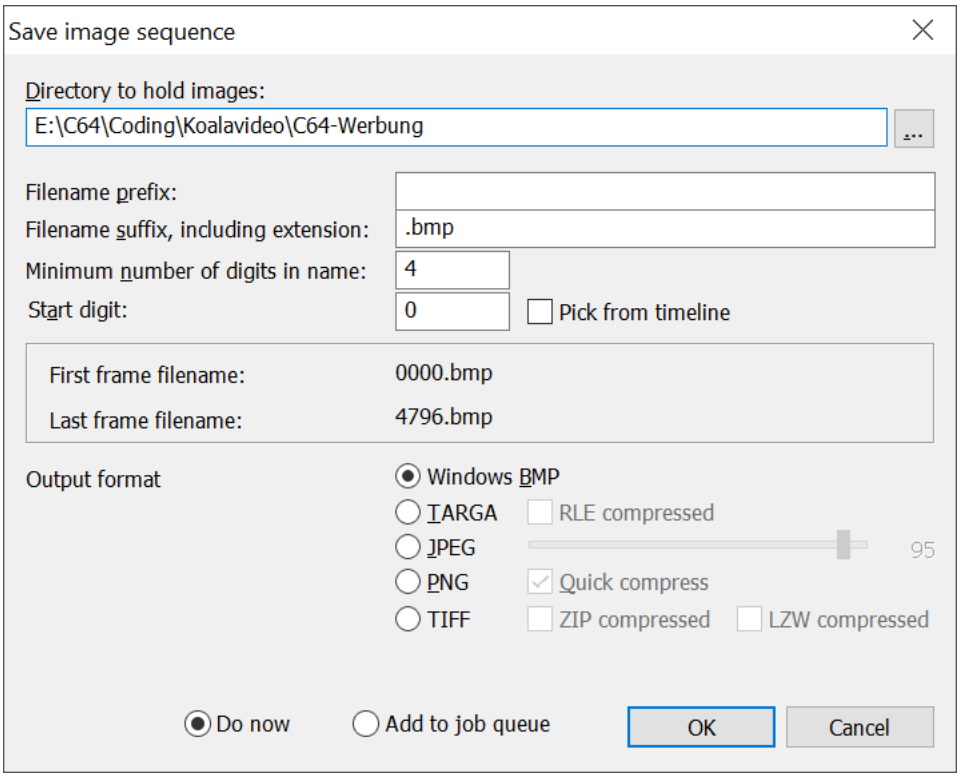


4.4 export the image sequence

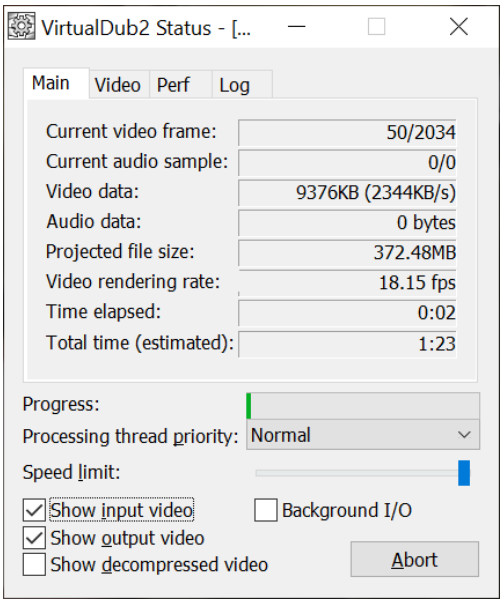
Now it is time to export the video as an image sequenz to allow to convert the resulting images into Koala images later.
This can be done by using the menu “File” -> “Export” -> “Image sequence...”.
The following settings have to be made:

- „Directory to hold images“ must be the project directory
- set the other options like shown in the following screenshot

Note: the program often shows a too high value for „Last frame filename“, because the changed frame rate is not taken into account. The program will export the correct amount of images.



By clicking on “OK” you will start the output of the image sequence:



After the process is finished all the images should be found in the project director, e.g.:



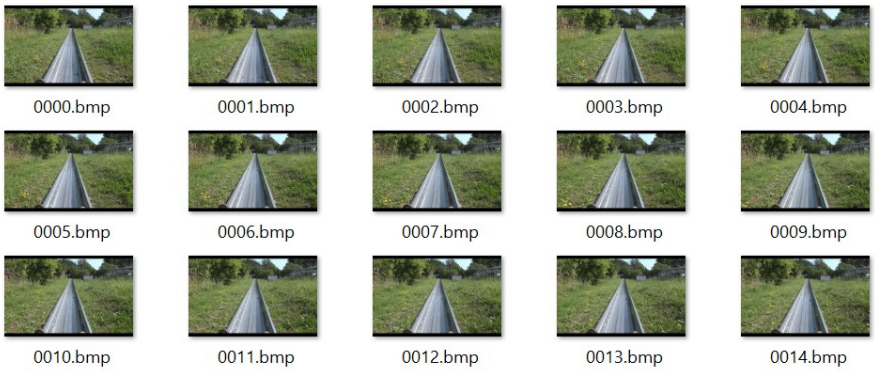
The steps 5 to 7 are only required if the video has to have a variable frame rate, e.g. to save storage space on parts with a low amount of movement or to show slide shows in the video. In this case the images that are no longer needed have to be deleted, a playlist has to be created and the remaining images have to be renamed.

For a “standard” video with a constant frame rate those steps are not required and you can directly continue with step 8.

5. delete bmp images that are no longer needed

If you want to create a video that would not fit into the REU at the chosen frame rate and length, you have to save storage space by leaving out some images. The images no longer needed have to be deleted from the project directory. The minimum number of images you have to delete is shown in the calculation tool for LibreOffice Calc.

Two examples for leaving out images:
1) halve the frame rate by deleting every other image. In this example from the images 0000 to 0009 every other image is deleted:

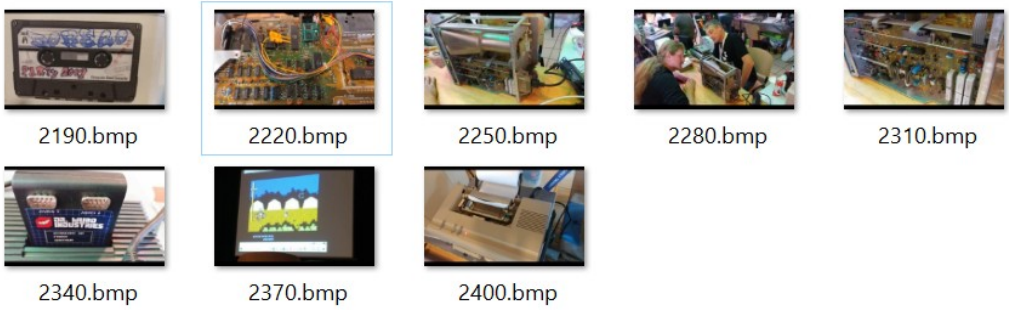


results in



= reduction by 5 images

2) The video contains a slide show: here you can save a lot of storage space, because each image has to be stored to the REU only once and can then displayed e.g. for 3 seconds:
After deleting the images no longer needed images the result can look like this:



You can see that the image numbers are increased by 30. In this example there is a slide show in a video with a frame rate of 10 fps. Each image is displayed for 3 seconds. VirtualDub2 therefore created 30 copys of each image whereof 29 can be deleted.

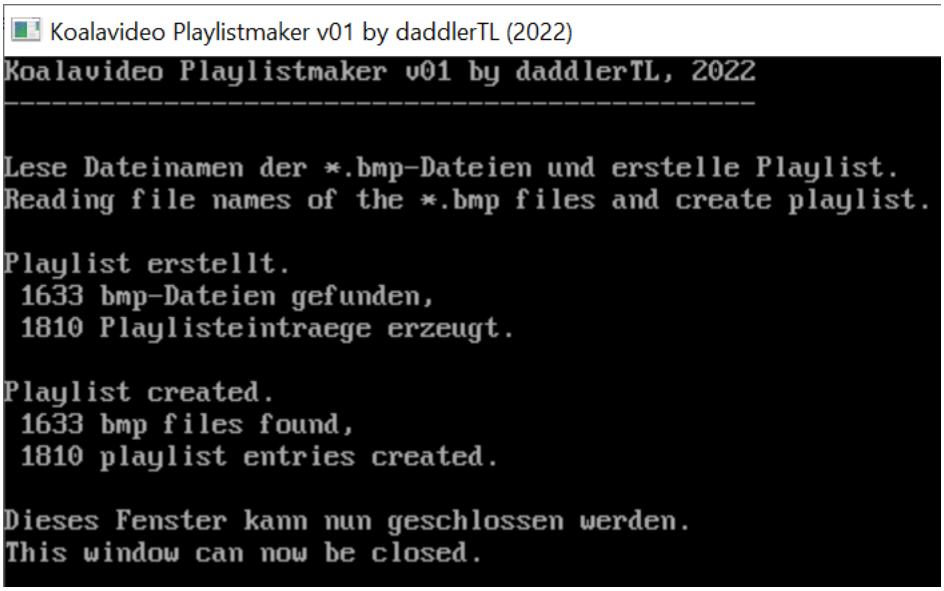
Important: if you delete the last bmp file, the video will be shortened because the playlistmaker (see step 6) cannot see that there were more images at the end. To avoid this you should not delete the last image. If the last image has to be deleted anyways due to shortage of storage space you should do this after the creation of the playlist (step 6) and manually decrease the last number by 1 in the file playlist.txt (e.g. change number 1604 to 1603).

6. create playlist

In order to make the Koalavideo player know which images have to be shown multiple times and therewith longer, a playlist has to be created which is used by the Koalavideo REUmaker to write to required informations to the *.reu file.

The creation of the playlist is easy: just copy the Koalavideo Playlistmaker from the directory “Tools” of the downloaded archive into the project directory and start it.

The program now searches the project directory for bmp files, detects the gaps in the numbering and creates a corresponding playlist. An example for the output of the program:

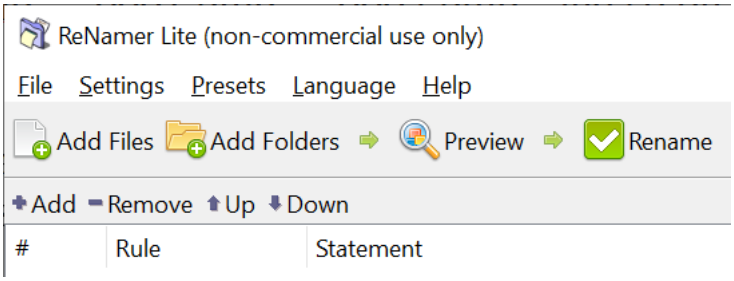


Now you will find the file “playlist.txt” in the project directory which is used by the Koalavideo REUmaker in the last step.
The creating of the playlist is now complete.

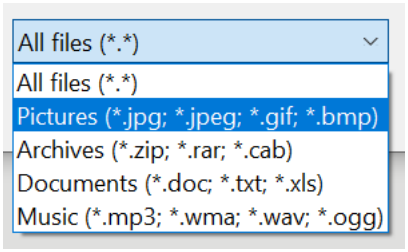
7. rename bmp files

If you want to convert the images using the Retropixels script this step can be skipped (continue with step 8a).

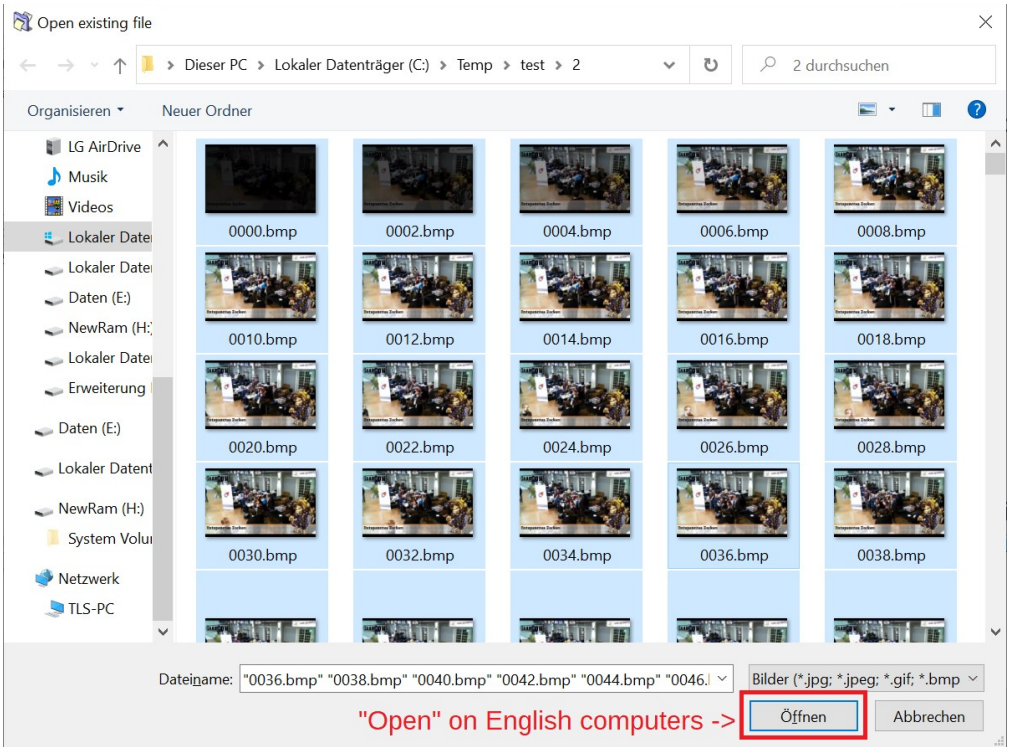
To allow an automated conversion of the remaining images they have to be renamed to the sequence “0000.bmp”, “0001.bmp”, “0002.bmp” and so on, which means that there must not remain any gaps in the numbering.
To remove those gaps in the numbering, you have to rename all bmp files to a continuous sequence. This can be done using the program “ReNamer”:
Start ReNamer and click on “Add Files”:



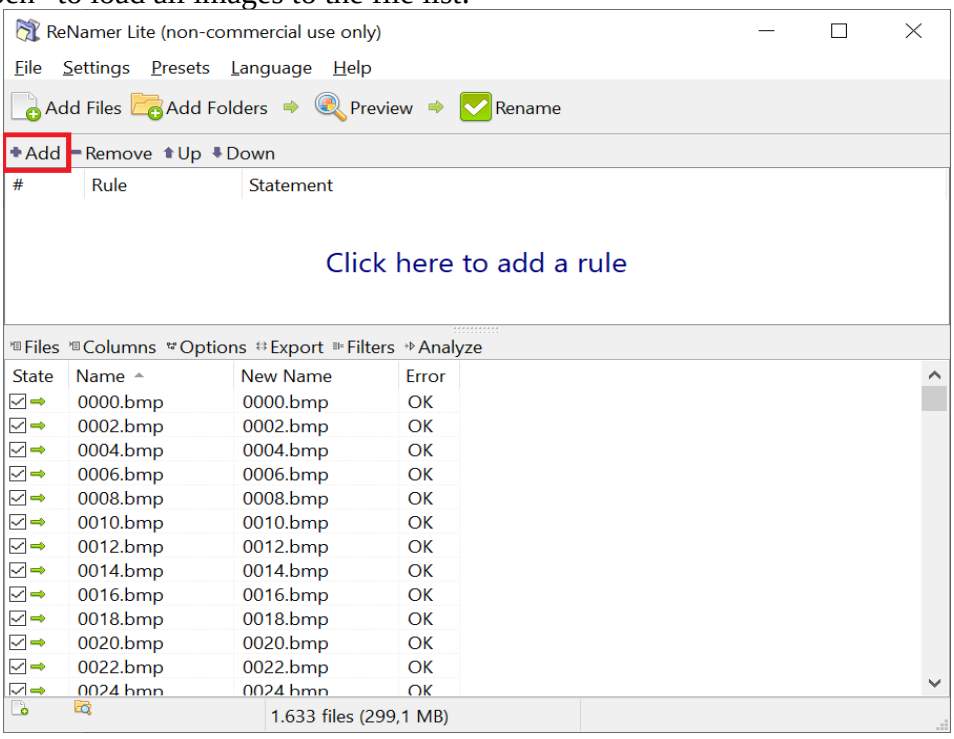
In the following window first select “Pictures (*.jpg; *.jpeg; *.gif; *.bmp)“ in the dropdown menu on the bottom right. This filters the file selection to only get images for selection and avoid the renaming of other files.



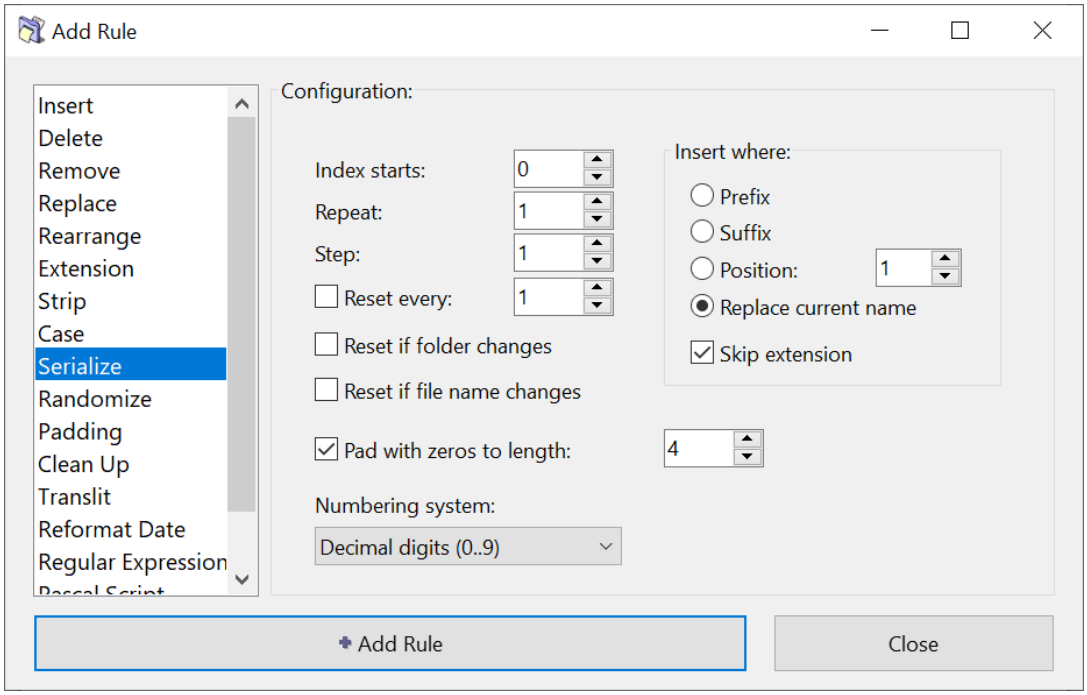
To select all images, click on one image in the window and press Ctrl + A.
Now all files are selected:



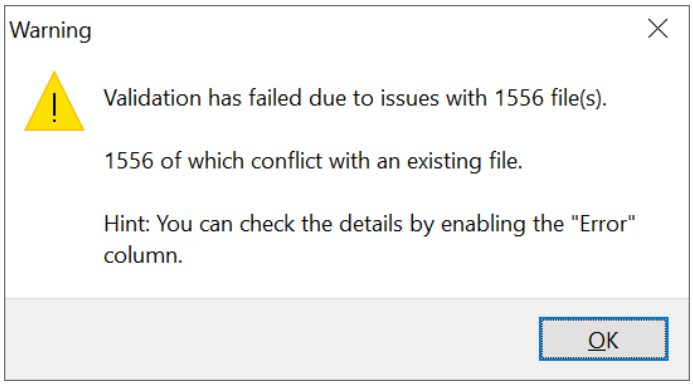
Click on “Open” to load all images to the file list:



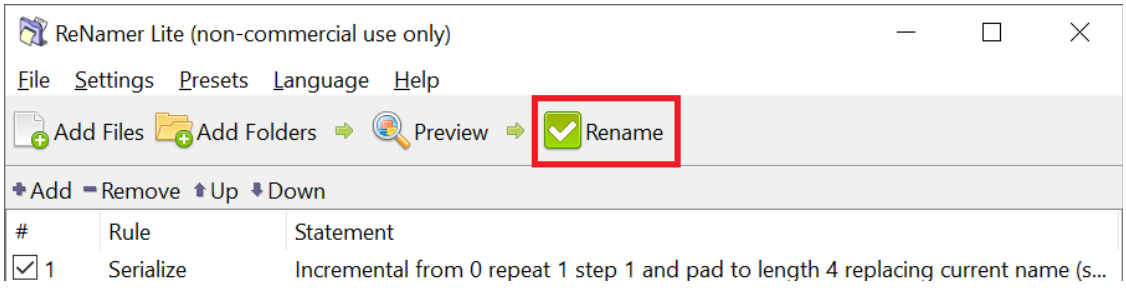
Now you to create a rule for the renaming. Click on “+ Add” and make the following settings:



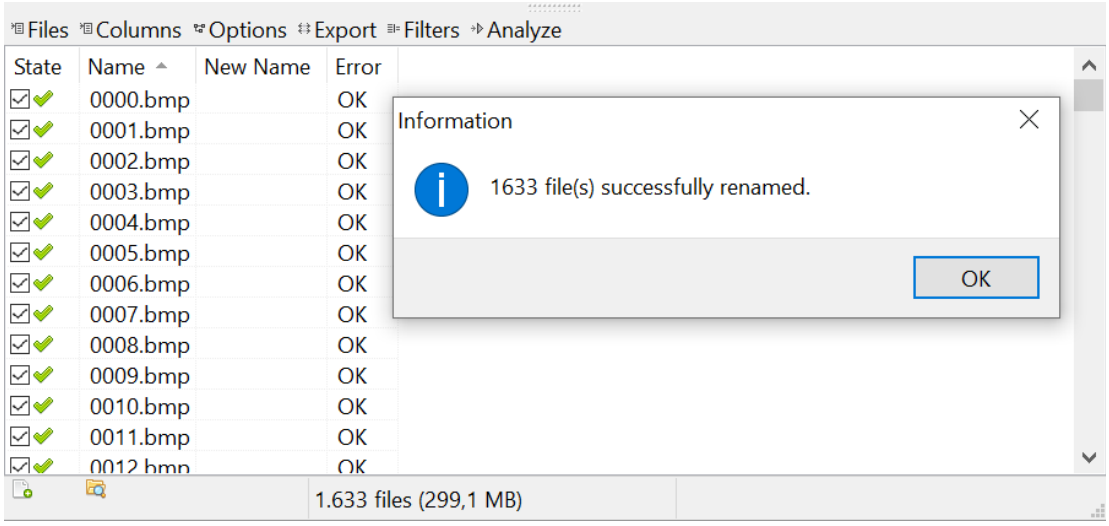
After everything is set correctly click on the “+ Add Rule” button.
This has to be done only once because the program saves this rule and you can use it again for the next renaming process.
The program will show a warning which you can ignore and confirm by clicking on “OK”. The conflicts the program assumes will not occur due to the selected serialize renaming rule.



To start the renaming process click on “Rename”:



The process should be finished successfully despite the prevoius warning:



Die images are now ready for the automatic conversion.

8. convert images to the Koala format

After the image sequence has been extracted from the video, the images have to be converted into the Koala format. There are two ways to do that:

a) Conversion using the command line tool “Retropixels” and a batch file: the recommended method as it is the fastest, allows the computer to be used while converting and it requires the fewest steps, but it does not have a preview and less settings.

b) using the program “Project One” and an AutoIt script: this method has more settings and a preview, but it takes a lot of time (several hours), it requires way more work steps and the computer cannot be used while the conversion takes place, because it would interrupt the AutoIt script.
Both methods are described below. Only one of the two methods needs to be performed.

After the conversion you can view the Koala images using the image viewer "xnview".

8a. convert images to the Koala format using „Retropixels“

The folder “Tools” of the downloaded archive contains the file "batch Retropixels.bat". This file has to be copied into the project directory. It calls the conversion program "Retropixels" for each image with the specified parameters.

For a first test you can leave the parameters in the batch file unchanged and start the conversion by double-clicking the batch file.

In the line
for %%f in (./*.bmp) do retropixels -c yuv -p PALette %%f
in the batch file you can alter the parameters (marked red) of the conversion program „Retropixels“. The following parameters can be specified (for unspecified parameters the standard settings are used):

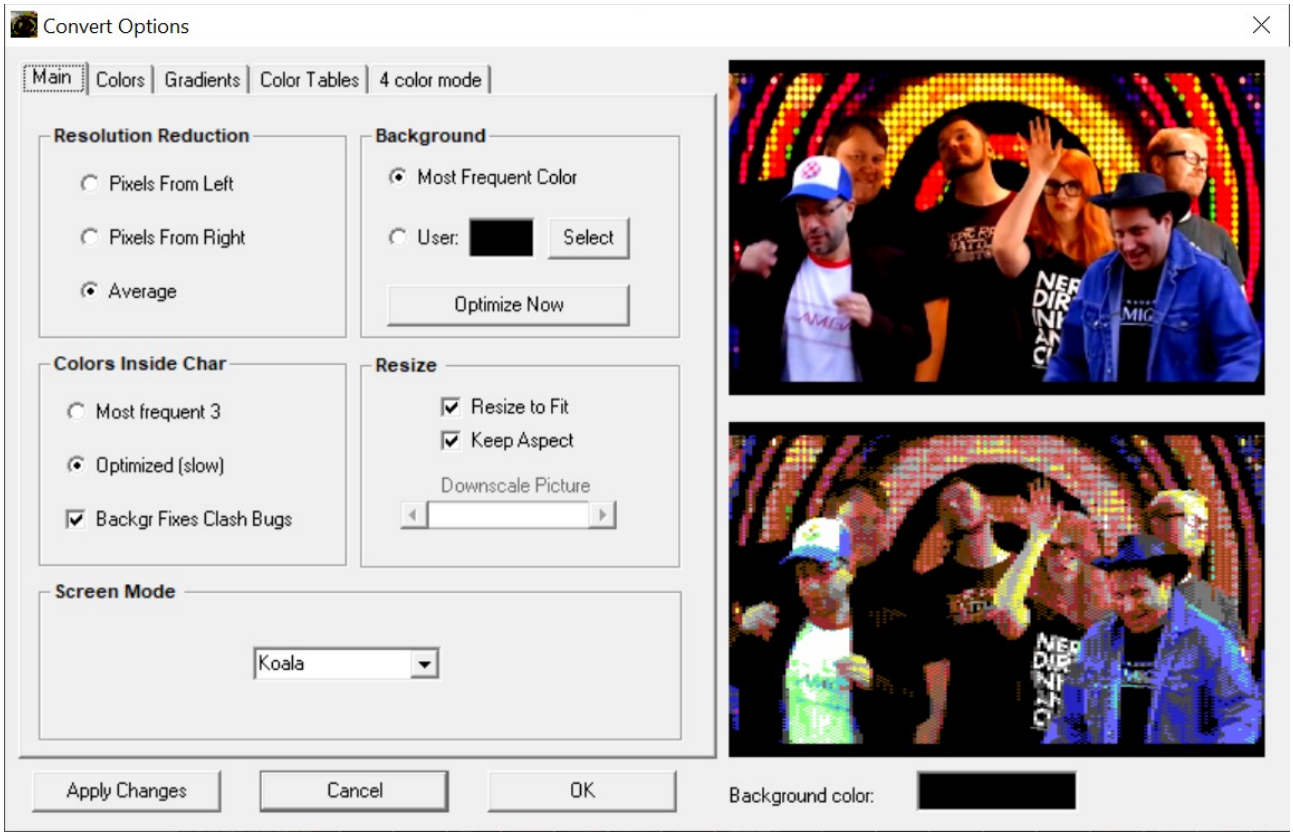
```
-d, --ditherMode <ditherMode>  bayer2x2, bayer4x4 (default), bayer8x8
-r, --ditherRadius [0-64]      0 = no dithering, 32 = default
-p, --palette <palette>        PALette (default), colodore, pepto, deekay
-c, --colorspace <colorspace>  xyz (default), yuv, rgb (no conversion), rainbow
```

A little trial and error is required here, because the optimal parameters depend on the source material. The conversion with this method is quite fast, you can try several parameter combinations, compare the results and pick the one you like best for further processing. It is best to save each setting to a separate batch file to have it available for future conversions.

8b. convert images to the Koala format using „Project One“

The best way is to use an AutoIt script. The conversion process takes several hours because more than 1000 images have to get converted.

First start Project One and load an image (bmp file) of the video. Choose one that has a lot of content using the menu “File” -> “Import Picture”. In the following “Open” dialogue navigate to the project directory and choose an image with contents that occur often in the video and/or contains a lot of elements / details (as an example to make the conversion settings). By double clicking on the image or by doing a single click on the image and on “Open” in the bottom right corner you get to the convert options.
In the tab “main” you should make the following settings:



In the tab “Colors” you can play around with the settings until you find a setting you like. By clicking on “Apply Changes” you can see how the converted image will look like on a C64.



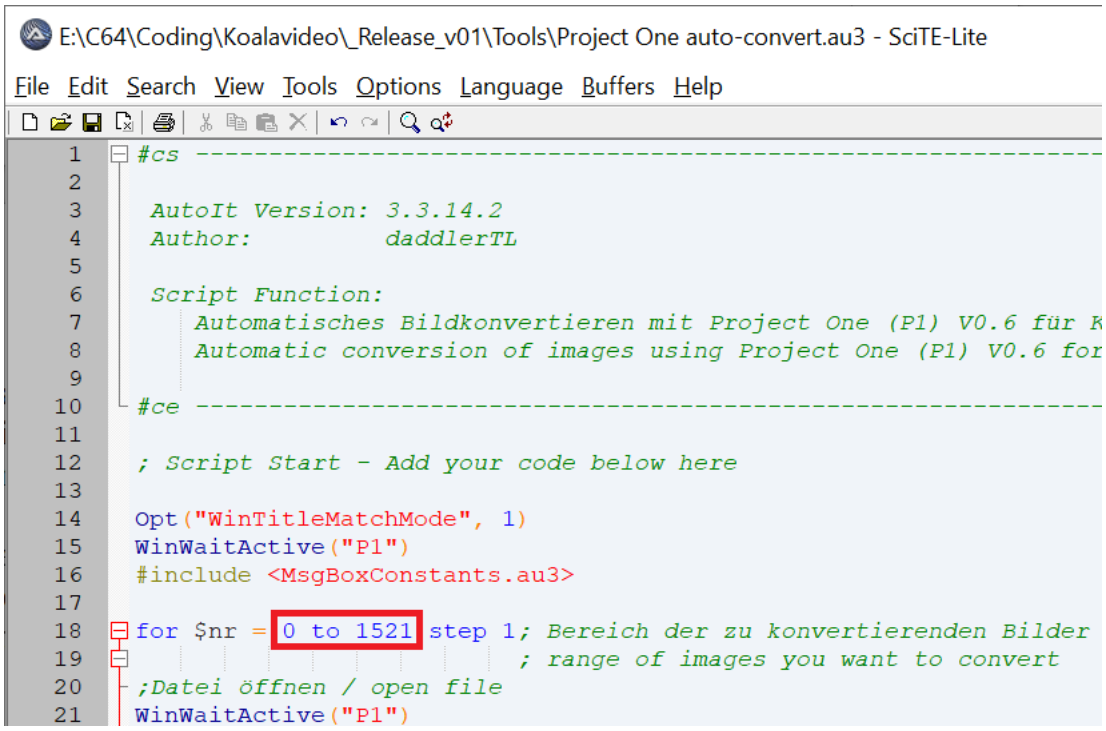
Then you can change the settings again and click on „Apply Changes“ and repeat this until you found settings that give the results you like most. If you are happy with the settings click on “OK” to get back to the main window of the program. Please leave it in the current state.

Now you could save the image using the menu “File” -> “Save Koala” to a Koala image, open the next image, save that to a Koala image too and so on until you converted all images, but that is what you will not want to do manually with more than 1000 images.

To automate the process you should use the AutoIt script „Project One auto-convert.au3“ in the “Tools” directory of the downloaded archive. To use it a full installation of the program “AutoIt” is required on the PC.

You should adapt the AutoIt script before execution. To do this right click on the script file in the Windows Explorer and select the context menu option „Edit Script“.

In the script editor go to the line „for $nr = 0 to 1521 step 1“ and change the den range of the images zu want to convert by editing the first and last image number. The first image number usually is 0 and the last is number of the last bmp file. You can define a different range if you already converted some of the images and want to convert the missing ones.

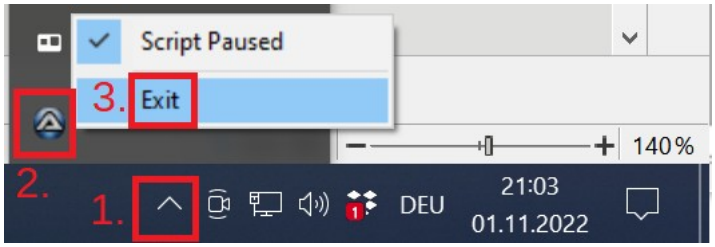


Save the changes using the menu “File” -> “Save” then close the script editor.

To start the automatic conversion double click on the script file „Project One auto-convert.au3“ and directly send the program „Project One“ („P1“) to the foreground (click into the program window). The script should now conduct the automatic conversion.

Important: During the conversion the PC must not be used for other tasks because the script operates the program „Project One“. If you change to another program the script will executes the commands in this program which makes no sense and can lead to unexpected behaviour and also interrupts the script execution (after each image conversion it checks if Project One is still in the foreground and if not it waits for it to get to the foreground again).
Prior to the execution of the script all programs that are not needed for the conversion should be closed (especially those which use a lot of CPU time, put themself into the foreground or open popup windows or similar things). This reduces the risk of a disruption of the automatic conversion process.

If you want to abort the execution of the script (e.g. because you need the PC for a different task) you can do so by clicking on the arrow ^ on the bottom right part of the windows task bar, right click on the AutoIt icon and select “Exit”.



You can continue the script execution later by doing the adaption of the range of the image numbers (as described above) to continue it at the image number at which you aborted it.

If the script does not run properly because the PC is too slow and tries to execute a command before the previous command has been finished, you have to increase the “sleep” values in the script, e.g. change “Sleep(200)” to “Sleep(400)”. If you have knowledge in scripting you can do specific increases where the timing is not right, if not you have to generally increase all values (e.g. double them), but this will significantly increase the time needed for the conversion due to the increased waiting time between the commands.
If you have a fast PC you can try to set lower sleep values to decrease the time needed for the conversion. Doing some experiments is required because every system is different. Do not set the timings too tight to leave a reserve for delays that can occur in certain circumstances.

After all image are converted you should check if the number of *.kla files matches the number of *.bmp files. If the numbers do not match you must check which images have not been converted and convert the missing images. If only a few are missing you can convert them manually. If a larger amount is missing use the conversion script again to convert the missing range of images.

If all *.kla files are present you can create the Koalavideo using the Koalavideo REUmaker.

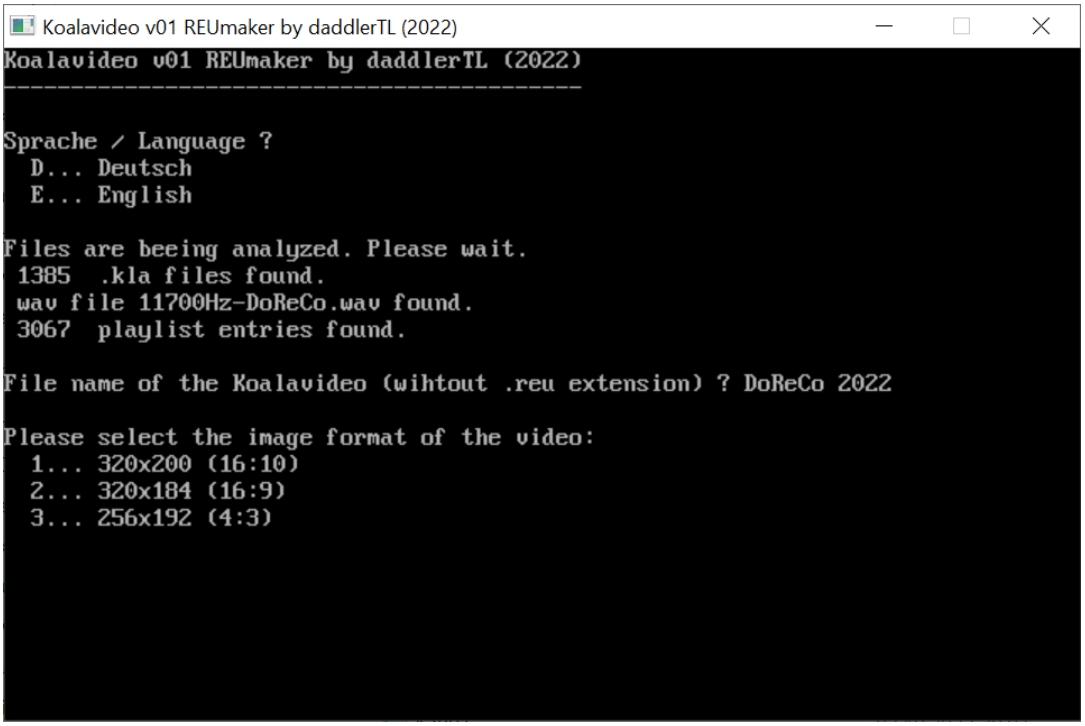
9. create the Koalavideo file

In this last step the Koalavideo file will be created using the Koalavideo REUmaker.
Copy the Koalavideo REUmaker from the directory „Tools“ of the downloaded archive to the project directory and start it.

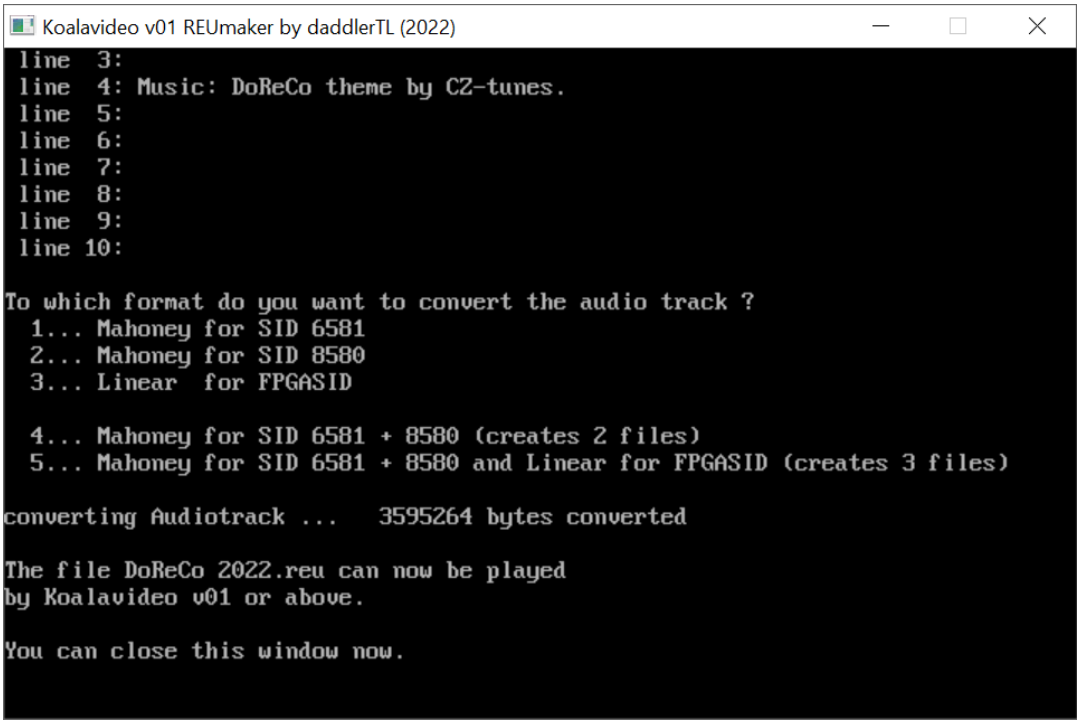
The Koalavideo REUmaker first asks if the language of the text messages and input requests should be in German or English and then analyses the files in the project directory. If no errors occured during the analysis the program requests the user to enter various parameters. It is important to enter the proper video format (16:10, 16:9 oder 4:3) and use the same speed / divider to get the same frame rate which you previously entered in VirtualDub2. If you enter the wrong values here the video will not play correctly (if the wrong video format is set you will get garbage on screen, if the speed / frame rate is set incorrectly the video and audio will be asynchronous).

It is also important to set the correct SID type (the SID model which is built in your C64 on which you want to play the video). If you do not know which SID type is built in your C64 you can select option 4 as the SID type which will create two *.reu files, one for each SID type.
If you want to use Ultimate Audio choose option 3 or 5 (if you want to create files for the two SID types too).

Note: The screenshots show the REUmaker in version v01. The process is the same in the subsequent versions, there are just additional queries.



After you entered all the requested information the *.reu file will be created if no errors occured (e.g. video does not fit into the REU).



The creation of the Koalavideo file is complete and it can now be played using the Koalavideo player.

links to the required third party software

Virtual Dub 2:
https://sourceforge.net/projects/vdfiltermod/files/
(click on “Download Latest Version”)

Audacity:
https://www.audacityteam.org/

Retropixels (only for conversion method of chapter 8a):
https://github.com/micheldebree/retropixels/blob/master/cli/README.md
installation: - install Node.js: https://nodejs.org/en
- open Windows Command Prompt (cmd) and enter:
npm install -g retropixels

Project One V0.6 (only for conversion method of chapter 8b):
https://csdb.dk/release/?id=86776

AutoIt (only for conversion method of chapter 8b):
https://www.autoitscript.com/site/autoit/downloads/

ReNamer Lite (only for conversion method of chapter 8b):
https://www.den4b.com/products/renamer
(„Portable“ recommended)

If one or more links do not work any more you have to get the program(s) from another source by using an internet search engine.