

UL2GSV

a Suite of Tools for Uploading Videos to Google Street View
and Extracting Geotagged JPG Sequences for Upload to Mapillary or Other Purposes

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Please see the [Change Log](#) section at the end of this document for the changes in this version.

Contents

Overview.....	4
Upload Reliability.....	5
Getting Started	5
Using UL2GSV to Upload to Google Street View	5
Using UL2GSV to Extract JPG Sequences with VID2JPG	5
Installation.....	6
Windows Defender.....	7
Versions of GSV2GSV and VID2GSV	8
Google Street View.....	9
Using AUL2GSV to Authorize UL2GSV to use your Google account.....	10
Using AUL2GSV to Authorize UL2GSV to use a different Google account	11
Introduction to Camera Workflows for Uploading to Google Street View	12
Using GSV2GSV.....	13
Using VID2GSV.....	14
Using BUL2GSV	17
Multiple Instances	17
Using JPG2VID	18
Using VID2JPG to Extract Geotagged JPG Sequences	20
Using VID2JPG in Single Video File Mode.....	20
Using VID2JPG in Batch Mode	25
Using CAMM2GPX	26
Using INSV2GPX.....	27
Using GPRO2GPX.....	28
Using MOV2MP4	29
Using CHECK	29
Appendix – Camera Workflows for Uploading to Google Street View.....	30
Insta360 Pro, Pro 2, Titan or Labpano Pilot Era, One, One EE (GPS data in CAMM format, Upload using GSV2GSV).....	30
Insta360 Pro, Pro 2, Titan or Labpano Pilot Era, One, One EE (GPS data in CAMM format, Editing with Third-Party tools, Upload using VID2GSV)	30
Insta360 Pro, Pro 2, Titan or Labpano Pilot Era, One, One EE (GPS data in GPS Exchange format, Editing with Third-Party tools, Upload using VID2GSV)	31
Insta360 ONE Series (GPS data in INSV “00” file format).....	32
Insta360 ONE Series (GPS data in GPS Exchange format)	32
GoPro Fusion (GPS data in GPMF format).....	33

GoPro Fusion (GPS data in GPS Exchange format) 33

GoPro MAX (GPS data in GPMF format)..... 34

GoPro MAX (GPS data in GPS Exchange format)..... 34

Any Camera – Video Mode (GPS data in GPS Exchange format) 35

Any Camera – Photo Mode (GPS data in GPS Metadata Tags format) 35

PLEASE NOTE! 36

 Donations 36

 How to contact me 36

Change Log 37

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Overview

UL2GSV was originally developed and used for a Google Street View (“GSV”) project using the Labpano Pilot Era, Insta360 Pro 2, and Insta360 Titan cameras. The suite has since been enhanced and testing is in progress with other cameras. The tools are now available for others to test and provide feedback. The tools are currently available for Windows 10 and are easy to use via a file drag-and-drop user interface. The suite includes:

TOOL	DESCRIPTION
AUL2GSV	Authorizes UL2GSV to upload videos using the user's GSV account.
GSV2GSV	Uploads a video file that contains a CAMM track. Enables uploading videos with higher speed and reliability than with camera vendor software.
VID2GSV	Uploads a video file and GPS data contained in a companion GPX file. Enables: <ul style="list-style-type: none"> uploading videos that do not contain a CAMM track using GPS data sources with higher accuracy, quality, and reliability than the camera vendor GPS may be able to record uploading videos that were recorded with a camera that does not have a GPS GPX files can be created by multiple methods, including: <ul style="list-style-type: none"> using a GPS logger device or GPS logger application on a smartphone using the JPG2VID, CAMM2GPX, INSV2GPX, and GPRO2GPX tools NOTE: IMU data is not currently uploaded.
BUL2GSV	Uploads a batch of videos using GSV2GSV and VID2GSV. Enables uploading multiple videos unattended.
JPG2VID	Converts a sequence of geotagged 360° spherical JPG files to a video file and a GPX file that can be uploaded with VID2GSV. Enables creation of Street Views using cameras that do not shoot in video mode or when use of still images is preferred.
VID2JPG (single video file mode)	Extracts a sequence of geotagged JPG files from a 360° or non-360° (e.g. GoPro HERO) video file and a companion GPX file. The user can specify the travel distance spacing used to extract the JPG files. The user can provide the GPX file or VID2JPG can create it automatically. Enables imagery from videos to be used for other purposes such as Mapillary and Pano2VR.
VID2JPG (batch mode)	Processes a batch of videos using VID2JPG. Enables extracting multiple JPG sequences unattended.
CAMM2GPX	Extracts GPS data from a video that contains a CAMM track and writes it to a GPX file. Enables videos containing a CAMM track to be uploaded with VID2GSV after post processing the videos with Third-Party software. Enables JPG sequences to be extracted from the videos using VID2JPG.
INSV2GPX	Extracts GPS data from an INSV “00” file and writes it to a GPX file. Enables INSV video files recorded with GPS data by Insta360 ONE Series cameras to be used to create a video that can be uploaded with VID2GSV. Enables JPG sequences to be extracted from the videos using VID2JPG.
GPRO2GPX	Extracts GPS data from a video that contains a GPMF track and writes it to a GPX file. Enables videos recorded by GoPro FUSION and GoPro MAX to be uploaded with VID2GSV. Enables JPG sequences to be extracted from FUSION, MAX and HERO videos using VID2JPG.
MOV2MP4	Converts a GoPro CineForm or ProRes format video to an MP4 format video. Enables 5.6K and 5.2K resolution videos to be uploaded with VID2GSV.
CHECK	Displays the processing status of a video that has been uploaded to GSV and saves a list of Photo IDs extracted from the video after GSV has successfully processed it.
* Multiple instances of UL2GSV can be used to perform more than one upload at a time if the system has the necessary resources. Each instance can use the same or a different GSV account. * Other tools and support for other recording formats may be added in the future.	

Upload Reliability

GSV2GSV and VID2GSV upload video files using the Google resumable upload protocol. This protocol allows an upload operation to resume after communication errors interrupt the flow of data. GSV2GSV and VID2GSV also detect communication errors and retry the upload operation until communication recovers and the upload can continue. Resumable uploads and communication error detection and recovery help enable unattended uploads and help avoid having to restart large file uploads from the beginning.

Getting Started

Using UL2GSV to Upload to Google Street View

1. Install UL2GSV by carefully following the [Installation](#) steps.
2. [Authorize UL2GSV](#) to use the Google account you use for Street View.
3. Read the [Google Street View](#) section if you are new to contributing to Street View.
4. Read the [Introduction to Camera Workflows for Uploading to Google Street View](#) section.
5. Read the sections for the GPS Data Extraction tool and GSV Upload tool that apply to your camera.
6. Follow the Workflow(s) for your camera in the [Camera Workflows Appendix](#).
7. Please review the Special [Notes!](#)

Using UL2GSV to Extract JPG Sequences with VID2JPG

1. Install UL2GSV by carefully following the [Installation](#) steps.
NOTE: The section “Versions of GSV2GSV and VID2GSV” does not apply to using VID2JPG. You can ignore it if you are only using UL2GSV to Extract JPG Sequences with VID2JPG.
2. Read the [Using VID2JG to Extract Geotagged JPG Sequences](#) section.
3. Read the section for the GPX file creation tool that applies to your camera ([CAMM2GPX](#), [INSV2GPX](#), or [GPRO2GPX](#)).
4. Follow the Workflow in the [Using VID2JPG in Single Video File Mode](#) section.
5. Please review the Special [Notes!](#)

Installation

1. Download the UL2GSV_v13.zip file and Unzip all files to a sub-folder of your user account folder. For example, if your name of your user account is “name”, then use the sub-folder “C:\Users\name\UL2GSV_v13”.

Users of Parallels Desktop on Mac: Unzip all files to the “C:\UL2GSV_v13” folder within Windows 10.

NOTE: The folder MUST NOT be a Mac folder accessed by Windows.

2. Create shortcuts on the Windows 10 Desktop for the exe files of the UL2GSV tools you will be using.

PLEASE NOTE!

YOU MUST RUN THE TOOLS USING THE DESKTOP SHORTCUTS OR THEY WILL NOT WORK CORRECTLY.

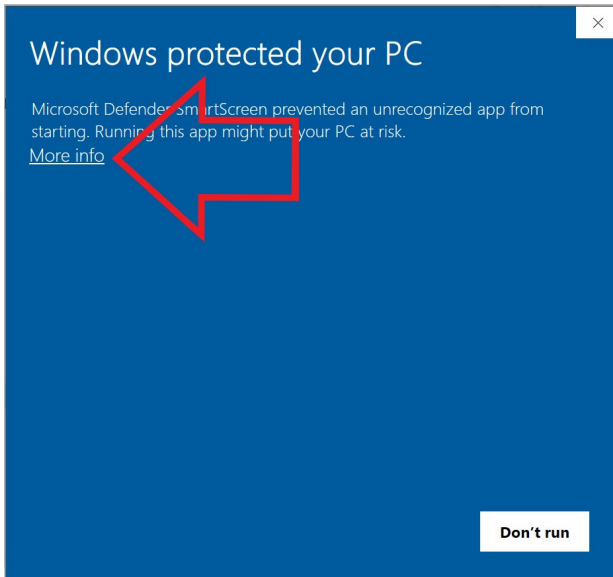
3. Review the following information about [Windows Defender](#) and the [Versions of GSV2GSV and VID2GSV](#).

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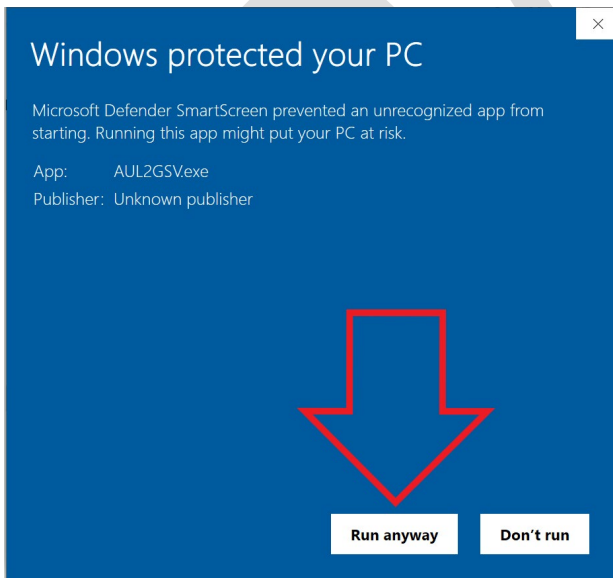
Windows Defender

The first time you run each tool, Windows Defender may display a message that it is an “unrecognized app” and prevent it from running. To allow the tool to run:

1. Click on the “**More Info**” link.



2. Click on the “**Run anyway**” button.



Versions of GSV2GSV and VID2GSV

Starting with UL2GSV Version 9, two (2) versions of GSV2GSV and VID2GSV are provided. A “**Chunks**” version and a “**Single Request**” version.

The Chunks version uploads a video file using multiple requests. It will detect network failures and attempt to retry until the upload can be completed. The EXE files for this version are named “GSV2GSV_chunks.exe” and “VID2GSV_chunks.exe”. Copies of these EXE files are included as the default “GSV2GSV.exe” and “VID2GSV.exe” files when you install UL2GSV.

The Single Request version uploads a video file using a single request. In some cases, this version will provide faster uploads. However, it does not detect network failures and will not retry. It should be used on reliable networks. The EXE files for this version are named “GSV2GSV_single.exe” and “VID2GSV_single.exe”.

Individual video and Batch Uploads – Both versions can be used for individual video uploads by creating desktop shortcuts for each EXE file. For example, you may want to use the Single Requests version for individual video uploads and the Chunks version for batch uploads. Only the version with copies of the EXE files named “GSV2GSV.exe” and “VID2GSV.exe” will be used for Batch Uploads by BUL2GSV. If you wish to use the Single Request versions for Batch Uploads then make a copy of these EXE files and rename them to “GSV2GSV.exe” and “VID2GSV.exe”.

Google Street View

If you are new to contributing to Google Street View, it is very important to familiarize yourself with the Google Street View capture guidelines to insure your uploads can be processed successfully. Please use the following resources. Thank you.

- Use the Google Maps and Street View Help Center
<https://support.google.com/maps/?hl=en#topic=6275604>
- Participate in the Google Street View Trusted photographer program by publishing 50 Maps-approved 360 images (**see NOTE**). After doing so you should receive an email invitation to join the program. Joining will include access to the Street View Trusted Help Center
<https://support.google.com/street-view-trusted/?hl=en#topic=9370321>

NOTE: Google Update July 19, 2021:

“As of today, July 19th, new enrollments into the Street View trusted program are put on hold. At this time, we do not award the trusted badge to new contributors who’ve reached the minimum number of photos for membership, and do not list new professionals on our for-hire index.

In relation to this, the ‘Available for Hire’ toggle has also been removed from the Street View app interface. If you’re planning on setting up any new accounts for contributing 360 imagery, please bear in mind that you will not be able to join Street View trusted with them.

Trusted accounts which were enrolled prior to today’s changes will not be affected and you’ll continue to see the badge in your Profile in the Street View app.

Keep an eye on this section for more updates soon on the evolution and new direction of our program.”

- Participate in the Google Street View Facebook Groups
 - Google Street View Trusted Photography
<https://www.facebook.com/groups/GoogleStreetViewTrustedPhotography/>
 - Google Street View Trusted Photographers
<https://www.facebook.com/groups/GoogleStreetViewTrustedPhotographers/>
 - Google Street View Trusted Photographers
<https://www.facebook.com/groups/GoogleTIPS/>
- Review the Google Maps User Contributed Content Policy
 - <https://support.google.com/contributionpolicy/answer/7422880?hl=en>

Using AUL2GSV to Authorize UL2GSV to use your Google account

1. Double-click the Desktop shortcut for AUL2GSV.
2. Read the instructions in the console window that opens.
3. Press the “Enter” key to continue.
4. A browser window will open.

Choose the GSV Account that you want to use with UL2GSV.

OR

click “Use another account” if the account you want to use is not listed and enter the account information.

5. Another browser window will open that requests UL2GSV access to your account to
“Publish and manage your 360 photos on Google Street View. [Learn more](#)”
6. Click “Continue”.
7. Close the browser window when it displays “The authentication flow has completed.”
8. The message “*** Google account has been authorized!” will be displayed in the console window.
9. Press the “Enter” key on your keyboard when prompted.
10. The console window will close. UL2GSV is now authorized to upload using your Google account.

Using AUL2GSV to Authorize UL2GSV to use a different Google account

1. Double-click the Desktop shortcut for AUL2GSV.

2. A console window will open and display the message:

** Google Account is valid. Do you wish to change accounts (yN)?

3. Enter “y” if you want to authorize a different account

OR

press the “Enter” key (“N” is the default) to keep using the current account.

Press the “Enter” key again to exit.

4. If you answered “y” read the instructions in the console window.

5. Press the “Enter” key to continue.

6. A browser will open.

Choose the Google Account that you want to use with UL2GSV.

OR

click “Use another account” if the account you want to use is not listed and fill-in the account information.

7. Another browser window will open that requests UL2GSV access to your account to

“Publish and manage your 360 photos on Google Street View. [Learn more](#)”

8. Click “Continue”.

9. Close the browser window when it displays “The authentication flow has completed.”

10. The message “*** Google account has been authorized!” will be displayed in the console window.

11. Press the “Enter” key on your keyboard when prompted.

12. The console window will close. UL2GSV is now authorized to upload using your account.

Introduction to Camera Workflows for Uploading to Google Street View

The Google Street View (GSV) workflow for a camera depends on the format used to store the captured GPS data. This determines how the GPS data is extracted and uploaded to GSV. The GPS data is stored in one of four (4) formats:

- Google CAMM format** – The GPS data is captured by the camera and stored in a track of the video file using the Google CAMM format. Normally, the video file is uploaded to Street View using the **GSV2GSV** tool. The GPS data will be extracted from the video file when Google processes it. However, editing the video file using third-party tools will remove the CAMM track. The **CAMM2GPX** tool can be used to save the GPS data to a GPX file prior to editing the video. This enables the video to be uploaded using the **VID2GSV** tool.
- Camera Vendor-specific format** – The GPS data is captured by the camera and stored using a vendor-specific format. The GPS data cannot be extracted from the video file when Google processes it. The GPS data must be extracted and uploaded alongside the video file. Insta360 ONE Series cameras store the data in the INSV “00” file. The data can be extracted to a GPX file using the **INSV2GPX** tool. GoPro Fusion and MAX cameras store the data in various files using the GPMF format. The data can be extracted to a GPX file using the **GPRO2GPX** tool. For these cameras, the GPS data in the GPX file can be uploaded to Street View alongside the video file using the **VID2GSV** tool.
- GPS Exchange (GPX) format** – The GPS data is captured and stored in a GPX file using a GPS logger device, a GPS logger application running on a smart phone, or other methods. The clocks of the camera and GPS capture device should be in sync. This format can be used when recording videos with cameras that do not have a GPS. It can also be used as backup GPS data if the GPS data captured in the CAMM or camera vendor-specific formats is unusable. The GPS data in the GPX file can be uploaded to Street View alongside the video file using the **VID2GSV** tool.
- GPS metadata tags** – The GPS data is stored in the GPS metadata tags of JPG files. This format is used when creating a sequence of stitched JPG files that will be converted to a video for upload to Street View. The **JPG2VID** tool can be used to extract the GPS data to a GPX file and convert the JPG files to a video file. The GPS data in the GPX file can be uploaded to Street View alongside the video file using the **VID2GSV** tool.

Summary

GPS data format	Cameras	Extraction Method	Upload Tool
Google CAMM	Insta360 Pro, Pro 2, Titan Labpano Pilot Era, One, One EE	Google Processing	GSV2GSV
		CAMM2GPX	VID2GSV
Camera Vendor-specific	Insta360 ONE Series	INSV2GPX	VID2GSV
	GoPro Fusion, MAX	GPRO2GPX	
GPS Exchange (GPX)	Any (video mode)	N/A	
GPS metadata tags	Any (photo mode)	JPG2VID	

Please follow the specific Workflow(s) for your camera in the [Camera Workflows Appendix](#).

Using GSV2GSV

GSV2GSV uploads a video and the GPS data stored in a track of the video file using the Google CAMM format. The GPS data will be extracted from the video file when Google processes it. This includes the following cameras:

- Insta360 Pro
- Insta360 Pro 2
- Insta360 Titan
- Labpano Pilot Era
- Labpano Pilot One
- Labpano Pilot One EE

Video files from other cameras can be uploaded using VID2GSV (see the next section).

NOTE: Editing video files from the above cameras using third-party tools will remove the CAMM track. The GPS data can be saved to a GPX file before editing the video. The video file can then be uploaded using VID2GSV (see the next section).

Workflow:

1. Create a video with a CAMM track using your camera and stitching software.
2. Select, drag and drop the video file on the GSV2GSV.exe desktop shortcut.
3. A window will open showing the progressive of the processing.
4. A progress bar will show the progress of the upload, the elapsed time and the time remaining.
5. If the upload is successful, the Photo Sequence ID assigned by GSV will be displayed. A file containing the Photo Sequence ID will also be created in the same folder as the video file, with the same base file name and the “.sid” extension. The file can be used with the CHECK tool to display the status of the GSV processing.
6. Press the “Enter” key to continue and exit when prompted.
7. Check the status of the processing using the Google Street View app. The upload should appear on your Profile tab.

Using VID2GSV

VID2GSV uploads a video file and GPS data contained in a companion GPX file. The method used to create the GPX file depends on the format used to store the captured GPS data.

- **Google CAMM format** – The GPS data is captured by the camera and stored in a track of the video file using the Google CAMM format. Normally, the video file is uploaded to Street View using the GSV2GSV tool. The GPS data will be extracted from the video file when Google processes it. However, editing the video file using third-party tools will remove the CAMM track. The **CAMM2GPX** tool can be used to save the GPS data to a GPX file prior to editing the video. This enables the video to be uploaded using the VID2GSV tool.
- **Camera Vendor-specific format** – The GPS data is captured by the camera and stored using a vendor-specific format. The GPS data cannot be extracted from the video file when Google processes it. The GPS data must be extracted and uploaded alongside the video file. Insta360 ONE Series cameras store the data in the INSV “00” file. The data can be extracted to a GPX file using the **INSV2GPX** tool. GoPro Fusion and MAX cameras store the data in various files using the GPMF format. The data can be extracted to a GPX file using the **GPRO2GPX** tool.
- **GPS Exchange (GPX) format** – The GPS data is captured and stored in a GPX file using a GPS logger device, a GPS logger application running on a smart phone, or other methods. The clocks of the camera and GPS capture device should be in sync. This format can be used when recording videos with cameras that do not have a GPS. It can also be used as backup GPS data if the GPS data captured in the CAMM or camera vendor-specific formats is unusable.
- **GPS metadata tags** – The GPS data is stored in the GPS metadata tags of JPG files. This format is used when creating a sequence of stitched JPG files that will be converted to a video for upload to Street View. The JPG2VID tool can be used to extract the GPS data to a GPX file and convert the JPG files to a video file.

Workflow:

1. Create a video using your camera, stitching software, or the JPG2VID tool and create a GPX file using one of the methods mentioned above.

When using cameras and stitching software that are not intended to be used for GSV it may be desirable to reduce file size, upload time and GSV processing time by re-encoding the video to a lower frame rate and/or a lower bitrate. **This is NOT recommended but can be considered if upload times become an issue.**

For example, Insta360 Studio stitches to 30 fps but Google recommends adapting the fps to your speed, depending on how you are collecting:

- Under 5 mph or 8 km/h when capturing at 1 fps
- Under 30 mph or 45 km/h when capturing at 5 fps
- Under 45 mph or 70 km/h when capturing at 7 fps

FFmpeg (mentioned in the installation instructions) can be used for re-encoding. It's a command line tool. For example, the following command will re-encode a video to 1 fps.

```
ffmpeg -y -i input.mp4 -vf fps=1 output.mp4
```

2. Specify the time VID2GSV should use as the start time of the video.

To successfully publish the video, the time period of the video must overlap the time period of the GPS track in the GPX file. It's not necessary to have complete overlap, however, only the part of the video that overlaps the GPS track will be published. VID2GSV will verify there is overlap before uploading the video.

VID2GSV calculates the time period of the video using the start time you specify and the duration of the video it extracts from the video file. There are two ways for you to specify the start time to use:

Starting timestamp in the GPX file – This is the default.

This way is normally used if the GPX file was created with CAMM2GPX, INSV2GPX, GPRO2GPX or JPG2VID. However, there are situations where this time may need to be adjusted. For example: if the camera did not start recording GPS data at the same time as the video, or you trim the beginning of the video to remove an unwanted section, etc. In these cases, the following method can be used.

Start time in the video file name – This overrides the default.

This way is normally used if the GPX file was created using a GPS logger device or a GPS logger application. This is because the GPS logging is usually started before the video recording is started.

The time must be in UTC Time, at the **beginning of the video base file name**, using one of the following formats. Note the use of the "**START**" keyword.

Video Base File Name Format (must be UTC time)	Typically used for the following cameras
VID_START_YYYY_MM_DD_HH_MM_SS	Insta360 Pro, Pro 2, Titan
VID_START_YYYYMMDD_HHMMSS	Insta360 ONE X, ONE X2, ONE R
START_YYMMDD_HHMMSS	Labpano Pilot Era, Pilot One, Pilot One EE
Any of the above	Can be used for other cameras (GoPro, Ricoh Theta, etc.)

3. Select, drag and drop the video file **AND** the GPX file on the VID2GSV.exe desktop shortcut.
4. A window will open showing the progress of the processing. If the video contains a CAMM track, the video track will be extracted to a temporary file for the upload.

If VID2GSV displays the message:

*** There is no overlap between the start and end times of the Video and the GPX track.

It means that the video start time specified in step 2 is incorrect.

NOTE: A common cause of GSV processing errors are GPX track points with time stamps that are not monotonically increasing. Starting with [UL2GSV v7](#), VID2GSV skips those track points and displays a message for each one.

5. A progress bar will show the progress of the upload, the elapsed time and the time remaining.
6. If the upload is successful, the Photo Sequence ID assigned by GSV will be displayed. A file containing the Photo Sequence ID will also be created in the same folder as the video file, with the same base file name and the “.sid” extension. The file can be used with the CHECK tool to display the status of the GSV processing.
7. Press the “Enter” key to continue and exit when prompted.
8. Check the status of the processing using the Google Street View app. The upload should appear on your Profile tab.

NOTE: IMU data contained in a CAMM track, INSV “00” file or GPMF file is not currently uploaded.

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Using BUL2GSV

BUL2GSV uploads a batch of videos using GSV2GSV and VID2GSV. This enables uploading multiple videos unattended. BUL2GSV uses a Batch Folder containing shortcuts to the videos rather than the videos themselves. This avoids having to copy the original files.

Workflow:

1. Create a folder to contain the shortcuts for the files to be batch uploaded.
2. Create a shortcut for each file to be uploaded and copy the shortcut to the batch folder:
 - a. For files to be uploaded using GSV2GSV:

Create a shortcut for the video file and copy the shortcut to the batch folder.
 - b. For files to be uploaded using VID2GSV:
 - i. Rename each companion GPX file to have the same base file name as the video file.
 - ii. Create a shortcut for each video file and copy the shortcut to the batch folder.
3. Select, drag and drop the batch folder on the BUL2GSV.exe desktop shortcut.
4. A window will open showing the progress of the processing.
5. Additional shortcuts can be added to the batch folder while BUL2GSV is running. BUL2GSV will scan the folder for new shortcuts after it finishes uploading the current video file and add the new videos to its list of files to upload.
6. A file containing the Photo Sequence ID assigned by GSV will be created in the batch folder for each video that was successfully uploaded. The file will have the same base file name as the video and the “.sid” extension. The file can be used with the CHECK tool to display the status of the GSV processing.
7. Press the “Enter” key to continue and exit when prompted.
8. Check the status of the processing using the Google Street View app. Each upload should appear on your Profile tab.

Multiple Instances

Multiple Instances of UL2GSV can be used to process more than one upload at a time provided the system has the necessary resources. To create a new instance, make a copy of the folder where you originally installed UL2GSV and create new desktop shortcuts. Run the copy of AUL2GSV to authorize the instance. The instance can use the same GSV account used by the original instance or a different GSV account.

Using JPG2VID

Now Street Views can be automatically created from still images by using JPG2VID to convert a sequence of **geotagged** 360° spherical JPG files to a video file and a GPX file that can be uploaded with VID2GSV.

JPG2VID requires the following metadata tags in the JPG files:

- First JPG file: “GPS DateStamp” and “GPS TimeStamp” (if missing, “DateTimeOriginal” will be used, if available)
- All JPG files: “GPS Latitude”, “GPS Longitude”, and “GPS Altitude”.

The ability to upload still images in video mode enables the use of cameras that can only shoot in photo and photo time lapse modes. It also enables cameras with a video mode to be used in photo and photo time lapse modes when those modes are faster, easier to use, and provide better image quality (for example, the GoPro OMNI and the Teche TE720 Pro). And, it enables the use of techniques to enhance image quality that may only be available for still images.

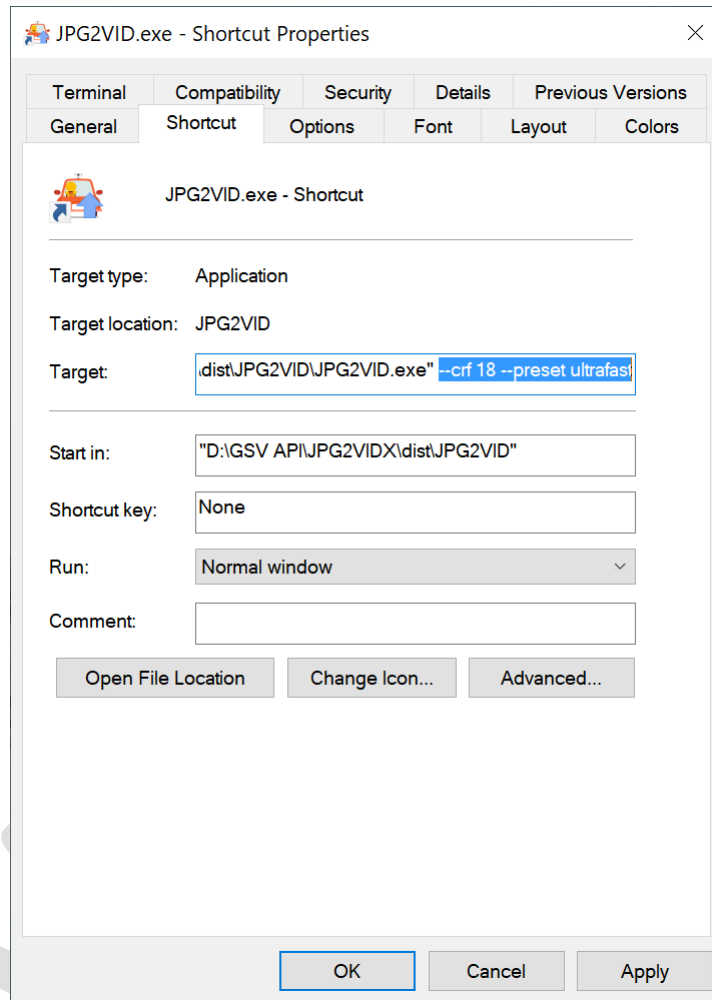
When capturing the sequence of images, please make sure to adhere to Google Street View guidelines. Especially, the information in the Street View Trusted Help Center (see the link in the Google Street View section of this document). Unfortunately, the information is currently marked **Restricted** so it cannot be included here. If you don't have access yet please try contacting another member for assistance or ask for help in the GSV Facebook Groups mentioned.

JPG2VID uses FFmpeg to convert the JPGs to a video file. The time and space required depends on resources of the computer used (CPU, Memory and SSD), the resolution and quantity of the JPG files, and the choice of the following FFmpeg parameters:

Parameter	Range	Default	Recommendations (see link below for more info)
CRF (Constant Rate Factor)	1 – 51	23	Use this rate control mode if you want to keep the best quality and care less about the file size. This is the recommended rate control mode for most uses.
x264 Preset	ultrafast superfast veryfast faster fast medium slow slower veryslow	medium	A preset is a collection of options that will provide a certain encoding speed to compression ratio. A slower preset will provide better compression (compression is quality per file size). This means that, for example, if you target a certain file size or constant bit rate, you will achieve better quality with a slower preset. Similarly, for constant quality encoding, you will simply save bitrate by choosing a slower preset. Use the slowest preset that you have patience for. You may need to experiment.

For more info on CRF and Presets please refer to information at: <https://trac.ffmpeg.org/wiki/Encode/H.264>

JPG2VID supports the use of the FFmpeg CRF and Preset parameters via the command line options “**--crf**” and “**--preset**”. The defaults shown in the table above are used if the options are not specified. The options can be set using the desktop shortcut used to run JPG2VID. For example:



Workflow:

1. Select, drag and drop the folder that contains the sequence of JPG files on the JPG2VID.exe desktop shortcut.
2. A window will open showing the progress of the processing.
3. The video file and GPX file will be created in the folder containing the JPG files, with a base file name containing the start date and time using the format “VID_YYYY_MM_DD_HH_MM_SS”. The date and time used is extracted from either the “GPS DateStamp” and “GPS TimeStamp” metadata tags or the “DateTimeOriginal” metadata tag of the first JPG file.
4. Press the “Enter” key to continue and exit when prompted.

Using VID2JPG to Extract Geotagged JPG Sequences

Using VID2JPG in Single Video File Mode

VID2JPG extracts a sequence of geotagged JPG files from a spherical (360°) or a traditional (non-360°) video file and a companion GPX file. This enables imagery from 360° videos originally recorded for Street View to be used for other purposes. It also enables 360° and non-360° geotagged JPG file sequences to be captured when recording in video mode is easier, preferred (for example, to use stabilization) or when the camera lacks a photo time lapse mode. Typical uses for the JPG sequences are for uploading to Mapillary or importing to Pano2VR. The user can specify the travel distance spacing used to extract the JPG files. GoPro videos can be recorded in normal or Time Warp mode. The user can provide the GPX file or VID2JPG can create it automatically.

The method used to create the GPX file depends on the format that was used to store the captured GPS data.

- **Google CAMM format** – The GPS data is captured by the camera and stored in a track of the video file using the Google CAMM format. The **CAMM2GPX** tool can be used to extract the GPS data to a GPX file.
- **Camera Vendor-specific format** – The GPS data is captured by the camera and stored using a vendor-specific format. Insta360 ONE Series cameras store the data in the INSV “00” file. The data can be extracted to a GPX file using the **INSV2GPX** tool. GoPro Fusion, MAX and HERO cameras store the data in various files using the GPMF format. The data can be extracted to a GPX file using the **GPRO2GPX** tool.
- **GPS Exchange (GPX) format** – The GPS data is captured and stored in a GPX file using a GPS logger device, a GPS logger application running on a smart phone, or other methods. The clocks of the camera and GPS capture device should be in sync. This format can be used when recording videos with cameras that do not have a GPS. It can also be used as backup GPS data if the GPS data captured in the CAMM or camera vendor-specific formats is unusable.

If the user provides the GPX file, it must have the same base file name as the video file and be located in the same folder as the video file. If VID2JPG does not find the GPX file, it will try to create a temporary one automatically if the GPS data was captured using the Google CAMM format or a Camera Vendor-specific format. The user must provide the GPX file if the GPS data was captured using the GPX Exchange format.

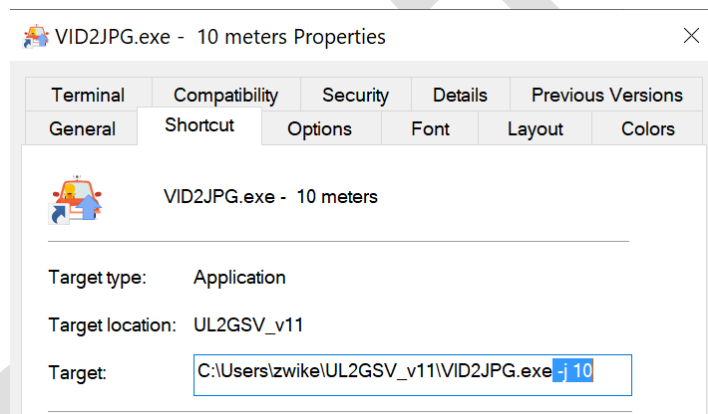
To automatically create the GPX file, VID2JPG requires a file that contains the captured GPS data. In some cases, that GPS data is stored in a track of the video file. When the GPS data is in a separate file, that file must have the same base file name as the video file and must be located in the same folder as the video file. Please refer to the table below to determine the file required for your camera.

Camera	To automatically create GPX file VID2JPG requires GPS data in:	
	Video File	Separate File
Insta360 Pro, Pro 2, Titan Labpano Pilot Era, One, One EE	Stitched video file with a CAMM track	
Insta360 ONE Series		INSV “00” file
GoPro Fusion	Stitched video file with a GPMF track	
GoPro MAX	Stitched video file with a GPMF track	.360 or .LRV file
GoPro HERO	Original video file with a GPMF track	

Workflow:

1. Record a video with your camera and record a GPX file if your camera does not have a GPS.
2. Create a video using your camera or stitching software.
3. Specify the travel distance spacing to be used in extracting the JPG files.

The distance spacing can be in the range 1 to 100 meters. By default, VID2JPG will use a distance spacing of approximately 3 meters of travel. A different distance spacing can be specified using the VID2JPG command line option `"-j n"` or `"--jpgspacing n"` where "n" is the distance in meters (integer values only). The option can be set using the desktop shortcut used to run VID2JPG. For example, to specify 10 meters, make a copy of the existing VID2JPG desktop shortcut and rename it to "VID2JPG.exe - 10 meters". Then append the option to the **Target** field of the shortcut as shown below:



NOTE: Make additional copies of the VID2JPG desktop shortcut for each distance spacing needed.

4. Specify the time VID2JPG should use as the start time of the video.

To successfully extract a sequence of JPG files, the time period of the video must overlap the time period of the GPS track in the GPX file. It's not necessary to have complete overlap, however, VID2JPG will only extract JPG files for the part of the video that overlaps the GPS track. VID2JPG calculates the time period of the video using the start time you specify and the duration of the video it extracts from the video file.

The start time you specify must be accurate relative to the timestamps of the GPX track. The more accurate the start time, the more accurately the images and the GPS positions of the extracted JPG files should match. There are several methods for you to specify the start time to use:

A. Starting timestamp in the GPX file – This is the automatic default.

This method is intended to be used if the GPX file is created with CAMM2GPX, INSV2GPX, or GPRO2GPX either by the user or automatically by VID2JPG. However, there are situations where this time may need to be adjusted. For example: if the camera did not start recording the video at the same time as the GPS data, or the beginning of the video was trimmed to remove a short unwanted segment. In those cases, a Start Delta Time method can be used to override the default start time. The Start Date and Time method can also be used if more flexibility is needed by specifying the absolute date and the time. See the following descriptions of each method for more information.

B. Start Delta Time using the command line option – This overrides the automatic default.

This method is intended to be used if the delta time between when a camera starts recording the video and when it starts recording the GPS data is constant. Method C below can be used to establish the constant amount. The delta time is specified as an amount relative to the starting timestamp in the GPX file. The delta amount can be specified using the VID2JPG command line option “-s ±SS.ss” or “--startdelta ±SS.ss”, where “+” means the video starts **after** the starting timestamp in the GPX file and “-” means the video starts **before** the starting timestamp in the GPX file.

A delta amount in the range **-60.00 to +60.00** seconds is supported.

NOTE: The “.ss” is optional. If present, it specifies fractions of a second in the range .00 to .99.

Append the command line option to the **Target** field of the VID2JPG desktop shortcut (See Workflow step 3 above).

C. Start Delta Time in the video file name – This overrides the automatic default and the command line option.

This method is intended to be used in several scenarios: (1) if the delta time between when a camera starts recording the video and when it starts recording the GPS data varies or (2) if it is constant and needs to be determined, (3) if the beginning of the video was trimmed to remove a short unwanted segment, and (4) if the GPX file was created using a GPS logger device or a GPS logger application. For scenario (1), Method B can be used after the constant amount has been determined. The delta time is specified as an amount relative to the starting timestamp in the GPX file. The delta time must be specified at the **beginning of the video base file name**, using one of the following formats. Note the use of the “START” keyword.

“VID_START_±SS.ss_” or “START_±SS.ss_”, where “+” means the video starts **after** the starting timestamp in the GPX file and “-” means the video starts **before** the starting timestamp in the GPX file.

A delta amount in the range **-60.00 to +60.00** seconds is supported.

NOTE: The “.ss” is optional. If present, it specifies fractions of a second in the range .00 to .99.

D. Start Date and Time in the video file name – This overrides the automatic default and the command line option.

This method is intended to be used if more flexibility is needed to specify the video start time. The video start time is specified as an absolute date and time. The time must be in UTC Time, at the **beginning of the video base file name**, using one of the following formats. Note the use of the “START” keyword.

Video Base File Name Format (must be UTC time)	Typically used for the following cameras
VID_START_YYYY_MM_DD_HH_MM_SS.ss	Insta360 Pro, Pro 2, Titan
VID_START_YYYYMMDD_HHMMSS.ss	Insta360 ONE X, ONE X2, ONE R
START_YYMMDD_HHMMSS.ss	Labpano Pilot Era, Pilot One, Pilot One EE
Any of the above	Can be used for other cameras (GoPro, Ricoh Theta, etc.)
NOTE: The “.ss” is optional. If present, it specifies fractions of a second in the range .00 to .99.	

NOTE: VID2JPG displays the values of the “Track Creation Time” and “Duration” metadata tags when processing the video file. These values can be used as reference to help determine the Start Time. Some cameras record the start time of the video track in the “Track Creation Time” tag. Other cameras record the end time of the track in the tag. In the latter case, the start time can be calculated as the “Track Creation Time” minus the “Duration”. VID2JPG also displays the result of that calculation for reference.

5. If the video was recorded using **GoPro Time Warp mode**, the speed can be specified using the VID2JPG command line option `"-w x"` or `"--twospeed x"` where `"x"` is the speed. Speeds of 2x, 5x, 10x, 15x and 30x are supported. Append the command line option to the **Target** field of the VID2JPG desktop shortcut (See Workflow step 3 above).
6. **If you are providing the GPX file**, create it using one of the methods described at the beginning of this section. The GPX file must have the same base file name as the video file and must be located in the same folder as the video file.

For example: **video.mp4** and **video.gpx**

OR

If you want VID2JPG to automatically create the GPX file, provide the required file containing the GPS data (see the table at the beginning of this section). If it is a separate file, it must have the same base file name as the video file and must be located in the same folder as the video file.

For example:

Labpano Pilot One EE: **video.mp4** (contains CAMM track, no separate file required)

Insta360 ONE Series: **video_00_001.mp4** and **video_00_001.insv** (separate INSV "00" file required)

GoPro Fusion: **video.mp4** (contains GPMF track, no separate file required)

GoPro MAX: **video.mp4** and **video.360** or **video.LRV** (no GPMF track, separate .360 or .LRV file required)

GoPro MAX: **video.mp4** (contains GPMF track, no separate file required)

7. Select, drag and drop the video file on the VID2JPG desktop shortcut corresponding to the desired distance spacing.

NOTE: Multiple Instances of VID2JPG can be used to process more than one video file at a time provided the system has enough resources.

8. A window will open showing the progress of the processing.

If VID2JPG displays the message:

*** There is no overlap between the start and end times of the Video and the GPX track.

It means that the video start time specified in step 2 is incorrect.

NOTE: VID2JPG skips GPS track points with time stamps that are not monotonically increasing. A message will be displayed with the total number skipped.

9. Progress bars will show the progress of the JPG file extraction and metadata tagging, the elapsed time and the time remaining.

10. A sequence of JPG files will be extracted from the video and stored in a subfolder where the video file is located. The name of the subfolder will be "VID2JPG[j,s,w]-" followed by the base file name of the video file. The value of "j" will be the JPG distance spacing used. The value of "s" will be the delta time if the Start Delta time command option was used. The value of "w" will the speed if the GoPro Time Warp command option was used. The JPG files will include GPS metadata tags and 360° metadata tags (if applicable). You should be able to upload these files to Mapillary, use them in Pano2VR (GPS metadata is included to automatically "Set North") or use them for other purposes.

NOTE: Leveling of the images is NOT performed.

11. A JPG GPX file will also be created. The JPG files already have GPS tags but the GPX file is useful to display the route in a GPX viewer and for verification.
12. Press the "Enter" key to continue and exit when prompted.

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Using VID2JPG in Batch Mode

VID2JPG will run in batch mode if a batch folder is provided as input. This enables extracting multiple JPG sequences unattended. The user can specify the travel distance spacing used to extract the sequences of JPG files. VID2JPG uses a batch folder containing shortcuts to the video files rather than the video files themselves. This avoids having to copy the original files.

Workflow:

1. Create a folder to contain the shortcuts for the video files to be batch processed.
2. Create a shortcut for each video file and copy the shortcut to the batch folder.
3. Provide any required companion GPX files and required separate files containing the captured GPS data (INSV "00", .360 or .LRV files) for each video. The files must have the same base file name as the video file and must be located in the same folder as the video file.
4. Specify any applicable command line options by appending them to the Target field of the desktop shortcut used to run VID2JPG:
 - **JPG distance spacing:** Append `"-j n"` or `"--jpgspacing n"` where `"n"` is the distance. A distance value in the range 1 to 100 meters is supported (integer value only).
 - **Start Delta Time:** Append `"-s ±SS.ss"` or `"--startdelta ±SS.ss"` where `"±SS.ss"` is the delta time. A delta time amount in the range -60.00 to +60.00 seconds is supported.
 - **GoPro Time Warp mode:** Append `"-w x"` or `"--twospeed x"` where `"x"` is the speed. A speed of 2x, 5x, 10x, 15x or 30x is supported.
5. Select, drag and drop the batch folder on the VID2JPG desktop shortcut corresponding to the desired distance spacing.

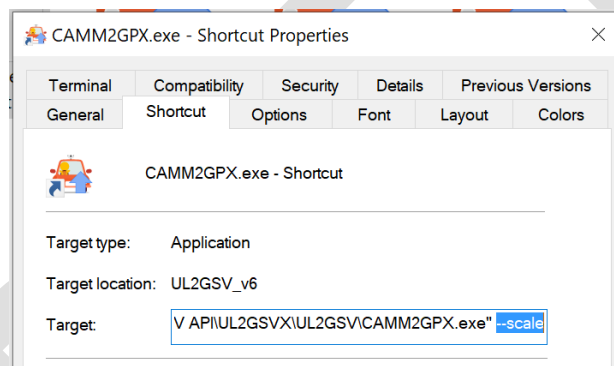
NOTE: Multiple Instances of VID2JPG can be used to process more than one batch folder at a time provided the system has enough resources. A separate batch folder must be assigned to each instance. Each instance can process one video at a time from its assigned batch folder.
6. A window will open showing the progress of the processing.
7. Additional shortcuts can be added to the batch folder while VID2JPG is running. VID2JPG will scan the folder for new shortcuts after it finishes processing the current video file and add the new videos to its list of files to process.
8. A sequence of JPG files will be extracted from each video and stored in a subfolder where the video file is located. A JPG GPX file will also be created for each sequence of JPG files and stored in the same subfolder.
9. Press the "Enter" key to continue and exit VID2JPG when prompted.

Using CAMM2GPX

CAMM2GPX extracts GPS data from a video that contains a CAMM track and writes it to a GPX file. The GPX file can be used by VID2GSV and VID2JPG.

Editing a video containing a CAMM track using Third-Party software removes the CAMM track containing the GPS data that is required to upload the video to GSV. The CAMM2GPX tool can be used to save the GPS data to a GPX file prior to editing the video. The GPX file generated by CAMM2GPX can be used by VID2GSV to add the GPS data at the time the video is uploaded to GSV. The GPX file can also be used by VID2JPG to add the GPS data to the JPG files when they are extracted using VID2JPG.

NOTE: The duration of a GPS track recorded by the Labpano Pilot series cameras may not match the duration of the video track. This can cause the ends of Street View blue lines to be truncated. Starting with [UL2GSV v7](#), a feature has been added to CAMM2GPX to automatically scale the GPS time stamps to match the video duration. This feature can be enabled by adding the “-s” or “--scale” option to the command line used to run CAMM2GPX. For example:



Workflow:

1. Select, drag and drop a video file that contains a CAMM track on the CAMM2GPX.exe desktop shortcut.
2. A window will open showing the progress of the processing.
3. The GPX file will be created in the same folder as the video file, with the same base file name and the “.gpx” extension.
4. Press the Enter key to continue and exit when prompted.

Using INSV2GPX

Extracts GPS data from an INSV “00” file and writes it to a GPX file. The GPX file can be used by VID2GSV and VID2JPG.

Currently, the Insta360 ONE X camera is the only Insta360 ONE Series camera that supports uploading videos to GSV. Videos recorded by Insta360 ONE Series cameras (including the ONE X) can be uploaded to GSV by stitching the INSV files with Insta360 Studio and using INSV2GPX to extract the GPS data from the INSV “00” file to a GPX file. The GPX file generated by INSV2GPX can be used by VID2GSV to add the GPS data to the video at the time of upload to GSV. The GPX file can also be used by VID2JPG to add the GPS data to the JPG files when they are extracted using VID2JPG.

Workflow:

1. Select, drag and drop an INSV “00” video file on the INSV2GPX.exe desktop shortcut.
2. A window will open showing the progress of the processing.

NOTE: Starting with UL2GSV v10, INSV2GPX skips extra GPS data points with the same time stamp. A message will be displayed with the total number skipped.

3. The GPX file will be created in the same folder as the INSV “00” video file, with the same base file name and the “.gpx” extension.
4. Press the Enter key to continue and exit when prompted.

Using GPRO2GPX

GPRO2GPX extracts GPS data from a video that contains a GPMF track and writes it to a GPX file. The GPX file can be used by VID2GSV and VID2JPG.

Videos recorded with GPS data by the GoPro FUSION and MAX cameras can be uploaded to GSV by using GPRO2GPX to extract the GPS data from the GPMF track to a GPX file. The GPX file generated by GPRO2GPX can be used by VID2GSV to add the GPS data to the video at the time of upload to GSV.

Videos recorded with GPS data by the GoPro FUSION, MAX and HERO cameras can be extracted to geotagged JPG sequences by using GPRO2GPX to extract the GPS data from the GPMF track to a GPX file. The GPX file generated by GPRO2GPX can be used by VID2JPG to add the GPS data to the JPG files at the time of extraction.

Workflow:

1. Select, drag and drop a video file that contains a GPMF track on the GPRO2GPX.exe desktop shortcut. The following files can be used:

GoPro Fusion:

- Stitched output file from Fusion Studio

GoPro MAX:

- Exported video file from the GoPro Player if the “Retain GPMF data” was used.
- .360 file
- .LRV file

GoPro HERO:

- Original video file recorded by the camera.

2. A window will open showing the progress of the processing.
3. The GPX file will be created in the same folder as the video file, with the same base file name and the “.gpx” extension.
4. Press the Enter key to continue and exit when prompted.

Using MOV2MP4

Videos in CineForm and ProRes format are not compatible with GSV and cannot be uploaded with VID2GSV. They can be converted to MP4 format using MOV2MP4.

NOTE: Cineform and ProRes format are compatible with VID2JPG. It is not necessary to convert them to MP4.

Workflow:

1. Select, drag and drop a CineForm or ProRes format video file on the MOV2MP4.exe desktop shortcut.
2. A window will open showing the progress of the processing.
3. The MP4 file will be created in the same folder as the original file, with the same base file name and the "MP4" extension.
4. Press the Enter key to continue and exit when prompted.

Using CHECK

CHECK displays the processing status of a video that has been uploaded to GSV.

Workflow:

1. Select, drag and drop a file with the ".sid" extension on the CHECK.exe desktop shortcut.
2. A window will open showing the status of the GSV processing.
3. If the GSV processing has completed, a file will be created in the same folder as the ".sid" file, with the same base file name and the ".seq" extension.
4. If the GSV processing completed successfully, the ".seq" file will contain the Photo ID assigned by GSV for each photo extracted from the video.
5. If the GSV processing did not complete successfully, the ".seq" file may contain additional information on the reason.
6. Press the Enter key to continue and exit when prompted.

Appendix – Camera Workflows for Uploading to Google Street View

Insta360 Pro, Pro 2, Titan or Labpano Pilot Era, One, One EE
(GPS data in CAMM format, Upload using GSV2GSV)

Workflow:

1. Record the video with GPS data using the camera GPS.
2. Create the stitched video file.
 - For Insta360: Use the Insta360 Stitcher to create the file.
 - For Labpano: Copy the file from the camera.
3. Use **GSV2GSV** to upload the video file.
4. Use **CHECK** and/or the Google Street View app to monitor Google processing of the video.

Insta360 Pro, Pro 2, Titan or Labpano Pilot Era, One, One EE
(GPS data in CAMM format, Editing with Third-Party tools, Upload using VID2GSV)

Workflow:

1. Record the video with GPS data using the camera GPS.
2. Create the stitched video file.
 - For Insta360: Use the Insta360 Stitcher to create the file.
 - For Labpano: Copy the file from the camera.
3. Use **CAMM2GPX** to extract the GPS data to a GPX file.
4. Use third-party tools to edit the video file.
5. If necessary, specify the start time of the video in the beginning of the video base file name using the format: “**VID_START_YYYY_MM_DD_HH_MM_SS**”.
6. Use **VID2GSV** to upload the video file and the GPS data from the GPX file.
7. Use **CHECK** and/or the Google Street View app to monitor Google processing of the video.

Insta360 Pro, Pro 2, Titan or Labpano Pilot Era, One, One EE
(GPS data in GPS Exchange format, Editing with Third-Party tools, Upload using VID2GSV)

Workflow:

1. Record the video and capture GPS data in a GPX file. The clocks of the camera and GPS capture device should be in sync.
2. Create the stitched video file.
 - For Insta360: Use the Insta360 Stitcher to create the file.
 - For Labpano: Copy the file from the camera.
3. If necessary, use third-party tools to edit the video file.
4. If necessary, specify the start time of the video in the beginning of the video base file name using the format: “**VID_START_YYYY_MM_DD_HH_MM_SS**”.
5. Use **VID2GSV** to upload the video file and the GPS data from the GPX file.
6. Use **CHECK** and/or the Google Street View app to monitor Google processing of the video.

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Insta360 ONE Series

(GPS data in INSV “00” file format)

Workflow:

1. Record the video with GPS data using the GPS Smart Remote or Smartphone GPS.
2. Use Insta360 Studio to create the stitched video file.
3. Use **INSV2GPX** to extract the GPS data from the INSV “00” file to a GPX file.
4. If necessary, specify the start time of the video in the beginning of the video base file name using the format: “**VID_START_YYYYMMDD_HHMMSS**”.
5. Use **VID2GSV** to upload the video file and the GPS data from the GPX file.
6. Use **CHECK** and/or the Google Street View app to monitor Google processing of the video.

Insta360 ONE Series

(GPS data in GPS Exchange format)

Workflow:

1. Record the video and capture the GPS data in a GPX file. The clocks of the camera and GPS capture device should be in sync.
2. Use Insta360 Studio to create the stitched video file.
3. If necessary, specify the start time of the video in the beginning of the video base file name using the format: “**VID_START_YYYYMMDD_HHMMSS**”.
4. Use **VID2GSV** to upload the video file and the GPS data from the GPX file.
5. Use **CHECK** and/or the Google Street View app to monitor Google processing of the video.

GoPro Fusion (GPS data in GPMF format)

Workflow:

1. Record the video with GPS data using the camera GPS.
2. Use GoPro Fusion Studio to create the stitched video file. Use 5.2K Resolution.
3. Use **MOV2MP4** to convert the video to MP4 format.
4. Use **GPRO2GPX** to extract the GPS data from the stitched video file to a GPX file.
5. If necessary, specify the start time of the video in the beginning of the video base file name using the format: “**VID_START_YYYYMMDD_HHMMSS**”.
6. Use **VID2GSV** to upload the MP4 video file and the GPS data from the GPX file.
7. Use **CHECK** and/or the Google Street View app to monitor Google processing of the video.

GoPro Fusion (GPS data in GPS Exchange format)

Workflow:

1. Record the video and capture the GPS data in a GPX file. The clocks of the camera and GPS capture device should be in sync.
2. Use GoPro Fusion Studio to create the stitched video file. Use 5.2K Resolution.
3. Use **MOV2MP4** to convert the video to MP4 format.
4. If necessary, specify the start time of the video in the beginning of the video base file name using the format: “**VID_START_YYYYMMDD_HHMMSS**”.
5. Use **VID2GSV** to upload the MP4 video file and the GPS data from the GPX file.
6. Use **CHECK** and/or the Google Street View app to monitor Google processing of the video.

GoPro MAX (GPS data in GPMF format)

Workflow:

1. Record the video with GPS data using the camera GPS.
2. Use GoPro Player to export the stitched video file. Use 5.6K Resolution. Use the HEVC Codec, if supported. Otherwise, use CineForm.
3. If the CineForm Codec was used, use **MOV2MP4** to convert the video to MP4 format.
4. Use **GPRO2GPX** to extract the GPS data from the .360 file or the .LRV file to a GPX file.
5. If necessary, specify the start time of the video in the beginning of the video base file name using the format: “**VID_START_YYYYMMDD_HHMMSS**”.
6. Use **VID2GSV** to upload the MP4 video file and the GPS data from the GPX file.
7. Use **CHECK** and/or the Google Street View app to monitor Google processing of the video.

GoPro MAX (GPS data in GPS Exchange format)

Workflow:

1. Record the video and capture the GPS data in a GPX file. The clocks of the camera and GPS capture device should be in sync.
2. Use GoPro Player to export the stitched video file. Use 5.6K Resolution. Use the HEVC Codec, if supported. Otherwise, use CineForm.
3. If the CineForm Codec was used, use **MOV2MP4** to convert the video to MP4 format.
4. If necessary, specify the start time of the video in the beginning of the video base file name using the format: “**VID_START_YYYYMMDD_HHMMSS**”.
5. Use **VID2GSV** to upload the MP4 video file and the GPS data from the GPX file.
6. Use **CHECK** and/or the Google Street View app to monitor Google processing of the video.

Any Camera – Video Mode (GPS data in GPS Exchange format)

Workflow:

1. Record the video and capture the GPS data in a GPX file. The clocks of the camera and GPS capture device should be in sync.
2. Create the stitched video file in MP4 format.
3. If necessary, specify the start time of the video in the beginning of the video base file name using the format: “**VID_START_YYYYMMDD_HHMMSS**”.
4. Use **VID2GSV** to upload the MP4 video file and the GPS data from the GPX file.
5. Use **CHECK** and/or the Google Street View app to monitor Google processing of the video.

Any Camera – Photo Mode (GPS data in GPS Metadata Tags format)

Workflow:

1. Create a sequence of GPS tagged JPG photos.
2. Use **JPG2VID** to convert the photos to a video file and a GPX file.
3. Use **VID2GSV** to upload the MP4 video file and the GPS data from the GPX file.
4. Use **CHECK** and/or the Google Street View app to monitor Google processing of the video.

PLEASE NOTE!

Donations

UL2GSV is free to use. I do ask that each user donate money to help support my efforts.

The requested donation amounts are:

- \$50 USD for an occasional user
- \$100 USD for a regular hobbyist or enthusiast user
- \$500 USD for a professional/commercial user

Please use the PayPal link below.

https://www.paypal.com/donate?hosted_button_id=3LC7FTM6BGY4A

THANK YOU!

How to contact me

For now, please contact me via **Facebook Messenger** if you have any comments, suggestions or questions. I try to check it often.

Thank you

Dean Zwickel

Change Log

Beta v13: 2022-0404

- Updated CAMM2GPX to automatically detect GPS timestamps that are relative to the GPS epoch.
- Updated GPRO2GPX to extract GPS positions only at explicitly measured timestamps. This should eliminate redundant GPX track points and improve accuracy.
- Updated JPG2VID to support metadata tags stored in more formats.
- Updated JPG2VID to display the names of the required GPS metadata tags that are missing from each JPG file.
- Updated the “Using VID2JPG in Batch Mode” section of the Readme file to correctly state the Start Delta Time amounts that are supported.
- Updated the Readme file to change “Exif” to “metadata”, where applicable.

Beta v12: 2022-0327

- Updated VID2JPG to add support for traditional (non-360) videos such as those from the GoPro HERO Series.
- Updated VID2JPG to add support for GoPro Time Warp videos. The new “-w” or “--twospeed” option is used to signify that a Time Warp video was recorded and to specify the speed that was used. Speeds of 2x, 5x, 10x, 15x and 30x are supported.
- Updated VID2JPG to enable video start times to be specified as a delta amount relative to the start time of the GPX track. The delta amount can be specified using the “START” keyword in the video file name or using the new “-s” or “--startdelta” command line option. A delta amount in the range -60.00 to +60.00 seconds is supported. Previously, the user was required to read the starting timestamp from the contents of the GPX file and the user could only use the “START” keyword with an absolute date and time. Using a delta time removes the first step and simplifies the time format used. If the delta time is constant for a camera it can be specified using the new command line option. This removes the step of specifying it each time using the “START” keyword. The “START” keyword with an absolute date and time can still be used for situations where more flexibility is needed.
- Updated VID2JPG to enable video start times to be specified with a subsecond precision of 2 decimal places. This enables the image and the GPS position of the extracted JPGs to be more precisely matched, if necessary.
- Updated VID2JPG to display video and GPX times with subsecond precision.
- Updated VID2JPG Exif tagging to support extraction of longer JPG sequences and to display the progress of the tagging.
- Updated sections of the Readme file related to VID2JPG.

Beta v11: 2022-0223

- Simplified use of VID2JPG. It now only requires the stitched video file as input. It will now search for a companion GPX file with the same base file name as the video file. If a companion GPX file is not found, it will try to create a temporary one automatically using CAMM2GPX, INSV2GPX or GPRO2GPX.
- Added a batch mode to VID2JPG. VID2JPG will now run in batch mode if a batch folder is provided as input. It will run in single file mode if a video file is provided as input.
- Multiple Instances of VID2JPG can be used to process more than one video file at a time provided the system has enough resources.
- Changed VID2JPG to use the “-j” option to specify the JPG distance spacing.
- Removed the BVID2JPG tool since VID2JPG now includes a batch mode.

Beta v10: 2022-0216

- Added VID2JPG tool. Extracts a sequence of geotagged 360° spherical JPG files from a video file and a companion GPX file. This enables imagery from videos originally recorded for Street View to be used for other purposes.
- Added BVID2JPG tool. Processes a batch of videos using VID2JPG. This enables extracting multiple JPG sequences unattended.
- Updated INSV2GPX to skip extra GPS data points with the same time stamp. A message will be displayed with the total number skipped.
- Simplified the Installation Steps. It is no longer necessary to download and install FFmpeg.
- Added and updated sections of the Readme file related to VID2JPG and other changes in functionality.

Beta v9: 2022-0126

- Added “Single Request” versions of GSV2GSV and VID2GSV. These versions upload video files in a single API request. These versions upload faster on some networks.
- Renamed existing versions of GSV2GSV and VID2GSV to “Chunks” versions. These versions upload video files in chunks using multiple API requests. These are the default.
- Updated the Chunks versions of GSV2GSV and VID2GSV to improve performance by using network connection pooling for API requests.
- Updated the Chunks versions of GSV2GSV and VID2GSV to accommodate slower networks and reduce connection errors by increasing the network timeout and retry interval.
- Changed VID2GSV to use the start time of the GPX track as the default start time of the video file. This is normally the time used, but previously the user was required to read the time from the contents of the GPX file and then specify it in the video file name. Using this time as the default removes those steps. If necessary, the user can override this time by specifying the start time in the video file name using the “START” keyword.
- Updated VID2GSV to add support for UTF-8 format GPX files.
- Updated JPG2VID to add additional checks for missing GPS Exif tags.
- Updated GPRO2GPX to add support for “.360” and “.LRV” input files.
- Added MOV2MP4 tool. Converts a GoPro CineForm or ProRes format video to an MP4 format video. This enables 5.6K and 5.2K resolution videos to be uploaded with VID2GSV.
- Added sections to the Readme file for: “Getting Started”, “Introduction to Camera Workflows”, “Using MOV2MP4”, and an Appendix of “Camera Workflows” for specific camera types.
- Updated various sections of the Readme file to improve clarity and reflect changes in functionality.
- Updated all tools to add checks for required FFMPEG files.

Beta v8: 2021-0730

- Changed JPG2VID to require geotagged JPG files.
- Changed JPG2VID to generate a video file with a frame rate of 1 fps and a GPX file with a track point time stamp interval of 1 sec. This enables the JPG files to be captured without regard for time spacing.
- Updated instructions for using AUL2GSV due to the recent changes in the Google consent screen.
- Added requested amounts to the Donations section of the Readme.pdf file.

Beta v7: 2021-0624

- Added a feature to CAMM2GPX that enables the user to specify that GPS time stamps be scaled to the duration of the video. This can prevent the ends of blue lines recorded with Labpano cameras from being truncated.
- Updated VID2GSV to skip GPX track points with time stamps that are not monotonically increasing. This can prevent some Street View processing errors.

Beta v6: 2021-0613

- Updated GSV2GSV to add the UL2GSV base folder name as a prefix in the window title bar. This enables users who run multiple instances to determine the instance running in each window.
- Updated JPG2VID to add additional checks for missing GPS tags.

Beta v5: 2021-0527

- Enhanced BUL2GSV to use a folder containing shortcuts to the video files instead of the files themselves.
- Enhanced BUL2GSV to enable videos to be added to the batch queue while it's running.
- Updated JPG2VID to ensure input JPG files are processed in the proper sort order.
- Updated the Installation steps to clarify which FFmpeg file to download.
- Updated the Installation steps to emphasize the requirement to use the Desktop Shortcuts to run the tools.

Beta v4: 2021-0523

- Updated JPG2VID to use DateTimeOriginal Exif tags if GPS Date and Time Stamp Exif tags are missing.
- Updated JPG2VID to allow for incorrectly formatted GPS Altitude Exif tags recorded by Mi Sphere cameras.
- Updated JPG2VID to add additional checks for missing GPS Exif tags.
- Updated JPG2VID documentation to explain the effects on output of the above changes.
- Updated JPG2VID documentation to stress the importance of following GSV collect guidelines and where to get help.
- Added Table of Contents to Readme file.

Beta v3: 2021-0519

- Added JPG2VID tool. Converts a sequence of 360° spherical JPG files to a video file and (optionally) a GPX file that can be uploaded with VID2GSV.
- Added workaround for GPRO2GPX to create a GPX from a .360 or .LRV file until the GoPro Player app supports the "Retain GPMF data" Advanced Export option.
- Added section on Google Street View to the Readme.pdf document.

Beta v2: 2021-0510

- Improved GSV2GSV and VID2GSV detection and recovery from network errors
- Added GPRO2GPX tool. Enables videos from GoPro FUSION and MAX cameras to be uploaded with VID2GSV.

Beta v1: 2021-0426

- Initial release
Requires Windows 10