Video Semantic Labeler

This tool is designed for making ground truth data for video semantic segmentation.

It provides pixel-wise, superpixel-wise and polygon-wise labeling methods.

Tool Configuration

In the folder, you will find an xml file named 'processSetting.xml'. This file specifies the configuration of the label classes and their respective color. It also specifies the input video file path and the output directory for labeled images and their label images. Each setting is defined in its own xml tag.

<InputFilePath>: specify the input file path.

<OutputDir>: specify the output directory.

Other settings are described in the xml file.

Please keep 'processSetting.xml' file in the same directory as the exe file.

Tool Usage

Video viewing mode

1. Set your 'processSetting.xml' file.
2. Open the 'LabelerSoftWare.exe' file.
3. Play your video.

Now, you can play the video by click **'play'** button, pause with **'pause'** button and stop with **'stop'** button.

You can also get to any position of the video by altering index accurately and clicking **'Commit Settings'** button.
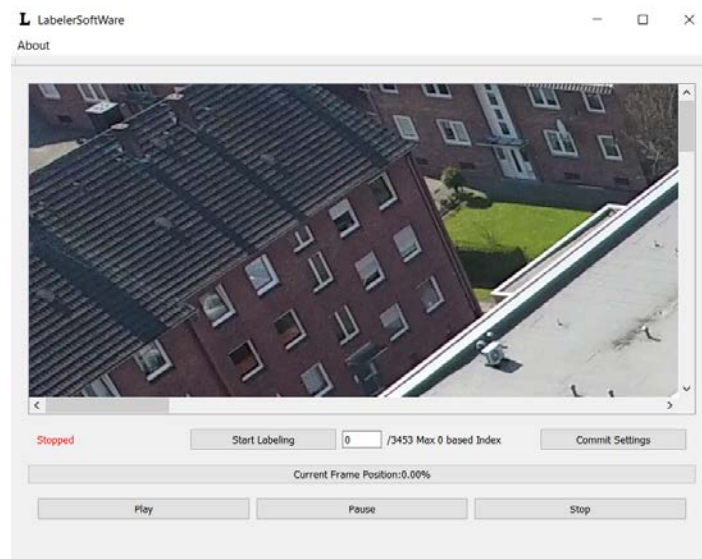

Fig.1 video viewing interface.

As the images are shown with qt label widget and the frames are grabbed with opencv library, it is not highly optimized for video viewing as this tool is aimed for labeling task.

Video labeling mode

4. Click start labeling to enter labeling mode. You will see the main panel in the top middle of your screen. And two small windows for labeling task.
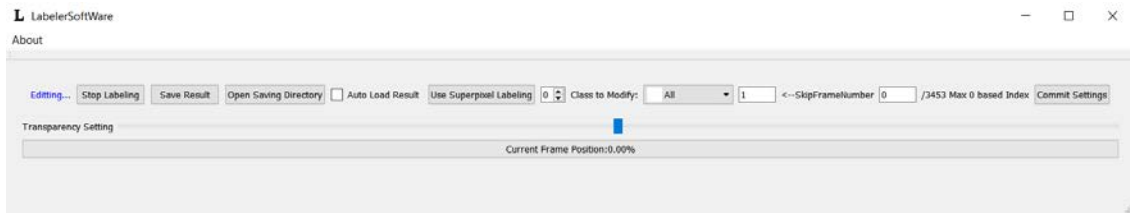

Fig.2 labeling task main panel.

The following shows what the buttons are used for.

1) **'Stop Labeling'** button: exit labeling process without saving and return to video viewing.
2) **'Save Result'** button: save current editing frame and current label image together.
3) **'Open Saving Directory'** button: open file explorer and navigate to the saving directory.
4) **'Auto Load Result'** checkbox: if ticked, and if saving directory has the corresponding label image for current frame, the label image will be loaded.
5) **'Use Superpixel Labeling'** button: if you want to use super pixel labeling mode, click this button to run SLIC segmentation with multiple scales. It takes a few seconds to run the algorithm depending on your computational power. Then, a new window will be opened for super pixel mode labeling.
6) **Spin Box** next to 'Use Superpixel Labeling' button: apply different scales of the super pixels.
7) **Class to Modify**: select the class to be changed in the image. Other classes will not be affected.
8) **'SkipFrameNumber'** edit line: set the interval for getting the next or the previous frame for labeling. Apply this setting by clicking 'Commit Settings' button.
9) **'index'** edit line: set the index for the labeling frame. Apply this setting by clicking 'Commit Settings' button.
10) **'Commit Setting'** button: apply the settings for skip frame number and current index.
11) **'Transparency Setting'** bar: change the blend ratio between original image and label image. To update the labeling window, click the window title and double click 'Tab' key.

Labeling windows

In total, there are three windows for labeling, they are listed below. Each window references to another image, which is used for blending purpose to see the label quality. All three windows can be used to label and they are synchronized. Just select a class and then label it.
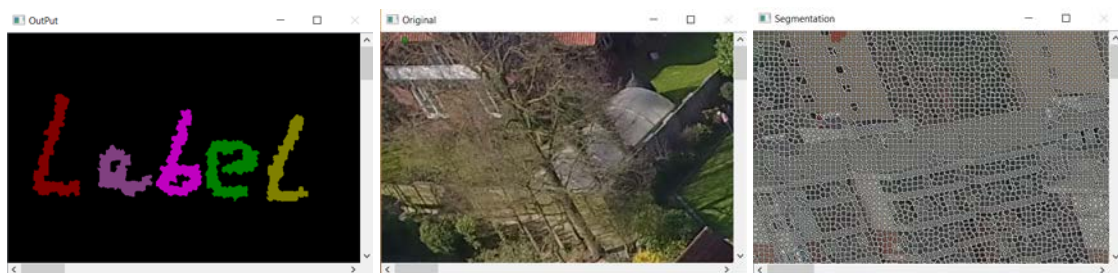
| OutPut window | Original window | Segmentation window |

Fig.3 Three labeling windows.

Class Selection

Select a labeling window, pressing down **shift** key (hold) to open class selection panel, hovering your mouse cursor to the class you need to label. Loose the **shift** key to confirm selection.
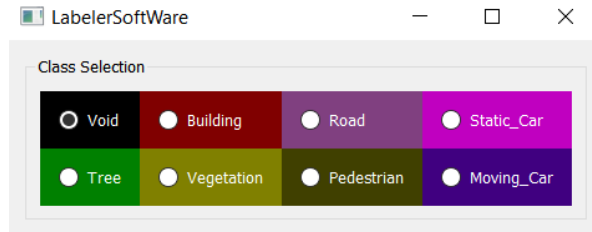

Fig.4 class selection panel.

Fast window navigation

Use **w**, **s**, **a**, **d** keys to move scroll bar. **Alt** + **mouse wheel** to zoom.

Three labeling mode (the following shows examples with blending on (Shot key: **tab**))

1) Pixel level labeling: in output window or original window, you can draw label directly. Use **Ctrl** + **mouse wheel** to change pen size.

Fig.5 pixel labeling mode.

2) Superpixel labeling: in segmentation window, you can draw label with super pixels. (To have this window, you need to click **'Use superpixel labeling'** button in the main panel.) Use **x**+**mouse wheel** to change superpixel size.

Fig.6 superpixel labeling mode.

3) Polygon labeling: you can draw polygons in the original window. Right mouse click to enter polygon mode, the cursor changes into a cross. Then, left mouse click to add vertex, left

mouse double click to draw polygon. Use **Ctrl** + **z** to remove the last added vertex if not correct.

Fig.7 polygon labeling mode.

To erase the label. Just select 'Clutter' class and draw above the unwanted part.

Saving File Name Rule

When saving the label, both original image and label image will be saved.

Output label file name is:' <index>.bmp', and the corresponding original image file name is '<index>_ori.bmp'. <index> part is formatted as '%06d'.

Shot Key Table

Tab.1 Shot Keys(Holding means pressing continuously)

Shot Key	Function
Tab	Blending the image with the reference image
Shift(Holding)	Hovering mouse on opened panel to select class
r	Clear all the labeled pixels
Ctrl + mouse wheel	Change pen size
Alt + mouse wheel	Zoom the image
v	Zoom to original scale
X + mouse wheel (segmentation window)	Change super pixel scale
w	Move scroll bar up
s	Move scroll bar down
a	Move scroll bar left
d	Move scroll bar right
Left mouse click	If not in polygon mode: Draw labels If in polygon mode: Add a polygon vertex
Right mouse click (original window)	Switch between polygon editing mode and pixel level labeling mode
Ctrl + z (original window, polygon mode)	Undo adding a vertex from current polygon
Left mouse double click (original window, polygon mode)	Finish drawing current polygon
→	Skip to next frame for labeling
←	Skip to previous frame for labeling

Classes for UAVid Project

There are 7 foreground classes (building, road, moving cars, static cars, vegetation, humans and tree) and 1 background class (clutter).

Building: includes normal buildings and garages.

Road: includes road that cars can run on. Sidewalk is not included. Parking lot is not included.

Moving cars: includes cars that is moving forward or backward.

Static cars: includes cars that is not moving.

Vegetation: includes low vegetation, such as shrubs and grass.

Humans: includes human in any behavior, walking, standing and riding.

Tree: includes trees, that have obvious canopy.

Clutter: includes all other objects that do not belong to any classes above.
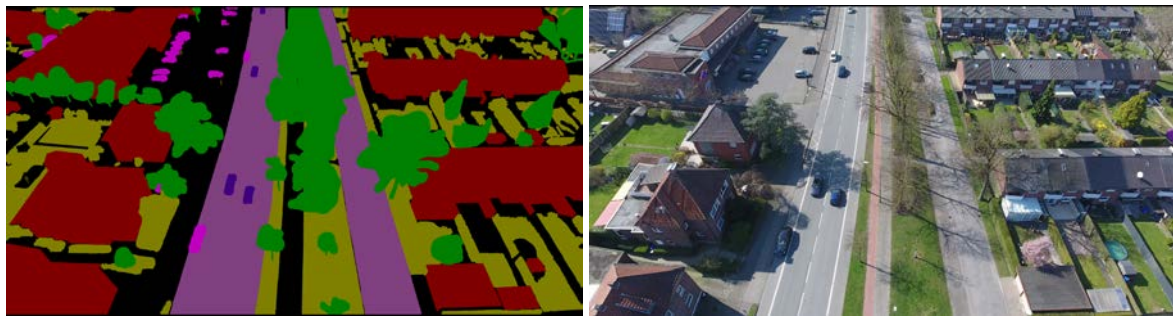
The following shows an **example**.

Fig.8 Labeling example.

Note that in the example images, if tree occludes objects in the back, then we label foreground.

Good practice for labeling

1) Class order of labeling: building -> road -> moving cars -> static cars -> vegetation -> pedestrian -> tree. You can also do it in your own preference anyway.
2) Save result constantly in case you lost the label by accident.
3) If you have already labeled some parts and saved in the output directory, you can always load it by tick **'Auto Load Result'** checkbox.
4) Remember to save result before you exit or switch frame.
5) Mode selection: For regular objects, use polygon mode. For round corners use pixel mode. For objects with saw tooth boundaries, use super pixel mode.
6) To **check an object is moving or not**, you can open another video semantic labeling tool in video viewing mode and play the video at specific index.

Question

If you have any question, you are welcome to contact me.

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