

# Modification of CTVox Flight Recorder Storyboard file (.sb) for easier multiple dataset visualization

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## Aims

Once it is required to create multiple look-alike videos of similar datasets (e.g. same organ of different animals) for their visual comparison or for a presentation, one realizes the complexity of the challenge and that there is no ready-to-use solution for that yet.

This paper represents our implementation to create similar video sequences for similar (orientation, position, size), but not identical datasets. Creating such visualizations could be achieved by applying same frames from standard CTVox flight recording acquired on one of the datasets to the rest of datasets.

## Method

CTVox Flight Recorder provides the possibility to create, copy (at the same position), delete and replace the frames, which are basically saved views of the object with given orientation, transfer function, etc. For each frame, one can modify any parameter and replace the frame. However, modification of each key frame in set requires this manipulation to be repeated. Unfortunately, Flight Recorder does not provide the possibility to move frames or to copy them to a different position, as well as modifying some parameters in bulk. The issue was to adjust object position or other parameters (transfer function, clipping box, etc.) for multiple frames due to differences in datasets.

While investigating the .sb frame file it was discovered that it is an xml-formatted file containing information about each frame in corresponding elements.

```

1 <?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
2 <!DOCTYPE boost_serialization>
3 <boost_serialization signature="serialization:archive" version="16">
4 <storyboard class_id="0" tracking_level="0" version="0">
5 <keyFrames class_id="1" tracking_level="0" version="0">
6 <count>1</count>
7 <item version="2">
8 <item class_id="2" tracking_level="0" version="2">
9 <glScene class_id="3" tracking_level="0" version="3">
10 <view class_id="4" tracking_level="0" version="0">
33 <lightingSettings class_id="10" tracking_level="0" version="0">
53 <lightSource class_id="13" tracking_level="0" version="1">
82 <volume class_id="15" tracking_level="0" version="1">
113 <clipPlanes class_id="17" tracking_level="0" version="2">
152 <cuttingShape class_id="19" class_name="GICuttingBox" tracking_level="1" version="0" object_id="0">
193 <bkgrndBox class_id="21" tracking_level="0" version="0">
220 <volumeAxes class_id="22" tracking_level="0" version="0">
249 <scaleBar class_id="24" tracking_level="0" version="0">
276 <transFuncPreviewBar class_id="25" tracking_level="0" version="0">
303 <labels class_id="26" tracking_level="0" version="0">
330 <logo class_id="27" tracking_level="0" version="0">
357 <legend class_id="28" tracking_level="0" version="0">
384 </glScene>
385 <volChannels class_id="29" tracking_level="0" version="0">
539 </item>
540 </keyFrames>
541 </storyboard>
542 </boost_serialization>
543

```

Figure1: Content view of a sample Flight Recorder Storyboard file, describing one frame.

Further investigation into each sub-element revealed that editing their contents and resaving the file provides a different way to change frame parameters as well as possibility to do this for multiple frames.

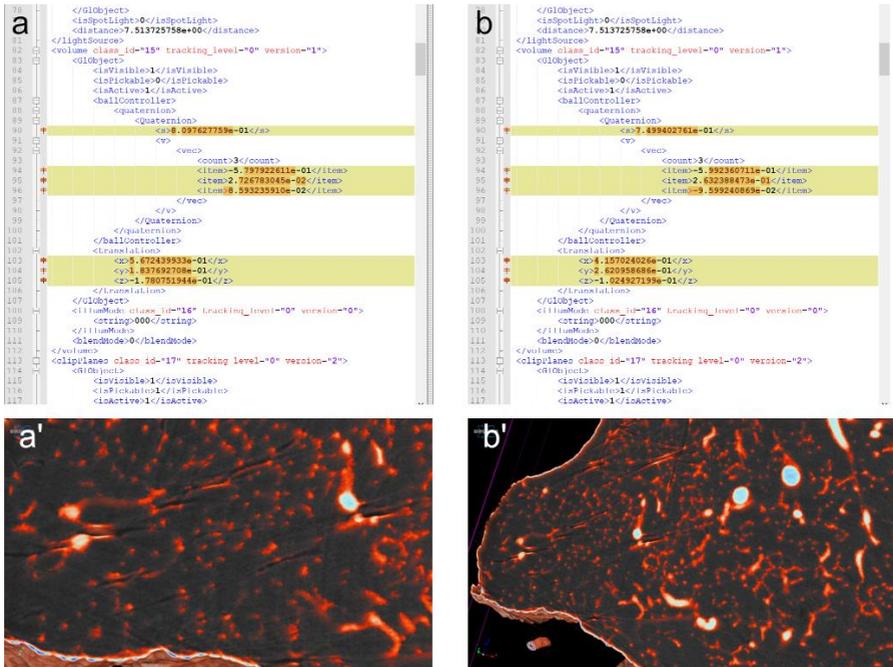


Figure2: Differences in the sample Flight Recorder Storyboard file, containing one frame before adjusting the position of camera (a) and corresponding view from CTVox (a'), and after viewing point was changed (b-b').

Saving two equal storyboard files with e.g. different transfer function, revealed which sections of this file are being modified. Tweaking numbers and parameters of frames in the storyboard and the comparison of those, allowed to understand what exactly has to be modified in the file for desired outcome.

As a simple trial, data about first frame was copied into a blank last frame, allowing for the video that would be created from given storyboard to be able to loop on itself. The same result can be achieved by simply creating two identical frames at the beginning of workflow and adding all the remaining in between those ("Add" function of the Flight Recorder appends the list of the frames).

Another method was used to modify the transfer function of each frame. This was done by saving a storyboard with a single frame tuned to desired transfer function. Afterwards, the data about the transfer function in a multiframe storyboard was replaced by data from the corresponding element of the single frame storyboard.

## **Results**

It was shown that by modifying the Flight Recorder Storyboard file one can adjust parameters of each frame, e.g. transfer function, object position, etc. The manual manipulation of storyboard file is tedious and time-consuming as well as prone to errors. However, it shows a feasible solution to the otherwise unsolvable (or rather extremely time consuming) aforementioned task.

## **Conclusion**

This approach showed to be a promising solution complementary to the already available functionalities of the CTVox Flight Recorder. There is a certain possibility to utilize these methods to add more features such as object reorientation, frame shift, transfer function manipulation. All of these could be done to multiple frames or specific one. The presenting author is investigating the possibility to develop in-lab software to be able to solve these tasks.

## **References:**

1. CTvox Quick Start Guide