Open Source Subtitle Editor Software Study for Section 508 Close Caption Applications

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Nomenclature

CC	= *Closed Captioning*
ITAW	= *IT Accessibility and Workforce*
GSA	= *General Services Administration*
EIT	= *Electronic and Information Technology*
.srt	= *the file extension for SubRip subtitle files*
OSS	= *Open Source Software*
.ssa	= *SubStation Alpha*
.ass	= *Advanced SubStation Alpha Subtitle*
.sub	= *Subtitling file*
.txt	= *Text File*
.idx	= *Index file*

I. Introduction

Government agencies are required by law under the Section 508 policy to provide any tools or services for their employees who may need them. For those who need special assistance these tools and services help them do their job to the best of their ability. With these tools and services a person with disabilities will have equal opportunities for advancing in their company, as others do. This research and implementation was used to find cost effective solutions to make information available to all Government employees as required by law, Section 508.

II. Abstract

This paper will focus on a specific item within the NASA Electronic Information Accessibility Policy – Multimedia Presentation shall have synchronized caption; thus making information accessible to a person with hearing impairment. This synchronized caption will assist a person with hearing or cognitive disability   to access the same information as everyone else. This paper focuses on the research and implementation for CC (subtitle option) support to video multimedia. The goal of this research is identify the best available open-source (free) software to achieve synchronized captions requirement and achieve savings, while meeting the security requirement for Government information integrity and assurance. CC and subtitling are processes that display text within a video to provide additional or interpretive information for those whom may need it or those whom chose it. Closed captions typically show the transcription of the audio portion of a program (video) as it occurs (either verbatim or in its edited form), sometimes including non-speech elements (such as sound effects). The transcript can be provided by a third party source or can be extracted word for word from the video. This feature can be made available for videos in two forms: either Soft-Coded or Hard-Coded. Soft-Coded is the more optional version of CC, where you can chose to turn them on if you want, or you can turn them off. Most of the time, when using the Soft-Coded option, the transcript is also provided to the view along-side the video. This option is subject to compromise, whereas the transcript is merely a text file that can be changed by anyone who has access to it. With this option the integrity of the CC is at the mercy of the user. Hard-Coded CC is a more permanent form of CC. A Hard-Coded CC transcript is embedded within a video, without the option of removal.

III. Research

A. Section 508

The Government Section 508 policy requires that Federal agencies' electronic and information technology be readily accessible to people with disabilities. The ITAW Division, in the U.S. GSA's Office of Government wide

Policy, has been commissioned with the task of educating Federal employees as well as building the groundwork necessary to support Section 508 compliance. The Section 508 web site (sited in reference page) can be used by both Federal employees and the public to access resources for understanding and the implementation of the policies requirements.

Successful implementation of Section 508 for Federal Employees requires the support of each and every federal employee who is involved in the design, development, procurement, or use of EIT. The policy states that all federal employees should understand the requirements of Section 508 and how they may apply to their business operations and processes with compliance in mind. With this policy in place, all government employees will be able to access information easily as suited to their needs.

The next section provides technical definitions of words used to describe the result of this research. These definitions will be helpful as you review the results.

B. Closed captioning

Closed captioning is the display of closed subtitles, specifically intended for people who are deaf or hearing impaired. CC is transcriptions rather than a translation, and sometimes contains descriptions of other important non-dialog audio such as sound effects and lyrics.

Some video programs may be prepared, in their entirety, several hours before it is to be broadcasted with CC capabilities. Insufficient time to prepare a time coded caption file (transcript) for automatic play-out may result in lag[1] in the captioning of the video. With this lag, cueing may be compromised slightly as the captions are not locked to the program's time code.

recreation, fitness and fitness from the standpoint of organized and unstructured activity.

There are two main methods that CC is processed; Soft-coding and Hard-coding

1. Soft-coding:

Subtitles are textual displays of the dialog, commentary, or actions as they are taking place in a film, television program, and video game. A transcript of subtitles is formed of the written translation of a dialog, with or without added information to help viewers who are deaf or hearing impaired to follow the dialog, or people who cannot understand the spoken dialogue or who have accent recognition problems. These subtitles are commonly displayed at the bottom of the screen, and give the viewer the option to turn the CC subtitles on or off. This is the method known as soft-coded CC. With this option users can access the video menu and toggle this setting as they chose.

2. Hard-coding:

Hard coding refers to the software practice of embedding input or configuration data directly into the source code of a program or other executable object. As for video files, a transcript is embedded within a video, displaying the words of the transcript at its respective time stamp.

One important case of hard coding is that when strings are placed (embedded) directly into the file, it prohibits others from removing it. In a since hard coding merges both the transcript and the video file together, as long as they are compatible.

C. Cost Effective

All research and testing for the 508 policy compliance, has been done on software that is cost effective for the agency. With rising concerns on budget cuts, software that is both easy to use and doesn't cost the agency money is very useful. There are two forms of software that have been tested, that are cost effective: Freeware and Open Source.

1. Freeware:

Freeware is software that is available for use at no monetary cost or nominal fee. Freeware usually comes with (not required) with one or more restricted usage rights or limitations. For example,

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[1] Lag- Fall behind in movement, progress, or development; not keeping pace with another or others

trials are forms of freeware. This example of freeware gives the user the full software sample that will expire at a given time. If the user so chooses, they can pay to get the full version of the software without any limitations. Freeware is in direct contrast to commercial software. Commercial software is normally sold for a profit. Since Freeware is made available for free, it cannot economically rely on commercial promotion. Most of Freeware promotion is internet based. Though Freeware is available for free, it is still copyrighted by its developer, who retains the rights to control its distribution, modify it and sell it in the future. Freeware is normally distributed without the software's source code, thus preventing modification by its users.

Freeware is different from open source software.

2. **Open Source software :**

OSS is software for which the source code is made freely available for other software developers, to use and modify. In this since there are very minimal restrictions on the use of OSS. OSS is made available and licensed with a special license, one in which the copyright holder provides the rights to users to study, change and distribute the software at no cost to anyone and for any purpose.

D. Security Compliant

1. **Software:**

All software that has been tested has been thoroughly scanned for any security risk that it may cause upon its installation. Many programs, once installed open ports within a computer. Through these ports, viruses and malware can make its way through systems defenses and infect a computer. Upon installation all options are reviewed as to what will be installed onto the system. Any potential risk option is either turned off, not installed with the program, or the software is not installed altogether.

2. **CC integrity:**

The integrity of the transcript is very vulnerable. For security reasons, research has been done to protect the information that is enclosed within the transcript. The reason for this being, that if someone could gain access to the transcript, then they could change the content that is to be displayed. If the wrong information is being displayed to a viewer, then they are not getting the right information that was intended for them.
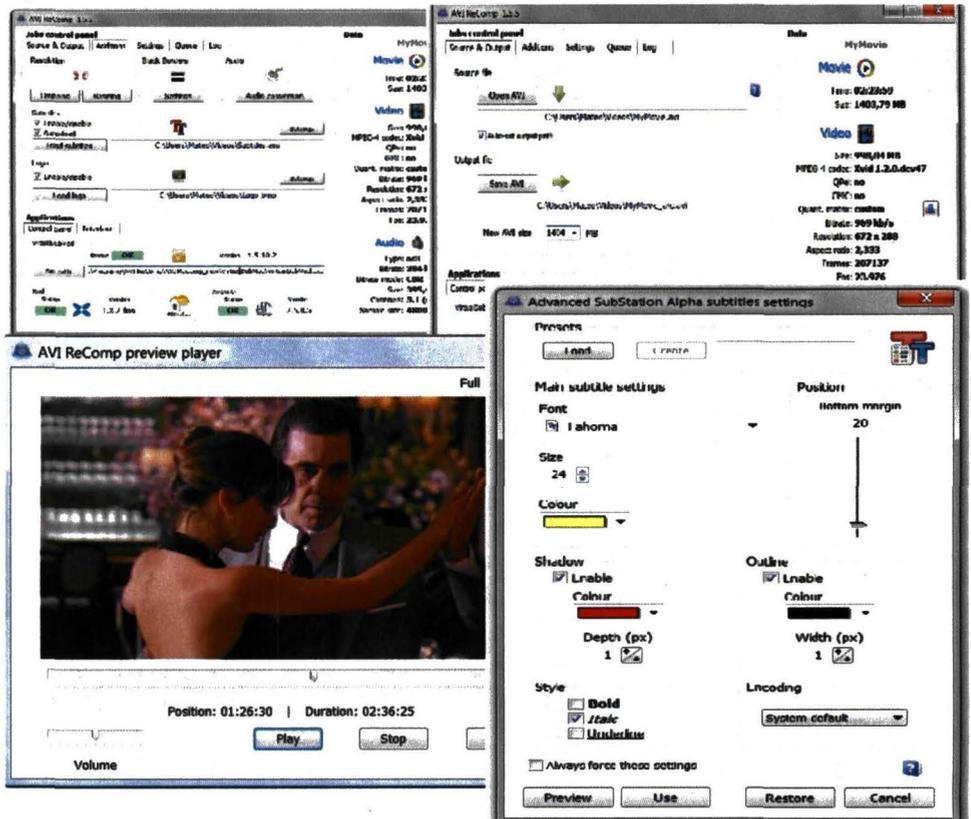
IV. Testing

Project Plan

The research project plan is to find, test and document suitable software products that can bring CC properties to NASA files. Software must reach requirements based on ease of use, as well as cost and security concerns.

A. Suitable Programs

1. **AVI ReComp**

AVI ReComp is freeware that allows a user to re-compress their AVI files. For the time being this program uses only Xvid codec for the recompression process. For that reason many video files are limited or are not supported with this program. Only AVI files will be supported with this program. This program contains the feature of embedding subtitles into video files, with
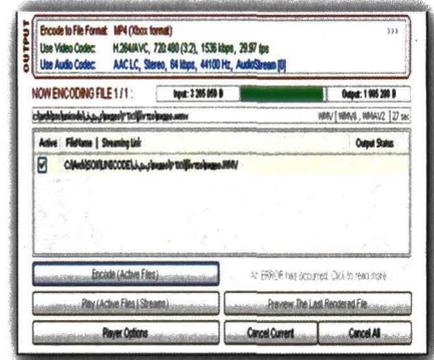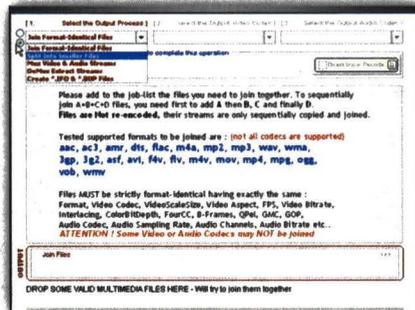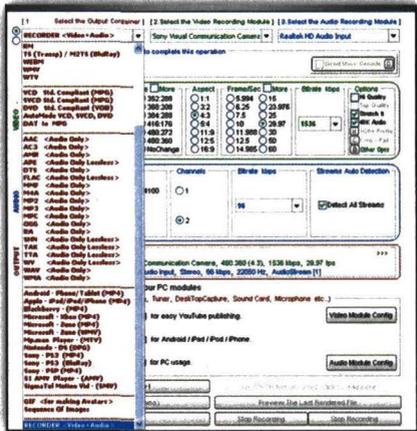
additional features to add to the subtitle display. AVI ReComp newest version allows the user to add black borders around the subtitles in their movie. AVI ReComp supports the following subtitle formats: .txt, .txt / .sub, .sub, .srt, .ass, .ssa, .sub/.idx. AVI ReComp subtitle features allows the user to also adjust all settings for subtitles in ways such as changing the position, font, size, color, outline, shadow, style (bold, italic, underline). If the user does not have the transcript in a supported subtitle format, then AVI ReComp allows the user to create custom subtitles from presets (for SSA and ASS formats only).

The verdict: AVI ReComp is a great tool for adding subtitles, but it is only limited to the AVI video format. AVI ReComp has a lot of options to edit the display of a user's subtitles. AVI ReComp is easy to use, but it is not the most powerful video encoder, due to its limits on only supporting avi files. AVI ReComp meets all of the requirements of the project plan, and is suitable for use in making NASA video files Section 508 compliant as long as they are encoded in an AVI file format.
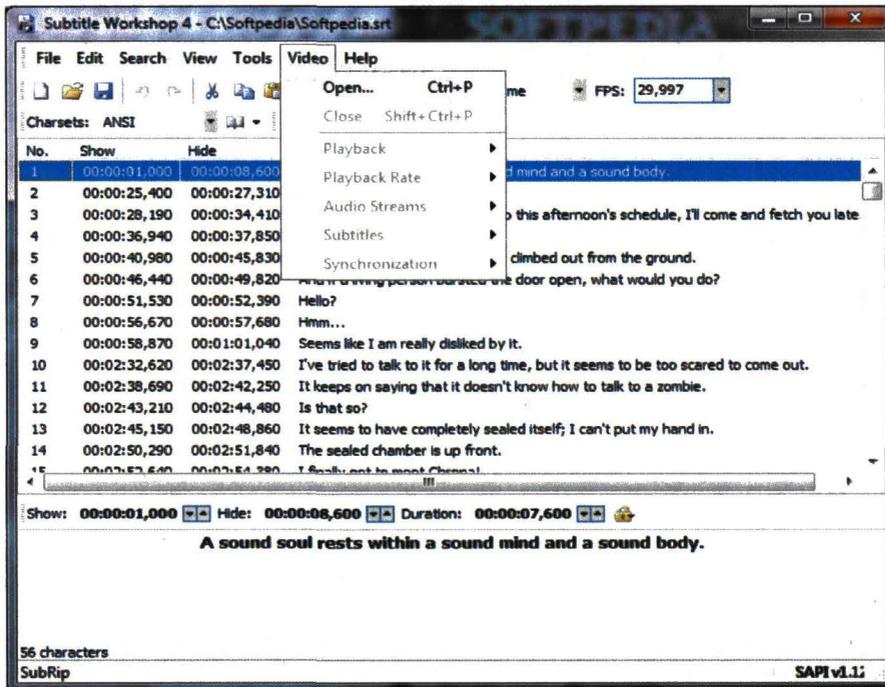
2. **SUPER ©**

SUPER © is freeware software that is a useful media conversion tool that both encodes and renders media files into a variety of other different media formats. SUPER © has a wide arrange of formats and features to use and media conversion. SUPER © uses a single window user interface, which is divided into audio and video sections. These sections represent the user's desired output specification. SUPER © gives the users the option to embed subtitle files into their video files. This method of embedding is hardcoded into the video.

The verdict: SUPER © is a very powerful video converter. SUPER © has numerous features for encoding video files into a wide arrange of other video formats. SUPER © has an available feature to embed a subtitle file hardcoded into a video file. SUPER © reaches the project plans requirements, to an extent. SUPER © has so many features, that for a novice user, it may seem overwhelming. Users may find themselves lost within endless feature sets. Some features a novice user may not understand its functionality, but with experimentation, a user can use SUPER © as an effective tool. Lastly, since SUPER © is such a powerful video encoder, it takes longer than your common video converter, because SUPER © goes more in depth with its conversions.

3. **Subtitle Workshop**

Subtitle Workshop is subtitle creator. Subtitle Workshop supports all commonly known subtitle formats. Subtitle Workshop uses a user friendly interface, in which the user can handle both time and frame based subtitles. Subtitle Workshop can perform massive subtitle conversions and can check for and fix errors in subtitle files. Subtitle Workshop has an advanced video preview feature which eases the task even more for the user. The user will be able to preview the video as they are creating the subtitle file. As the user enters in data they will be able to see their work in the preview in real-time.
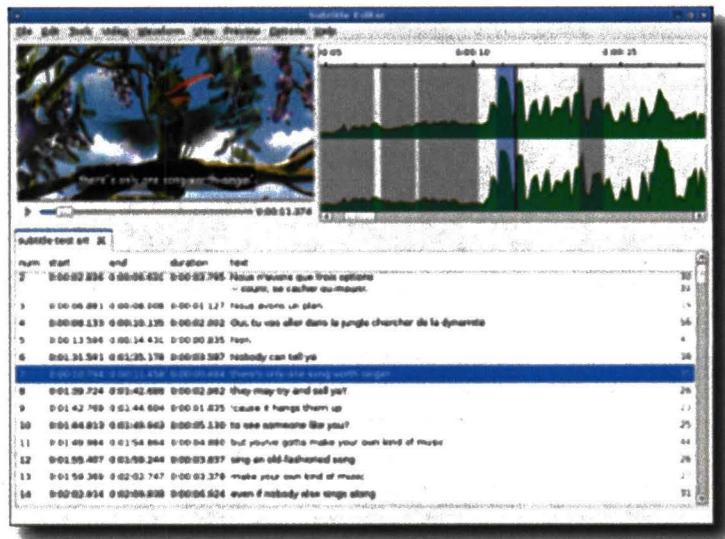
The verdict: Subtitle Workshop a great for user to create a transcript for video files. Subtitle Workshop give the user all the tools they need to create a transcript and save subtitle transcript in many different subtitle formats. Subtitle Workshop is fitted with a video preview so that a user can see their subtitles in real time within their video. Subtitle Workshop does not allow the user to embed the subtitle file into a video; it only allows the user to create a subtitle file. Subtitle Workshop meets all of the project plans requirements. Subtitle Workshop is very easy to use. Subtitle Workshop makes it easy for a user to add new time steps, and subtitle lines into a video. Subtitle Workshop is also free for use.

4. **Subtitle Edit**

Subtitle Edit is a free (open source) editor for video subtitles. With Subtitle Edit you can easily adjust a subtitle if it is out of sync with the video in several different ways. A user can use Subtitle Edit for making new subtitles from scratch with a feature for translating subtitles. Subtitle Edit has the ability to show a video preview, of subtitles. The user can edit a subtitle file, by editing specific time-stamps of each line in a transcript. Once a user has created the subtitle file, they can save it in any subtitle format available. Subtitle Edit also gives the user the ability to import other subtitle formats and convert them to other formats. The most convenient feature that Subtitle Edit has to offer is their integration with Google Translate. This feature imports the users current subtitle file (any format), and convert it to another language. With the integration of Google translate, the subtitle file will take the native language, and translate the entire file into another desired language.

The verdict: Subtitle Edit is a top of the line subtitle editor. Subtitle Edit is very helpful in bringing Section 508 to compliance. With Subtitle Edit features a user has the best tools to create a subtitle transcript. In addition the Google Translate feature is an extremely useful tool within this policy. With the Google translate tool, the agency will be able to not only create one transcript in one language, the agency will be able to translate the transcript into other languages, making a video available in other languages. This feature makes video files multilingual and section 508 compliant.
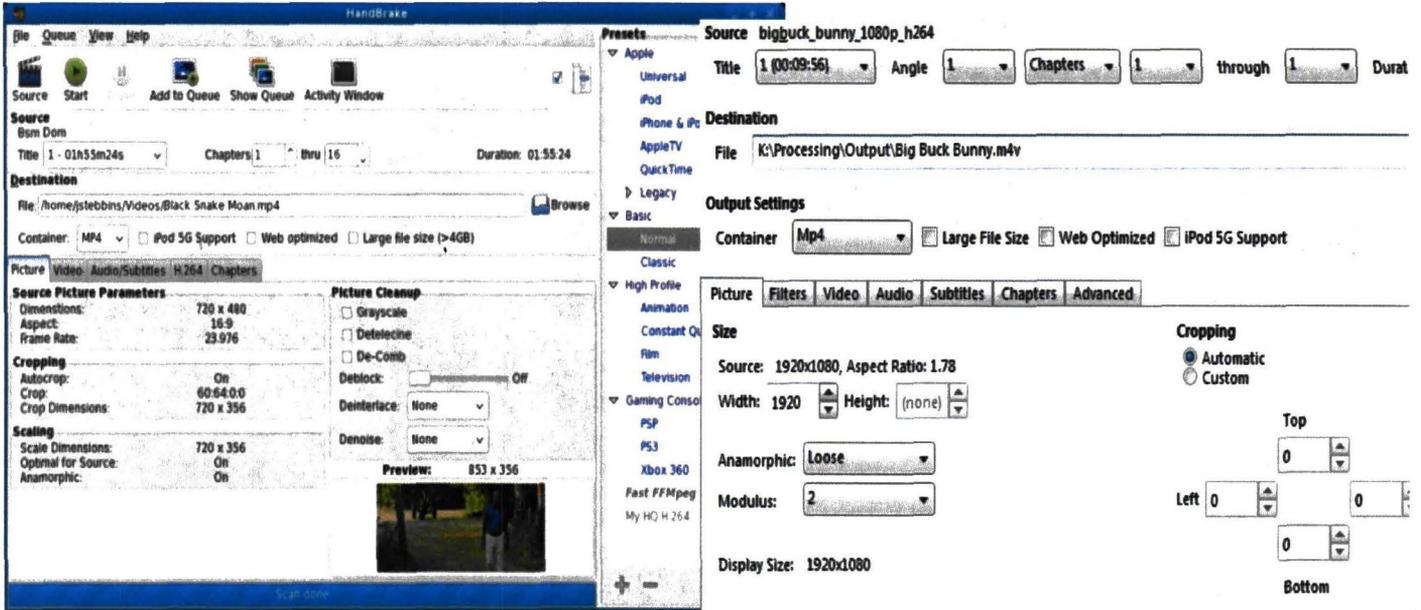
5. **Aegisub**

Aegisub is a free, open-source cross-platform subtitle editing program. Aegisub's native subtitle format is .ass (supports subtitle positioning and styling). Aegisub also supports other common subtitle formats, such as SubRip. Aegisub's features include support for timing to both audio and video, and can use many video processing bindings to process. Aegisub allows the user to edit the subtitles animations, font, style and more. With this tool Aegisub can be used to create a custom subtitle transcript.

The verdict: Aegisub is a good tool for creating subtitle transcripts. Aegisub is limited to the different certain subtitle output formats. Aegisub meets all of the projects plan requirements. Aegisub is limited to a few formats, but in the section 508 compliance, Aegisub features are very useful.

6. **HandBrake**

HandBrake is a general-purpose, free, open-source, cross-platform, multithreaded video transcoder software application. HandBrake has many useful features that can be used to encode video files into various other video file formats. Within these features HandBrake has a particular feature where the user can insert a .srt into their chosen video. This feature within HandBrake is unique because it gives the user 3 different options of embedding the .srt for subtitles. Option one gives the user the ability to soft-code subtitles into a video. This option gives the user the ability to turn subtitles on and off. Option two gives the user the ability to hardcode subtitle into a video. For this option it means the subtitles are irremovable from the video. Option three gives the user the ability to hardcode subtitles as though it is a soft coded option. This option means that the subtitles are hardcoded into the video but also gives the user the ability to turn the subtitles on and off. This option secures the integrity of the subtitles while also giving the user the ability to turn subtitles on and off. HandBrake is simple, easy, and fast to use.
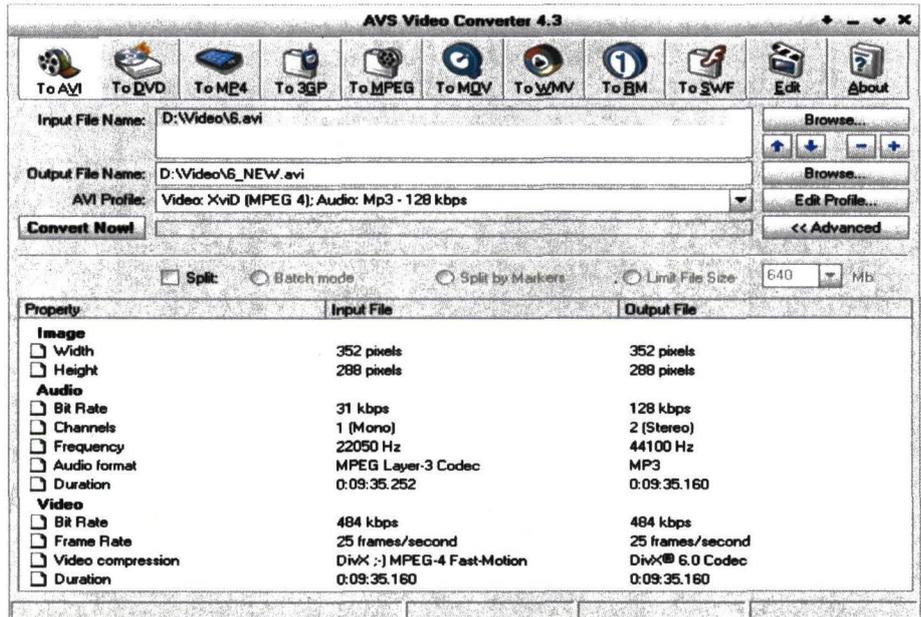
The verdict: HandBrake is another powerful video conversion tool. HandBrake is very easy for a user to navigate. Video conversion is made simple and easy. HandBrake's subtitle options are very useful in making NASA video files Section 508 compliant. The conversion process is fairly short. HandBrake meets all of the projects requirements, without any apparent faults.

B. Non-Suitable Programs

1. AVS Video Converter:

The AVS Video Converter is a basic video converter. AVS Video Converter is simple to use, and has an easy to navigate user interface. Within AVS Video Converter there are a few minor spelling mistakes, updating of the video codecs or a help files are flawed and unresponsive. AVS Video Converter advertises a subtitle feature, yet does not support basic subtitle formats. Also this software does not clearly state how to add a subtitle file to a video.

The verdict: Though AVS Video Converter is free, this application works okay at best. AVS Video Converter meets some of the projects plans but falls short of meeting the basic functionality required to make videos Section 508 compliant.

2. VirtualDub:

VirtualDub is a free, Open Source solution specifically designed for that purpose. VirtualDub lacks the editing power of a video editor. VirtualDub installation process is tricky, and requires a lot of user input on multiple files. Its settings are straightforward, but lack instruction, making it hard for the user to navigate the program. VirtualDub advertises subtitle support, but the software's initial setup was so flawed, that this option could not be located.

The verdict: VirtualDub fails on the entire projects plan requirements. VirtualDub is not a suitable product because its installation process is too confusing as well as its interface being too difficult to navigate.
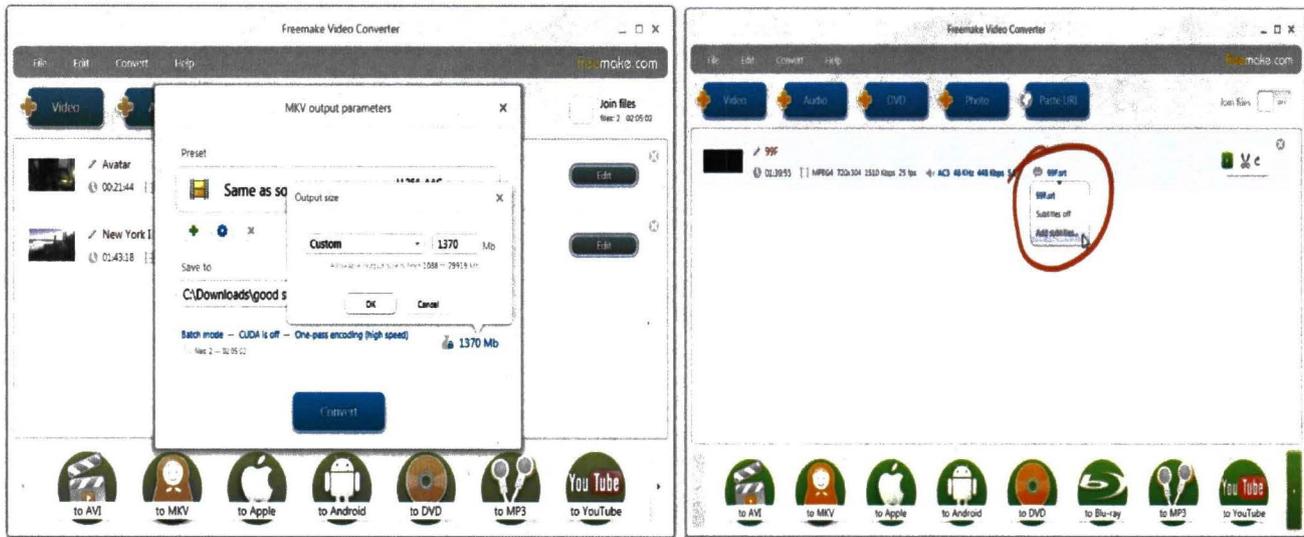
3. XviD4PSP 6.0:

XviD4PSP is a video editor. XviD4PSP has a nice user design which makes it easy to use and navigate. XviD4PSP also fitted with exhaustive configuration settings, which a user can use to best edit their video file XviD4PSP requires the user to use QAAC (Apple audio encoder) Audio Codec. The user needs to have QuickTime/iTunes installed on their system in order for the program to work. Or the user could download the codec and move it to a specific folder, (c:\Program Files\XviD4PSP 5\apps\qaac\) in order to make this program work. XviD4PSP will freeze and lock up the system if the user uses Cyrillic or any special symbols in the videos file name. XviD4PSP includes an embedded video player, where the user can preview their video file before applying any changes to it. XviD4PSP allows its user to add a subtitle file to it media stream to be embedded into the new video file. XviD4PSP only supports SRT, SSA, and .txt files.

The verdict: XviD4PSP is not a suitable program for use in converting and embedding subtitles for Section 508 compliance. XviD4PSP will give the user numerous error messages of missing plugins before the user can use the program. In addition, a user must search for and install other software, before XviD4PSP can be installed. XviD4PSP limits the naming capabilities of its video files, meaning that it if XviD4PSP finds an error, then the user's computer will then freeze or stall. With all of the aforementioned issues; XviD4PSP does not meet the project plan requirements.

4. **Freemake Video Converter:**

Freemake Video Converter is a tool that can encode several video and formats to other extensions. Freemake Video Converter recognizes file formats, and can convert them to many others. With Freemake Video Converter a user can configure the frame size, width and height, adjustment, video codec, frame rate and bitrate, as well as select audio codec, channels, sample frequency rate and bitrate. Freemake Video Converter uses a very high amount of the user's system resources in its idle state, and it also puts a massive strain on the computer when a task is in progress. Freemake Video Converter can also become difficult to navigate back and forth in the videos, in some cases. Freemake Video Converter needs the user to install (and keep up-to-date) .Net framework in order to install. Freemake Video Converter has a feature for subtitling, but it only supports SSA, SRT, and ASS subtitle formats.

The verdict: Freemake Video Converter uses to much of the user's system resources, as well as locks the system up. The overall navigation is semi fluid, but confusing at times. To find the features that a user is looking for, one would have to search through the program, instead of easily finding it. Freemake Video Converter has some features that could be used for Section 508 compliance, but due to the software's foundational problems, it is not a suitable program to use.

V. Issues

There were many issues encountered during this research. The most apparent issue is obtaining or creating the transcript for each video. For without a transcript the closed captioned subtitles will not be useful. If the transcript is readily available the transcript must then be verified for its integrity. If a transcript is not readily available one must be created. With the creation of a transcript, a scribe must watch and record every word and or action that is shown in the video. This can be very time consuming depending on the length of a video. There are also other considerations a scribe must take into account when creating a transcript. One must be able to listen closely to hear every word. For in a video, speakers may speak very fast and or with a dialect, making it difficult to record every word that is being said. Besides recording the actual words, a scribe must also record the timing in which each sentence has been said. These timings must be precise, because the time that is recorded represents the time in which the words from the transcript will show up on screen. Another issue that was apparent was to find software that was free, easy to install, and straightforward to use without any prior training.

VI. Conclusion

To conclude, amongst the tested software, the best options for bringing NASA KSC video files to Section 508 compliance are: Subtitle Edit and HandBrake.

Subtitle Edit is the best subtitle creator option because it allows the user to create a transcript to embed into a desired video file. With Subtitle Edit's feature a user can customize the display of the subtitles, and review how they would look inside of Subtitle Edit's video preview terminal. Additionally Subtitle Edit gives NASA the option to convert all English subtitle files into other languages, for audiences of other countries.

Handbrake is video encoder option for hardcoding subtitles. HandBrake provides the user with the necessary tools to bringing video file to Section 508 compliance. With HandBrake a user can embed any subtitle format into a video. With Handbrakes special feature, users have the option to embed the subtitle file into a video with the special functionality of being hardcoded but with soft-coded settings.

Using both of these programs together all video files can be made to meet Section 508 compliance. With the special features that each program brings, video files will have displayable subtitles for viewers who are hearing impaired, with the option of turning such subtitles on and off. Videos will also be made multilingual. With the subtitles hardcoded into the video files NASA can rest assured that any subtitle transcript, cannot be tampered with. Both options can be used at no cost.

Though Subtitle Edit and HandBrake are the preferred software options, the other suitable programs will work as well.

VII. Future Work

Google Drive Documents

All users who have a Google email account, also have the ability to take advantage of Google Drive services. Google Drive is a Google services that allows the user to store documents online in their own personal Google Cloud. Google drive allows the user to upload their own personal documents and or create documents within Google Drive cloud.

This feature will come in handy for the section 508 compliance, by using Google Drive document live recording. As stated above one of the main issues was creating a transcript for the video to edit and convert into a usable subtitle file. With Google docs live recording, a user can record the dialogue also video in real time. Any device connected to use your Google account that is equipped with a microphone, can record the dialogue that is being spoken and translated into words and stored into a Google document to be later edited and stored as a subtitle file. This option will minimize the process time taken to create the original transcript for a video.

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