August 1, 2012

David O. Carson
General Counsel
U.S. Copyright Office
P.O. Box 70400
Washington, DC 20024

RE: Docket No. RM 2011-7
Exemptions to Prohibition on Circumvention of
Technological Measures that Control Access to
Copyrighted Works Proposed Classes 7 and 8

Dear Mr. Carson,

On behalf of the EFF and the OTW, this letter provides our response to the DVD CCA's
July 24th, 2012 letter and exhibits which were made available to us by Dropbox and on data
disc.

We believe that the exhibits provided to us demonstrate that in fact we underestimated
how difficult it would be to produce useable footage of correct technical specifications for
video editing with screen capture software. As the below report will discuss in detail, the .mpg
footage provided is unusable: several of our team were unable to even play the file (it does not
play at all in Quicktime, the Mac video player, and plays incorrectly in Windows Movie Player)
let alone edit or manipulate it, and the goal for remixers is to produce material that can be edited
and transformed.

Attached is a technical report created by Tisha Turk evaluating and summarizing the
exhibits that were submitted to us. We are also uploading a second series of exhibits illustrating
the inadequacy of screen capture software for remix purposes.

Respectfully submitted,

Francesca Coppa, Rebecca Tushnet, Tisha Turk
Organization For Transformative Works

Corynne McSherry
Electronic Frontier Foundation

RESPONSE TO DVD CCA EXHIBITS

by Tisha Turk

Associate Professor of English, University of Minnesota Morris
Vidding Committee, Organization For Transformative Works
Video Remix Artist

July 27, 2012

OVERVIEW

When I tested the Replay Video Capture (hereafter RVC) screen capture software to create the exhibits that the OTW submitted for the June 4, 2012 hearing, my goal was to create a clip that could be edited, since the whole point of noncommercial remix is to edit and otherwise transform works. While there are many problems with the DVD CCA's exhibits (which I will discuss below), the most significant issue is that the RVC software is not designed to produce editable footage -- that is, footage compatible with editing software. (Only one of RVC's four output modes is properly editable: the .avi export that I used and that looked terrible. The other three, including the .mpg format that the DVD CCA used, are *not* meant for editing.) So while RVC can, occasionally, produce a watchable clip, it will not export footage of the correct technical specifications for video editors. RVC's settings do not conform to editing protocols; they export .mpg footage that might under some circumstances *look* acceptable (though the DVD CCA's footage does not) but which does not work, and *is not meant to work*, with editing software like Final Cut Pro and Premiere. For the purposes of remix, any software that produces footage that cannot be edited is not, in fact, a solution.

Noncommercial remixers need footage that not only looks good but that will work with editing tools. In fact, the DVD CCA's files show no evidence of editing, which is unsurprising considering the .mpg's incompatibility with video editing software programs. While RVC can produce .avi footage which can be edited (see the StarTrekRebootIntro.avi footage I produced, which was the basis of the side by side comparison,) it is not optimized for doing so and the resulting footage, as demonstrated at the June 4 hearings, looks terrible.

.MPG VIDEO

The primary problem with the .mpg video provided is simply that it's an .mpg. The capture settings for RVC offer four options: MPEG-2 (.mpg), DVD (.vob), AVI (.avi), and Windows Media (.wmv). Of these options, AVI is the only one appropriate for editing rather than distribution, which is why I used it when capturing test video for the June 4 hearings. Unfortunately, AVI is the only setting in RVC that does not allow the user to set the video bitrate. (Higher bitrate generally results in better quality.) The only setting in RVC that will produce editable video produces *bad* video, and the quality cannot be altered or controlled by the user. This is why the file size of the .avi I captured of the first 12 minutes of *Star Trek*

(2009) is scarcely larger than the two-minute .mpg captured by Mr. Taylor. I don't know what RVC's settings for AVI capture are -- the program is very much a black box in this regard -- but whatever those settings are, they don't work.

FORMAT AND EDITABILITY

The .mpg format of the submitted video presents problems for an editor because MPEGs are, simply put, not meant to be edited. Adobe's help files are unambiguous on this point: "Though MPEG is ideal for final output, especially on the Web, the compressed video isn't designed to be edited" (http://help.adobe.com/en_US/premiereelements/using/WS10821B57-3A94-416b-93E9-F5995C23C3A7.html). Practically speaking, most video editing software has trouble with MPEG files: "Because MPEG-2 and VOB files can be encoded with settings that vary greatly, not all imported MPEG-2 or VOB files play correctly in Adobe Premiere Elements" (http://helpx.adobe.com/premiere-elements/kb/troubleshoot-video-premiere-elements.html#main_Notes_About_Specific_Kinds_of_Video_Files). And yet Replay Video's recommended settings for movies are MPEG-2 and WMV, and the the recommended setting for DVD videos is VOB.

Because the provided .mpg file is not meant for editing, it cannot be opened in VirtualDub, a powerful video pre-processor widely used by amateur video editors for clipping and resizing, and the logical choice for an editor (at least an editor using a PC—the program is not available for Macs) who wanted to fix the file's aspect ratio problems or crop the letterboxing. (See VDubError.jpg for a screencap of the error message I received when I attempted to load the file.)

MPEG files are not meant for editing because MPEG is a lossy compression format: it "compresses data by discarding (losing) some of it" (http://en.wikipedia.org/wiki/.mpg; http://en.wikipedia.org/wiki/Lossy_compression). *Especially* when working with files that have already been encoded in a lossy format, editors should use footage that's encoded in a lossless format to avoid further data degradation. Like using NTSC-compliant frame sizes, using losslessly encoded footage is not merely a matter of personal preference; rather, it's standard practice for digital video editors.

As far as I can tell, the .mpg video provided by DVD CCA has not been edited at all in the ordinary sense of editing: the video has not been cut (sequenced by the editor instead of following the film as it happened), resequenced, had speed or color effects added, or otherwise been changed in any of the normal ways one might when creating a remix video. I therefore treated the file as raw footage.

The .mpg file does load in Premiere. It does not, however, play accurately; most notably, it stutters (drops frames)--and this is on a computer with an i7 Quad-core CPU and 4GB of RAM, which routinely handles large projects in Premiere and AfterEffects and renders video on the fly without a single hitch, which indicates definitively that the problem is with the file, not the software or the machine. It is worth keeping in mind, too, that I had only one two-minute clip to work with. Most remix videos include dozens or even hundreds of clips. Because MPEG files are not meant for editing, and therefore editing software is designed to export but not edit MPEG files, loading that many MPEG clips into Premiere would almost certainly crash the program.

Less robust editing software might well struggle with the files in ways that I can't anticipate.

Even when working with only one clip, editing the footage in NTSC standard widescreen film format results in visible ghosting and dropped frames in the monitor window. The letterboxing presents problems when zooming or jumping in on a character and when rotating the image. (See sample video TeleworkTrekTest.mp4.) For details on these and other problems, see below.

PLAYBACK

Although our primary concerns about the .mpg file is its unsuitability for editing, it is worth noting that the file also had problems with playback--presumably the result of the vagaries of MPEG encoding. When opened in QuickTime, the video appears to be a two-minute-long screen capture of a single frame of DVD playback paused on the screen: it shows a still frame from the movie with the timecode frozen on it (as the timecode of the actual QT player advances), accompanied by the words "John Russell, Reuters" (audio that is found nowhere in the movie). When opened in Windows Media Player, the video displays at an incorrect size. When opened in RealPlayer, the size appeared to be correct, but dropped frames were noticeable. Only in VLC does the video play correctly (or as correctly as it can given the incorrect aspect ratio).

FRAME RATE

The video submitted has a frame rate of 25 frames per second (fps). 25 fps is standard in the PAL television encoding system used in the UK, Australia, and large portions of Europe, Asia, Africa, and South America. (PAL frame size is 720x576.) However, the U.S. uses the NTSC television encoding, in which the standard is 29.97 fps (for interlaced and telecined video suitable for broadcast television). Because interlaced and telecined video is not suitable for editing, it is usually inverse telecined and deinterlaced in order to convert it back to progressive footage; these processes result in a 23.976 frame rate. The standard frame rate for film is a much simpler 24 fps, though it is often edited at 23.976.

These standards are important because they form the basis of editing presets in good editing software. For example, Adobe Premiere CS4 does not include an NTSC preset for footage with 25 fps frame rate; the available options are 29.97fps, for standard or widescreen interlaced video, and 23.976fps, for standard or widescreen non-interlaced or progressive-frame video. Editing 25fps footage in any of these NTSC standard presets will produce unpredictable results, including speed problems and dropped frames.

(For more information: http://en.wikipedia.org/wiki/Frame_rate#Film_and_television; http://en.wikipedia.org/wiki/PAL; http://en.wikipedia.org/wiki/Interlacing; http:// /en.wikipedia.org/wiki/Telecine#2:3_pulldown; http://en.wikipedia.org/wiki/ Telecine#Reverse_telecine_.28a.k.a._inverse_telecine_.28IVTC.29.2C_reverse_pulldown.29)

FRAME SIZE

The standard frame size for NTSC video is 720x480. Correct frame size, like frame rate, is not simply a matter of user preference; it is a limitation imposed by NTSC DVD standards,

because editing programs are designed to work with footage that complies with those standards. For example, the film and NTSC presets in Adobe Premiere CS4 are *all* 720x480; the only differences are in pixel aspect ratio (PAR), frame rate, and audio settings. (See PremierePresets1.jpg and PremierePresets2.jpg for screencaps of Premiere settings.)

The provided .mpg video does have a standard 720x480 frame size. However, the video includes extraneous material: the Windows logo, timestamp, total video length, and player controls are all visible in frame at the beginning of the video. Some of this visual garbage could, in theory, be cropped out because it's in the black letterboxed areas; other elements, like the timestamp, intrude on the image and could not be cropped without losing visual information. And, of course, all cropping of the image requires resizing in order for the clip's edges to match those of the surrounding clips; as we saw at the hearings, resizing means losing quality.

In contrast to the video, most of the provided still frames are 768x586, except for the one that's 1134x650 (for no apparent reason). Neither of these frame sizes is the standard size for NTSC DVD video; nor are they the frame sizes one would get from properly cropping the letterboxing and resizing the footage for square pixel editing (see Aspect Ratio, below) to 720x304 (resized vertically) or 848x360 (resized horizontally). When cropped to remove letterboxing, the images are 768x436 (or 765x436 if one also removes extraneous material at the left side of the frame), which bears no resemblance to any normal frame size; the numbers aren't even multiples of 16, which is standard for maximum compatibility with most codecs.

Without having been present at the encoding, and without any details about the software settings used, I can't be sure whether the non-standard size of the still images should be attributed to user choice, player settings, or RVC settings. What's most important is that *not one of the frame sizes for the stills* (large or small, cropped or uncropped) *is a standard size*. Even if an editing program would accept footage at those frame sizes, resizing the footage to a standard frame size (as required by most editing software on export) would further degrade the already questionable quality. Letterboxing -- adding black bars around the top and/or sides of the frame to bring the frame to a standard size -- would look fine within the editing software but would also reduce the quality upon export: encoding all that black space means less data is devoted to the actual image, which is why widescreen DVDs are encoded anamorphically in the first place (see Aspect Ratio, below).

(For more information: http://en.wikipedia.org/wiki/NTSC; http://en.wikipedia.org/wiki/Anamorphic_widescreen; http://en.wikipedia.org/wiki/List_of_common_resolutions#Digital_TV_standards; http://en.wikipedia.org/wiki/Codec)

ASPECT RATIO

Both the .mpg video and the .bmp stills are the wrong aspect ratio—that is, they are horizontally squished (or vertically stretched). This problem is typical of anamorphically encoded video: movies and widescreen TV are encoded this way to use all the available pixels for image information rather than losing a third of them to the black bars typical of letterboxing. The video is encoded with a flag that tells DVD players to resize the video properly for display on a TV screen; some (though not all) computer multimedia players will also recognize this flag.

A video editor working with anamorphically encoded footage—whether ripped or screencaptured—must adjust the footage's display aspect ratio (DAR), either by resizing the footage or by adjusting the DAR and pixel aspect ratio (PAR) in the editing software to allow the footage to display correctly—an option that is only available in high-end software and that requires enormous amounts of RAM and processor power to render on the fly. (Based on the video submitted, I suspect that PAR adjustment is not available in the $99.95 Pinnacle software used by Mr. Taylor.)

Any video with these aspect ratio problems would require substantial pre-processing even to be usable. Footage that looked like the provided stills would be especially problematic: because *both* the frame size *and* the aspect ratio are incorrect, figuring out the necessary math for the pre-processing would be even more complicated than it is when using footage that conforms to NTSC standards.

(For more information: http://en.wikipedia.org/wiki/Anamorphic_widescreen; http://en.wikipedia.org/wiki/Aspect_ratio; http://en.wikipedia.org/wiki/Pixel_aspect_ratio)

STILLS: COMPARISONS

The point of the still images we provided at the June 4th hearings was to illustrate quality differences between ripping and screen capture, especially from the artist's perspective. The recently provided stills continue to illustrate these differences, though with a different set of problems. For purposes of comparison, I have placed these new captured images side by side with the same still frames of ripped footage that we provided at the DC hearings in June. (One mysteriously large image has been resized for purposes of comparison.) As before, the ripped images are on the bottom and the captured images are on the top. While the stills taken from the DVD CCA's .mpg are not as pixellated as those taken from the .avi I made for the June hearings, they have other problems; note the lack of detail, the blurriness, the washed-out color, and the incorrect aspect ratio (see above). Again, however, even if the stills were of excellent quality, the file that they are taken from is still an MPEG file not meant for editing.

CONCLUSIONS

Examining the files submitted by Mr. Taylor and Mr. Turnbull has exposed a serious issue that I did not discuss during the June hearings. In my testimony, I focused solely on aesthetic issues; it didn't even occur to me how difficult it might be to produce footage that meets the minimum technical specifications needed for editing -- the kind of footage that a remix artist can actually use. Though I noted that the results of Replay Video Capture were visually sub-par, I described the process of using Replay Video Capture as "easy." After reviewing these files, I am forced to conclude that producing usable footage with RVC is easy only for those with pre-existing technical expertise. The process is, as technical writers say, *clear only if known*. Because I am familiar with video encoding formats and editing software specifications, I was able to produce the editable, if ugly, footage that we showed at the hearing. The.mpg video that was captured and submitted to us by the DVD CCA is *not* editable. This problem is not simply a matter of user error; it is inherent in RVC's encoding options.

Upon reflection, I am forced to acknowledge that, when I began making remix video, I would not have known which RVC settings to use. The difference between 23.976, 24, and 25 fps is not, after all, obvious. I might well have made the same technical errors that characterize the Telework files. In preparing for the June hearings, I chose VLC and RVC settings based on my understanding of frame size, aspect ratio, frame rate, codecs, NTSC standards, and the presets standard to my editing software. The results are editable, but aesthetically unacceptable. I can only assume, based on the description of Mr. Taylor as "not even an amateur video expert," that he either used RVC's default settings when capturing and exporting his video, in which case the software is clearly doing him no favors, or chose settings essentially at random, as any beginner might do. The results are of higher visual quality, but they are not meant for editing.

I conclude, then, that while it is indeed *possible* to use RVC to capture video that can be edited in Premiere (as I did for the sample video showed at the June hearings), doing so requires considerably more expertise than a beginning user can reasonably be expected to have, and it also requires the user to sacrifice visual quality -- a sacrifice that is counterintuitive, to say the least. It is therefore difficult to see how this approach can be considered appropriate for noncommercial remixers, many of whom are beginners with no more technical expertise than Mr. Taylor. One shouldn't have to have ten years of editing experience to obtain source material for remix videos--and to be honest, I'm not sure how anyone would *get* ten years of experience if forced to use this technology. Noncommercial remix artists run the gamut from beginners to veterans, and they learn by doing: how are they going to learn if they have to pass a technical competence test before they're allowed to make stuff? This is just another version of the digital poll tax and digital literacy test that Professor Tushnet discussed in her 2009 testimony: it raises the bar to entry; it places restrictions on speech. And it is worth reiterating that the footage produced, even with experience, looks *terrible,* much worse than the ripped footage, as the side by side video from the hearings demonstrates. With all my experience, I could only produce editable footage of the quality that we showed at the June 4 hearings, because *that is all that the software allows*. Screen capture requires the user to have sophisticated knowledge and tools and *still* produces awful footage.

All in all, I would argue that the DVD CCA's Telework files do an excellent job of demonstrating the unsuitability of screencapture for noncommercial remix; using this software, one can produce either editable footage or, occasionally, footage that looks acceptable, but not both. In short: you cannot produce *usable* footage by this method, nor can you edit it effectively.

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LIST OF EXHIBITS

Image Gallery: Comparison Still Frames

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The following image files, provided via Dropbox, are a side by side comparison of the *Star Trek* stills made by Tisha Turk from ripped DVD footage (shown at the June 4th hearing) with the stills provided to us by the DVD CCA on July 25, 2012.

While the stills taken from the DVD CCA's .mpg are not as pixellated as those taken from the .avi Tisha Turk made, they have other problems; note the lack of detail, the blurriness, the washed-out color, and the incorrect aspect ratio (see above report). But even if the stills were of excellent quality, the file that they are taken from is still an MPEG file not meant for editing.

Image A: telework-0145-captainstill.jpeg
Captain Robau of the USS *Kelvin*: top image captured by DVD CCA, lower image ripped.

Image B: telework-0152-captainlight.jpeg
Captain Robau of the USS *Kelvin* as seen after a flash of bright light; top image captured by DVD CCA, lower image ripped.

Image C: telework-0152-captainlight-crop.jpeg
Captain Robau, cropped and resized. Top image captured by DVD CCA, lower image ripped.

Image D: telework-0155-ship.jpeg
The *Narada*; top image captured by DVD CCA, lower image ripped.

Image E: telework-0219-kirkpan.jpeg
Panning past Kirk Senior; top image captured by DVD CCA, lower image ripped.

Image F: telework-0223-missiles.jpeg
Missiles fire during the battle; top image captured by DVD CCA, lower image ripped

Image G: telework-0228-kelvin.jpeg
The USS *Kelvin* takes fire; top image captured by DVD CCA, lower image ripped.

Image H: telework-0305a-console.jpeg
The *Kelvin*'s helmsman reacts (first shot); top image captured by DVD CCA, lower image ripped.

Image I: telework-0305b-console.jpeg
The *Kelvin*'s helmsman reacts (second shot); top image captured by DVD CCA, lower image ripped.

Other Exhibits referenced in Tisha Turk's "Response TO DVD CCA Exhibits"

The following exhibits, provided via Dropbox, document parts of Tisha Turk's process when attempting to work with the submitted .mpg as a remix artist would. These are in the order in which they are referenced in the above document.

VDubError.jpg: a screencap of the error message received when attempting to load the submitted .mpg file into VirtualDub.

Telework Trek Test.mp4: this video shows stuttering, dropped and stray frames, and letterboxing problems when attempting to work with the submitted file in Premiere (video editing software.)

Premiere Presets1.jpeg and **Premiere Presets2.jpeg**: screencaps illustrating the standard frame size for NTSC video (720x480) as illustrated by the film and NTSC presets in Premiere.