Summary of the colorization project.

At this stage my discussion of colourization is not formalised and it would be a preliminary requirement for me to ascertain from my thoughts and research as laid out here a structure to proceed as a research project, acceptable to the University with clearly defined aims, objectives and conclusions.

My background in media has given me an insight into the technical aspects of video editing which has stemmed by interest but I suppose that my starting point goes back to my childhood – as a child I was unable to come to terms with the absences present in archive film stock. I felt that with modern technological advancements it should be possible for modern media establishments to 'restore' their archive stock and that where the archive is public-ownership (as is the case with BBC or county archives) there existed a moral duty to 'recover the past'.

This is quite an extreme viewpoint, I know. As a child one does not appreciate that the need to restore materials is not evident if the public come to terms with the loss of quality "due to the archive nature of the footage" and that by doing so form a nostalgia with the past. Secondly, the financial consideration of spending time and effort on scratch removal, frame replacement, frame frequency conversion, audio repair, conversion to VT-field display format and possibly also colourisation appears to be unnecessary. However, for me this seemed to be a necessity to ensure viability for the product.

It is my contention after examining the growth of Widescreen and Surround Sound over the past fifteen years, and the current technological state of the domestic TV (and now widescreen computer displays, which are the norm in Europe) that the Media Industry is gearing up for High-Definition TV and that this would leave archive footage on the shelf – there will come a point (if we have not already reached it) where there is no economic viability in the sustenance of public archives if the public may never be interested to watch them simply because of their archive nature at a time where these could be utilised as excellent resources to uncover our nation's past. In fact there have been a few successes such as "The First World War in Colour", where hand-cranked 8mm black and white film footage has been cleaned, frame-stabilised and in many cases frame-converted to 25 frames per second to display as naturalistic as possible. Moreover, the sequences have been worked using Foley and sound effects pertinent to the scene as depicted ("Non-Real-time Sound"[1]) to convey atmosphere relevant to the scene. Colourisation of the sequences is basic and lacking in detail, but appears an improvement on monochrome due to the added naturalism which will engage the viewer with the sequence due to realism as used in colours.

At this point I would like to mention experimental work undertaken by Ted Turner (a famous media producer) in the 1980s and 90s in which well-loved American programmes (such as "Casablanca" and "The Maltese Falcon") have been 'restored' using colourisation methodologies which have been kept relatively secret but which were in essence unresearched colour tinting, often quite random 'best fits' which did the final presentation little justice and has hampered the progress of colourisation[2]. The argument here has been one of anger as a general viewpoint and starting point for the discussion as one man's defiance to adapt archive footage and add that naturalism missed from archive monochrome breaks the 'Halcyon' image for the public and other media moguls.

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[1] See "The Importance of Non-Realtime Sound" MA dissertation, 2001, M Bennett (Bournemouth Univeristy)
[2] Reference to MSNBC article: http://www.msnbc.msn.com/id/5651949/

One great detractor is George Lucas who made his feelings open and in doing so invited criticism from the press because he was seen as adapting his own work anyway – a case of double-standards? Perhaps not as Dale Pollock explains in the Washington Post:

> "He is a big believer in artist's rights, and he completely and totally believes that they are his works, he created, financed and owns them, and he can do whatever he wants with them as their creator. Colorization is something corporations did to works they legally owned, but were made by someone else, and they didn't bother getting the filmmakers' permission. Lucas is both owner and filmmaker, so he doesn't need anyone's permission to change whatever he pleases."[3]

At present the debate rages as a 'marketing angle':

> "The best thing about this DVD release is it gives the consumer the ultimate choice," said Suzanne White, vice president of marketing for Columbia TriStar home entertainment. "They can watch the very best, the finest restored image of the black-and-white version, or watch the new colorized version and switch instantaneously between the two."[4]

Another major critic is Roger Ebert, critic for the Chicago Sun-Times who plainly stated unequivocally that "Colorization is a form of vandalism". In fact, with Steven Spielberg, George Lucas testified before congress in the 1980s against colourisation and other adaptations of work in order to preserve the intellectual property of the work with the Director as colourisation may lead to ownership rights over the newly restored footage. "The process yanks such slapstick performers as the Stooges out of the black-and-white universe they belong in", Lucas commented.

Nevertheless colourisation is a process which has been seen by Production houses as a technology which may breathe a renewed market potential into their own products which had a considered, expired shelf life and exists in the debate as to whether existing TV material may be 'enhanced' and adapted into Surround Sound, HDTV-friendly or 3D in years to come. From personal experience I recall the debate with a member of the BKSTS, a projectionist working at a multiplex cinema over Digital projectors capable of enhancing DVD material to be displayed on 80ft high Pearlescent screens to be told severely that film has no 'dot per inch' resolution to speak of – the quality of the image, due to the nature of light through a magnifying lens is capable of tremendous magnification without loss of quality. It is for this reason that the 35mm film projector has not been phased out in national cinemas.

As a break-away from his normal work, Ralph Montagu's telecine conversion company at Beulieu in the New Forest, Hampshire work with post-production specialists and technicians (know as the Restoration Team[5]) on experimental procedures to restore archive material at are one of a small few individuals working restoration technology. The materials they are given are predominantly under license and with permission from the BBC and the project is undertaken because of the market potential of the restored material. The majority of materials are from the BBC TV series "Doctor Who" which suffered badly as did many programmes which were left incomplete as a result of junking footage which was considered to have no further market potential.[6]

It is currently evident that footage can be remastered from 16mm film to videotape and reframed at 25-frames per second by use of Vidfire[7] software. Leaving only the sound to

3 Transcript: Star Wars: George Lucas' Vision, Dale Pollock, Author, "Skywalking"
Thursday, May 19, 2005; 4:30 PM – The Washinton Post.
Cited at http://www.washingtonpost.com/wp-dyn/content/discussion/2005/05/06/DI2005050600821.html
4 "Stooges DVD revives colorization debate: Viewers can choose to watch color or B&W version"
Cited at http://www.msnbc.msn.com/id/5651949/
5 Refer to http://www.restoration-team.co.uk/
6 "Missing Without Trace": The Search for the lost episodes of Doctor Who, by Dr.Paul Lee.
Cited at http://www.btinternet.com/~dr_paul_lee/MWT.htm
7 skonnos feature: what is vidfire? By peter finklestone. Cited at:
http://freespace.virgin.net/mark.campbell10/vidfire.htm

be restored, equalised, compressed and converted to Stereo for a crisp end-product acceptable to a modern audience (but missing the colour information)

But what exactly is colourisation? It has taken many forms and requires a little visual trickery to succeed well. It is the enhancement of black and white footage with colour information which is naturalistic and realistic, giving the eventual product the impression to the view that it had been originally recorded in colour. Advancements in colourisation software have been slow and as such several hash attempts have not met this objective:

1. Tinting

An early form was to tint the entire frame in a colour which would reflect the mood of the scene. An example would be the Moroder version of Fritz Lang's Metropolis, which due mainly to its contemporary rock music soundtrack led to a successful re-release of this classic film which had been heavily re-edited as the original 1927 film had been destroyed in the 1930s. This version[8] stems from the American edited edition sold to the US and had been severely edited with many scenes deleted and entire sections of the movie reworked to increase the pace of the film for a US market.

2. Pastelling

Although it is more time-consuming it is possible to track the progression of a shape over time and tint it. This is often done by adding a transparent colour on a layer over the footage, and is performed often frame-by-frame. The end result is that the luminance information from the footage lightens the colour, so low-lux colours have to be used to counteract this, otherwise 'Pastelling' occurs. This is where the colour appears lighter than the realistic outcome expected. It is for this reason that Ted Turner and the "Laurel and Hardy" colourised versions were not the market success expected by the studios.

3. Advanced chrominance

By adding a chrominance value to an opaque copy of the footage overlaying the original luminance values can be used to determine the amount of colour which can be used to colourise the selected area. The problem here is that unwanted areas need to be masked out, and the data required for this is excessive for the computer, leading to poor results and data wastage. Each different area would need to exist as a separate masked layer.

4. Colour dynamics

My own discovery was that if two layers could be used to mask and track a shape as it progresses through the footage, one could use high luminance information to determine light colours within the shape and the other could track lower luminance data to determine a darker colour. (In fact the software I am using can handle three masks – the third would be used for the interim, "main" colour using areas which are most prevalent within the shape – the 'grey' areas, which would give the foundation colour to the shape where the other two form the emphasis colours.) The combination of the two would effectively recreate gradients of colour, using data values already present from the footage. One example could be skin tone – a Caucasian skin tone consists of yellow, white, light orange, pink and red, with a much darker brown for the hairs and green for the veins. Due to studio lighting and the use of makeup, and the fact that even on a close-up shot detail is limited in colour, if the three most prominent colours are used (pale yellow, light brown (with a hint of orange) and pink, the computer can expertly determine skin tone, with detail perceptible to the human eye. A separate layer could then be used to expose hair (for example).

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[8] There are now several, but all incomplete. For further information refer to
http://www.persocom.com.br/brasilia/metrop2i.htm#nota08

Compare these two samples (taken from Dads Army videotape footage v. colourised print photo)

| From videotape (colour original) | From photo (colour original) |

As you can see, the perceptivity is different between these differing media, caused in part from over-saturation on the photo as compared to lighting in the studio (notice the yellow on the side of James Beck's cheeks, in comparison to his pink complexion, as compared to the yellow/orange hue of Clive Dunn).

What follows is a colourisation attempt comparison performed by myself and Restoration experts Stuart Humphryes and James Russell. Here[9], James has used frame-by-frame development software where I have attempted to work on a scene-by-scene basis using the original movie file without having to split the scene into frames and work on them separately. The following examples demonstrate the effectiveness of the frame-by-frame approach but do not consider the time implications involved:

(The following are all samples from the BBC series Doctor Who.)

Dodo in "The Savages" (1966) (Telesnap[10])

[9] Cited at http://www.colourisation.com/
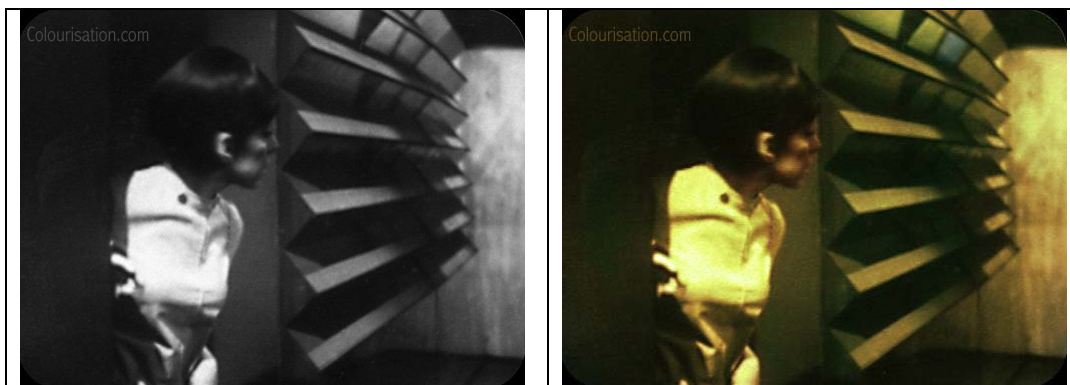
[10] Telesnap – a term to describe a photograph taken as a snapshot from a TV screen and was a process used by the BBC's production offices to keep independent records of their projects. It was an automated process – one photo was taken from an output studio monitor approx every 30 seconds. Photographer John Cura was employed to perform this service between 1964 and 1968. Copies of most of his photo collection were returned to the BBC after his death and are available for viewing online. For examples refer to http://www.shillpages.com/dw/dwia.htm

William Hartnell (etc) in "Marco Polo" (1964) (publicity photograph, originally b/w)

Patrick Troughton (etc) in "The Wheel in Space" (1968) (from VT[11] b/w)

With this example you can see how skin gradients can be recreated, however this work is extensive and has been performed using photo editing software (presumably Adobe Photoshop).

William Hartnell and Peter Purves in "The Celestial Toymaker" (1966) (from VT b/w)

Here, Russell has not added the gradient effect leaving flat tonality and using colours which although are realistic (certainly the clothes as colour Production and publicity photos can confirm for this production) the colour photo lacks dynamism.

In our final example for this section I have compared the two differing techniques. In Russell's example colour gradient has been added through adding different colours manually using Photoshop (remember that this is only one frame) whereas the second is
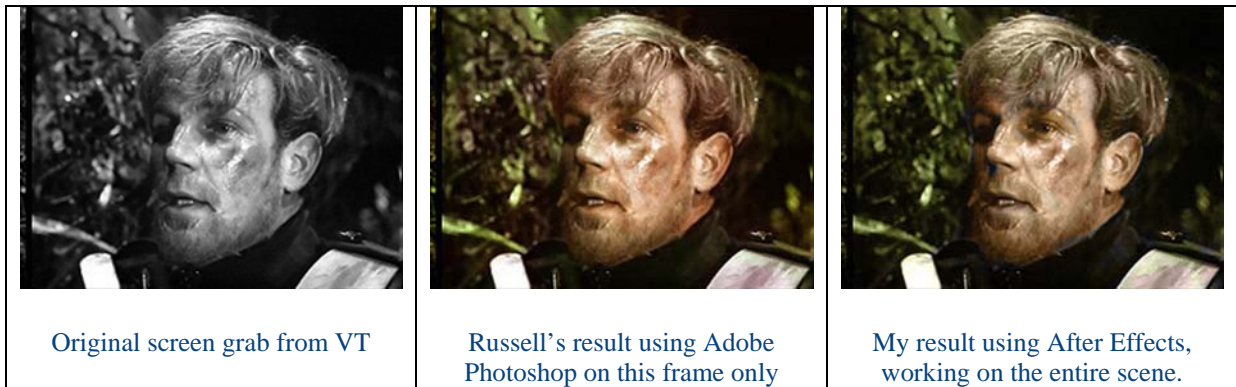
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[11] originally recorded on videotape, since wiped by the BBC archives, but a 16mm film print has been converted and digitially remastered by the restoration team using Vidfire.

my attempt using Adobe After Effects using the white and black luminance level technique to create tonality.

Brian Cant in "The Dalek Master Plan" (1965) (from VT b/w)

| Original screen grab from VT | Russell's result using Adobe Photoshop on this frame only | My result using After Effects, working on the entire scene. |

This work is more acceptable when the viewer can break away from the photo concept through the use of movement. This poses an interesting problem for the colourist as detailed later. Below there follows a few sample movies which further demonstrate how movement supports the use of colour:

Clip 1 - Tomb of the Cybermen ep1 opening shot, using Photoshop with Akvis Coloriage plugin, frame by frame, M Bennett, 2005

Clip 2 - Tomb of the Cybermen ep1, using Photoshop with Akvis Coloriage plugin, frame by frame, M Bennett, 2005

Clip 3 - Dr Who titles v2 using color tinting, Adobe After Effects, M Bennett, 2004

Clip 4 - The War Games ep2 (1s) - frame by frame, Photoshop, M Bennett 2001

Staying with the extensive work carried out on Doctor Who, it is worth noting that photo editing software is becoming an apparent training ground for would-be colourists and through the array of colour photos now appearing, agreements are being reached on item colours where this was not previously documented, but most are still 'best guess' scenarios to colour balance the photo.