THE R.G.B. PROJECT

by

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ABSTRACT

The *R.g.b-project* is a diagnostic instrument to analyze the culture of colour. It uses various filters to execute this diagnosis, namely the computer, the software program, the camcorder, and the cameraperson, and the audience who can paste together the filtered images of the city, which are presented in the final piece. Each of these filters has a liking for a particular quality image. Colour is a playful concept to find the bias of digital technology regarding colour. The question *R.g.b-project* asks is what cultural biases does digital technology have towards colour representation, and does the technology have a preference towards a certain kind of image.

The program written for the *R.g.b-project* can be compared to a script, the interpretation of the script is determined by the participants and the city the project takes place in. The participants are asked to map walks through the city by using the video camera in relation to colour. For example, on a walk they would focus only on the colour red, making sure that in every frame they shoot, red is present. The same is done on other days with Green and Blue. The choice of Red, Green and Blue is related to the RGB -colourspace commonly used by digital technology. Collectively the participant will decide which parts of the city to map.

DEDICATION

This project is dedicated to Puk.

ACKNOWLEDGEMENTS

I want to thank all the participants of the R.g.b-project for their support, feedback, and creative input, and my committee Laura U. Marks, Susan Kozel and Martin Gotfrit for their artistic and intellectual support. Without you this project would not have happened.

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1.1 Introduction: the R.g.b-project

In 2001 I worked on a project called “Biking”, wherein I mounted a camera in front of my bike and documented trips through three cities: Beijing, Groningen (NL) and Winnipeg. When confronted with the “postproduction” of this project, I was not sure how to make decisions as to which footage to use, or when to cut. Ideas based on randomness and algorithms came to mind, and thus computer programming entered my art-practise. Very quickly, I found that algorithmic art and ideas based on randomness were uninteresting in the contexts of computer programming. These ideas seem for the most part more interesting when human intervention was at stake. An example of this might be the throwing of dice, where the outcome is partly determined by the purity of the dice, the surface it is thrown on, and the possibility of cheating; one might call these unpredictable elements.

These thoughts motivated my choice to look at the semantics of a programming language, because semantics, like the colour space RGB[1], are based on presupposed agreement. I was curious to see how the meaning of the colour space RGB influenced and created its own meaning in the contexts of video editing.

[1] The **RGB color space** is an additive color model in which red, green, and blue light are combined in various ways to create other colors. (RGB color model)

My R.g.b-project began in the summer of 2003. Rather than just aimlessly walking through the city, I decided to let the walk be guided by colour. The colours red, green and blue, the primary colours of the colour space RGB, were the colours I used to guide me on the walks (The RGB colour space is commonly used by computer monitors to represent colour. The programming language I use, Max Object programming, analyses video through this colour-space).

The computer's numeric representation of colour, in relationship to the human perception of colour, is the starting point of the R.g.b-project: digital standardization of colour versus our human cultural, historical and individual interpretation of colour. Further, by working within the structure of this programming language, I wanted to create a dialogue with the computer, instead of merely using the computer as a tool.

> Because we have considered the relationship between human and machine as instrumental and prosthetic (subordinating and conforming machines to the requirements of human instrumentality), and even because we have created them in the image of an ideally isolated individual, we have denied our computers the use of the shifters (here, now, you, we,…) that might transform their servitude into partnership. (Cubitt 35)

By conceptualizing the computer as a partner, I open up the possibility to understand more of this complex machine. An awareness of construction of the computer, its interface bias, is crucial if one wants to be less "a slave" to this technology. If technology is created in the image of an idealized, isolated individual, what consequences does this have for us users? Maybe it is more applicable to ask the question, how can the user be democratic in using this

technology, than to ask the question: how can technology, itself, be democratized?

New technologies, in this case consumer digital cameras and computers, are becoming more and more closed. Certain interfaces, like the automated settings on a camcorder, make the technology easier to work with and accessible to non-professionals, but they also make the inner workings of this technology difficult to access. The clarity and accessibility of the interface of both the computer and the camcorder make questioning almost unnecessary: the computer becomes a black box sealed off by the operating system. An assumption is created that one has to be a skilled programmer to actually change the concepts behind the interface design.

The R.g.b-project is a diagnostic tool to analyze the culture of colour. It uses various filters to execute this diagnosis, namely the city, the cameraperson, the camcorder, the computer software and the R.g.b -software, and the monitor. Each of these filters has a liking for a particular quality of image. Colour is a playful concept with which to find the bias of digital technology. The question the R.g.b-project asks is: what biases does digital technology have towards colour representation? Does technology have a preference for a certain kind of image?

1.2.1 Project Description

The R.g.b-project is a collaborative media project consisting of a computer program written in Cycling74, Max Object Programming, and video/audio

material[2]. The program written for the R.g.b-project can be compared to a script. The participants and the city in which the project takes place will determine the interpretation of this script. In computer language, the script is referred to as an algorithm. This algorithm processes the video and sound in real time.

The initial parameters for the footage were based on individual colour walks through urban space. Volunteer participants were asked to map walks through the city by using the video camera in relation to colour. For example, on a walk they would focus only on the colour red, making sure that in every frame they shot, red was present. They would do the same on other days with green and blue. These clips are then imported into the program. The final result is a three-channel video on the monitor, and a soundscape. The sound and video are processed in real-time by the program. The interface provides audience with the possibility to select the clips they want to see; if the audience chooses not to interact with the piece, the clips will be played back in alphabetical order. The parameters of the project are flexible, depending on the situation; the final installation, the sound process, and the image processing can be changed to reflect the particularities of each production.

1.2.2 The Participants

When I began this project the desire to ask others to do the shooting was an intuitive one, motivated by curiosity. I was curious to see how other people would interpret the assignment and how the computer program would deal with the different styles of shooting. I enjoyed looking at the footage; it gave me an

[2] For more information on Max Object Programming visit the Cycling 74 website at: www.cycling74.com

insight into people's oddities and particularities. But looking at footage is only interesting if the footage is shot with some restrictions in place. The restrictions for the R.g.b-project, the colour and urban space, fed through the "filter" of the computer program, are what makes the R.g.b-project accessible to people with various skill levels in camera work. The computer program emphasizes the participants' choice of subject matter. Technical skills like composition and focus are less important to the program. This program's focus on subject matter makes it possible to expose the idiosyncrasies of the participants in relationship to the colour culture of the city. Issues of quality and skill are not as relevant in this project.

Thus far, the project has been performed three times, in Vancouver, in Winnipeg and in Kingston. Each time the project is performed, the results depend on the logistical possibilities of the situation. What kind of gear is available? Who are the participants and what are their expectations? What prior knowledge of the project and technology do they have? How much time is available? What is the city like? This makes the project a very different experience every time it's performed.

For the first Vancouver version of the project, the choice of shooters was geared towards conceptual development rather than technical problem solving. I purposely kept the assignment as open as possible, so I could get a high level of creative input. This openness has the potential to stifle people or to end up with footage that is too broad and so loses coherency. I hoped to avoid this by choosing the shooters personally, and not to put out a call or approach a specific

social group. I wanted to work with people who could, through their input of footage, contribute in the development of the software. What all the people presently shooting for me have in common is that they are working in the arts, and they have some experience with operating a video camera. In addition, they all have an interest in their relationship with their city. The background of the shooters is culturally and socially diverse, within an age range of early twenties to mid forties.[3]

I tell the shooters to explore a part of the city that interests them in and to let colour be a guide on their walk. My goal is to have clips that are portraits of an individual's experience of Vancouver through three colours: Red, Green and Blue. Participants have called these clips "documentation of little performances". Each time I get a clip I am surprised at what people come up with. It appears to me they become more aware of colour, because they are confronted with decisions that question the construction of colour and technology's role in it. This initial Vancouver version gave me the confidence and a more thorough understanding of the algorithm so that I could produce the project with people I didn't know, with various levels of technical skills.

1.2.3 The Relationship between the Sound and the Image

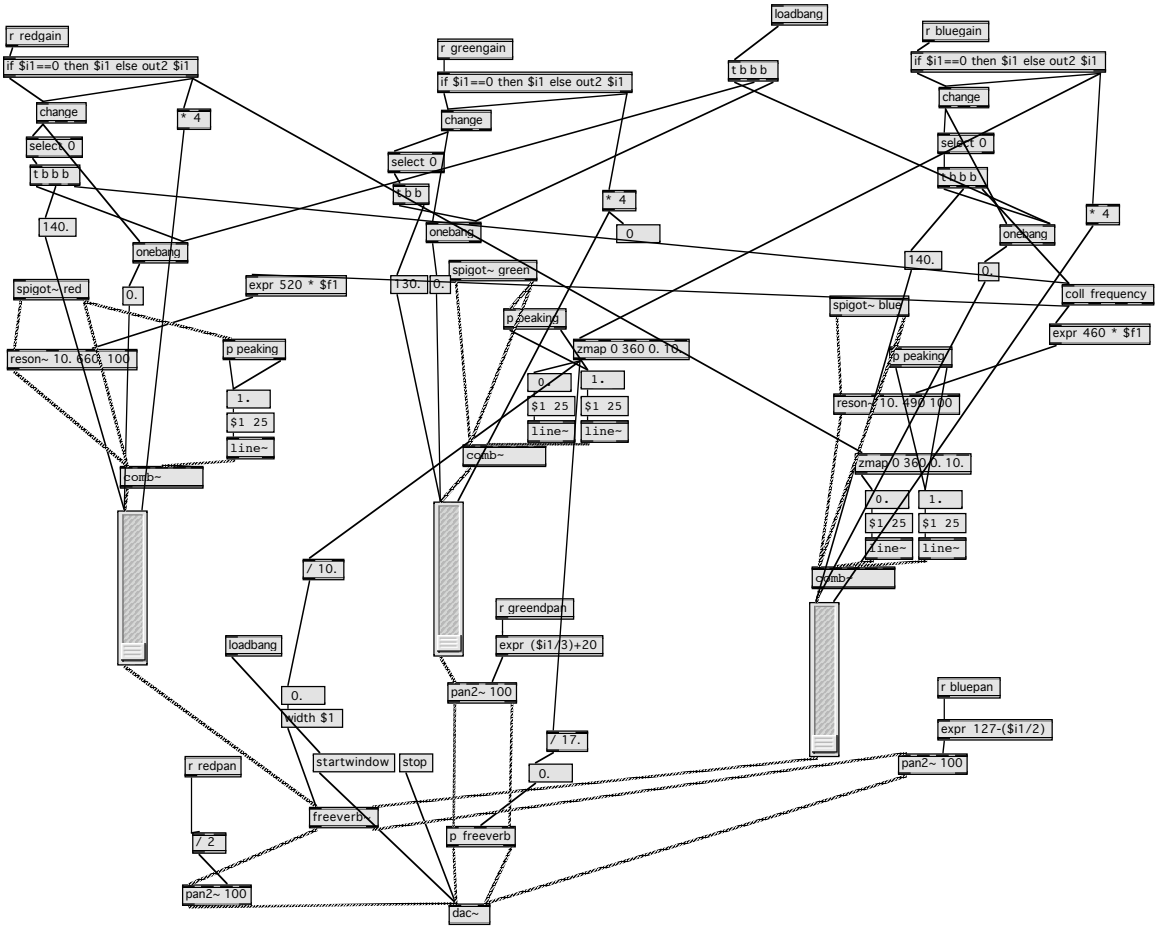
"On a downtown street corner of the modern city there is no distance; there is only presence." (Schafer 43) Generally, a video camera records video and two sound channels. The microphone built into the consumer camera is an omni-directional microphone. The cameraperson has little control of the sound.

[3] With the Winnipeg version the age ranged from early twenties to late sixties, whereas in the Vancouver version the age ranged from early twenties to late thirties.

For the Vancouver development version of the R.g.b-project, the focus of the participants was on the colour not the sound. In the final installation the software is designed so sound is only present if one of the video channels doesn't show any image. I.e in the case of blue, this happens if there is no blue in the image at all, or if the blue is not saturated enough to be recognized by the program as being blue. The program then takes the sound for that particular clip, and processes it in real time. The amount and particularities of the process are determined by the amount of colour in the other two clips.

The processing of the sound creates a soundscape that has a haunting effect because of the isolation of certain frequencies. For example, the sound track of the red video is filtered through a reson filter, which only lets through the frequency of 660 kHz or a derivative of this frequency. Heard through headphones it creates an immersive environment. This relationship between colour and sound is crucial to the project, and gives an extra layer to the algorithm. The participants can "play" with this layer. However, since there are moments when the participant perceives a colour, but the program does not recognize it, it is difficult for the participant to completely control the effect of image on sound.

Figure 1 The sound program of the R.g.b-project. Source: Jacky, Sawatzky 2004. (Used by permission).



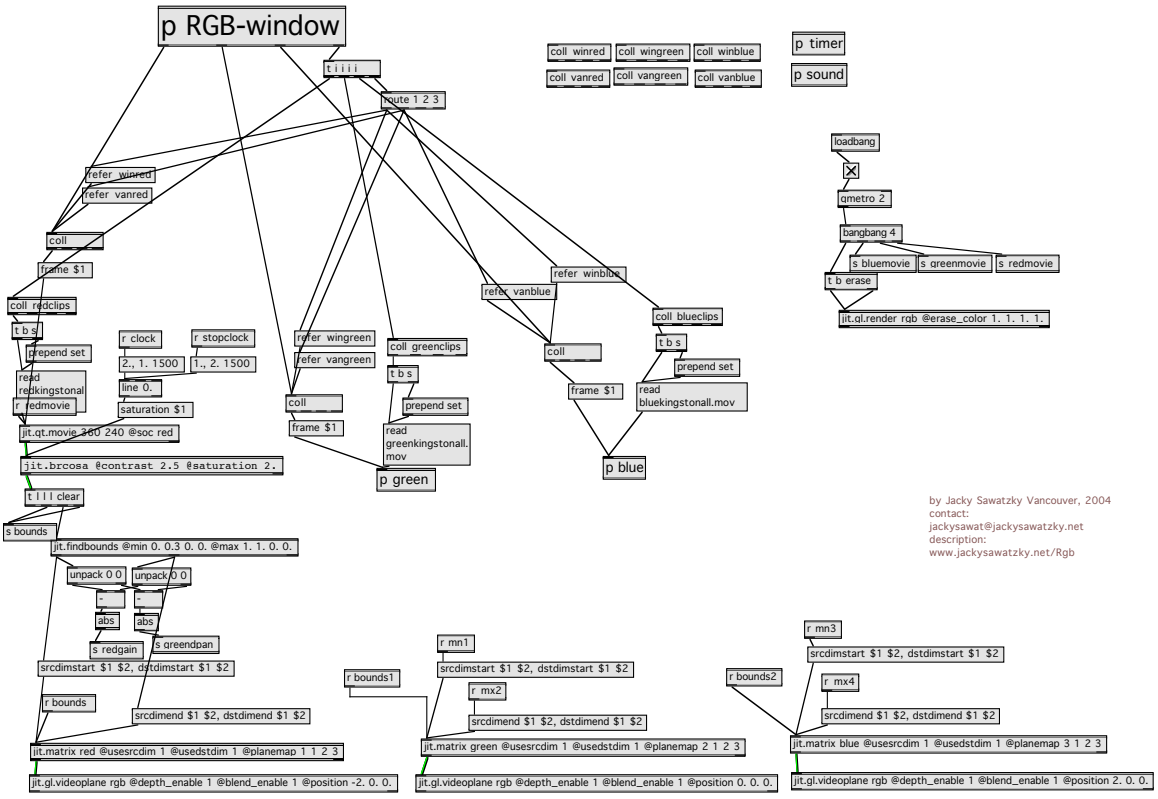
1.2.4 The Computer Program

I have been working intensely with the Cycling74 program, Max Object Programming. This programming language developed for sound manipulations of so-called higher level programming language, consists of so-called “objects”.

These objects are a discrete process of a lower level programming language in this situation, C. The objects can have functions such as addition or multiplication, or more complicated functions such as jit.qt.movie, which provides the opportunity to read and play a quick time movie.

An interesting aspect of Max is that it allows one to unravel pre-existing concepts of data structures. For example Jitter, the visual component of Max, reads a movie as a two-dimensional matrix; the two dimensions stand for the size in pixels. Also, Max splits the video-image into four planes of which three are the colours, red, green and blue. My motivation to work with this programming language is that it is user-friendly: one doesn't have to be a programmer, but still it lets you have access to every pixel of a video.

Figure 2 The main program of the R.g.b-project. Source: Jacky Sawatzky, 2004 (Used by permission)



For the R.g.b-project, I chose the object called jit.findbounds as the starting point of the project. This object looks for the boundary of a specified colour and creates a bounding box around it. This object acts somewhat like a camera: the object focuses on the specified colour, and frames it. The amount of specified colour and the location within the frame creates the new image. For the R.g.b-project I have three of these objects: the first one looks only for red, the second for green, and the third for blue. One can set the minimum and maximum of the amount of the specified colour in a pixel. For red, this is set to 0.3 –1. Translated, this is a pixel with a red value of 77-255. The program focuses on things it understands as red and creates a frame around them. The maximum

value red can have is 255 (100%); the program filters out all the pixels which have a value of red less than 30%.

Generally, the images coming from the video camera are of very low saturation. To get a response from the program, the saturation level of the footage is increased. The white, washed-out image is created through having the specific colour plane, such as red, act as a transparency filter. All these filters have the goal of emphasizing the colour, and not the object in the footage.

The program written for the R.g.b-project manipulates incoming media in such a way that it is not a literal and accurate reflection of the footage the shooters provide, but through the processing, creates an image that is clearly mediated. The working of the program is explained to the participants, and this gives them the possibility to play with the perceptions of the program. I see writing code as writing poetry; I make choices that I find important, and aesthetically valuable.

1.2.5 Interactivity

The problem that confronted me when conceptualizing the installation was how to represent the experience of the participants without literally illustrating this experience. I wanted to communicate the same level of playful dialogue and awareness that I had noticed the participants experienced.

While writing the code for the computer program, I became aware of the power I had. With each choice I made I was thinking of all the other options I was hiding and not making accessible. Through developing the code for the project, I realized that the problematic of this technology is situated in users' awareness of

the choices imbedded in this technology, and not so much with the "democratizing" of technology itself. Biases are imbedded in any interface design or application. The problem is that consumer interfaces are presented to the user as obvious and natural. On the contrary, through presenting the viewer with an interface that emphasizes how different participants make choices about colour and form, the R.g.b-projects' interface emphasizes the subjectivity of its design.

I find interactivity in a gallery to be problematic. The situation doesn't allow people the privacy of interacting with the work. As soon as a person interacts with a piece, she becomes part of the installation, and becomes an object of observation. I wanted the viewing of the R.g.b-project to be a private experience, to avoid situations of self-consciousness.

> Ondaatje: Strangely, if you watch a DVD on a computer, with headphones, you get back to that true intimacy that film has.
> Murch: I hadn't thought of that, but you're right. That gets back to the very origins of film, with Edison, who didn't like the idea of projection. He thought individual people looking into their own Kinetoscopes should see film. He thought he would make more money that way.
> Ondaatje: Marchel Duchamp insisted his last artwork, Étant donnés…., could only be seen by going up to an old door in a gallery wall in which there were tiny holes the viewer had to peek through to see the work that was constructed behind the wall. He wanted his last piece of art to reawaken an original private and childlike curiosity. So, it's this shared secret, between two…..(Ondaatje 48)

This dialogue between Walter Murch and Michael Ondaatje situates interacting with this new means of presenting work, the laptop computer, in an art-historical context. It illustrates the unique and intimate experience this interaction can have.

The white wall of a gallery demands a solemn, contrived attention. This kind of attention was in opposition to the experience of the participants in the R.g.b-project. I chose to place the computer in a situation of everyday life, like a café, and have the sound played through headphones. The use of laptops in café's is much part of western urban culture. I installed the R.g.b-project in the Our Town Café, which is located at the corner of a busy intersection in Vancouver. I had two viewing stations in the café: located behind a pillar was a small Powerbook with headphones, and another Powerbook in a more "public" location. This Powerbook was connected to the plasma screen, and the sound played on the speakers inside and outside the café. The relationship this particular café had to the street was crucial. The big windows looking out on the intersection, the outdoor speakers, and the indoor plasma screen on a wall surrounded by photographs of old film stars, located the installation in the community, but also added new associations to the project.

In Winnipeg I placed the installation in the lobby of the technical department of Videopool. The piece was presented on a desktop computer. In the lobby was a second computer station to check email, which normalized the interaction with the computer of the R.g.b-project. The setting provided the viewer of the R.g.b-project the privacy necessary to view the work.

1.2.6 Winnipeg

This version of the R.g.b-project was produced as part of the sound festival Send&Receive, October 2004. Videopool produced the workshop and

hosted the final installation. The workshop consisted of an evening presentation of the project, followed by a production weekend.

The particularities of the local art community played a crucial part in the production. Because the art community in Winnipeg is small, and most of the galleries are located within two blocks of each other, the shoot became an intimate experience, and evoked dialogue among participants. I spent a significant amount of time talking with each participant about his or her experience. There was an atmosphere of curiosity and dialogue, especially in relation to the software. The participants had creative solutions to the shooting, like Sandee Moore who undressed and then dressed in green, in front of the camera.

In the Winnipeg version for the first time two non-artists participated, Zobida Ambtman and Linda Meckling, They were two ladies in their sixties who have an interest in art, but do not produce art. Their familiarity with the new technology is minimal, but this didn't seem to hold them back. They worked as a team, which as Linda Meckling said later was crucial in overcoming their uncertainty regarding the technology. They documented Selkirk Avenue, a street in Winnipeg know for its historical significance and located in one of the most disenfranchised areas in the city.

2 THE FIVE FILTERS

2.1. Introduction: The Five Filters

The R.g.b-project's so-called filters are the city, the human perception of the participants**,** the camera, the computer program, and finally the monitor. The R.g.b-project is an attempt to create a dialectical situation between the images these various filters produce. The monitor processes the images from the computer program, the program processes images from the camera, the camera processes the images from the shooters, and the shooters are dependent on their situation in the city, the colour palette of a city, and the light situation.

The human eye sees colour through three cones, which roughly relate to the colours red, green, and blue, This is called a trichromatic colour space based on the additive mixing of the three colours in our brain. The R.g.b -project plays with the discrepancy between the human perception of colour and the computer's representation of colour. The project emphasizes the difficulty, even impossibility, of giving an absolute value to colour.

Colour is relational, which makes the reproduction of colour difficult. What is pure red? The computer might have a "solution" for this, 255, and 0,0, which means red. But for humans how we see red depends on factors like luminosity, the colour adjacent to the red, the texture of the object, and of course our

individual biology and cultural backgrounds. The presentation of the computer's values of "pure" red depends on the calibration of the monitor in relationship to a so-called white-point, 255, 255, 255. [4]

2.2 The City

In the city of Groningen in the northern part of the Netherlands, the Italian architect Alessandro Mendini designed a new museum. One of the critiques circulating in the city was that the colours Mendini chose for the building, yellow and pastel green, would never stand out in the light of Groningen. Various geographical circumstances associated with the city provide less colour contrast than the architect's native city, Milan. These circumstances include Groningen's proximity to the sea and the grey hue of the frequently cloudy skies.[5]

This light might seem very similar to Vancouver, because of Vancouver's close proximity to the sea and overcast days, but it is not. Vancouver, with its mountains, tall buildings, and smog hanging above the city, has a light that is very greyish, whereas Groningen's light has a blue tint. Winnipeg, where the geography is flat, and wind cleans the smog from the city, has even on a cloudy, grey day, very bright yellowish light, and contrasting effect on colour.

Viewers of the R.g.b-project have commented that there is a different feel to each of the two cities presented in the project, Vancouver and Winnipeg. My

[4] Typical display hardware in 2003 uses a total of 24 bits of information for each pixel; this corresponds to 8 bits each fro red, green, and blue, giving a range of 256 possible values or intensities fro each color. With this system, approximately 16.7 million discrete colors can be reproduced. When written, RGB values are commonly specified using three integers between 0 and 255, representing red, green and blue intensities, in that order. (RGB & cathode ray tube)

[5] An aerial picture of the museum is to be seen at:
http://www.groninger-museum.nl/gm/ie4/open.php?section=&subsection=&itemID=

argument was that a large part of this was caused by the difference in light associated with these cities, which will influence the colours of them. Erika Lincon participated in the Winnipeg version. She shot a walk on Portage Avenue between 9.00 Am and 9.35 AM, in mid-October. When giving me the footage she mentioned the lack of saturated colours she encountered. When seeing the footage I was surprised at the brightness of the footage given the time of day, and month it was taken.

The landmarks on Portage Avenue are not typical of Winnipeg, but the light is typical. Although the subject matter, a boring stretch of a major street in Winnipeg, is not that interesting, the light gives this footage an extra dimension and particularity. The subject matter of this footage can be compared to Aretha's footage of a suburban bus station in Coquitlam, but unlike Aretha's, it is beautifully illuminated.

2.3 The Participants

After viewing all the footage submitted to the program, I realized that the individuals' idiosyncrasies were crucial to the project. Every person, as well as experiencing the city in a different way, experiences colour in a different way. The individuals' footage submitted was a very personal account of the colour culture in the city.

An example of two completely different approaches to the R.g.b-project's parameters was the footage by Jeff Gray and Vish Judgeo. Vish had a conceptual approach to the documenting of the three colours. Taking his work place as the point of departure (Simon Fraser University's Visual Arts Studio,

located in downtown Vancouver), he shot red from inside the studio, looking out on to the container harbour of Vancouver. Green was shot on the street outside of the building, which is located in one of the poorest areas in Vancouver. Blue was shot inside the studio. Jeff Gray documented the neighbourhood he lived in, the West End. He walked through the neighbourhood first shooting a red clip, then a green clip, and then a blue clip. The direction of the walk was determined by the colour he was shooting at that moment.

There are also moments when a participant perceives a colour, for example red, but the program doesn't recognize this. This is partly due to the notion of colour constancy, where red in a shadow is according to our eyes still red, but if own would take a measurement of the colour values, red would not be dominantly present and so the R.g.b-project's computer program does not recognize this as red.

Through these different approaches, a commonality could be detected in the footage; a commonality that seemed almost unavoidable, and was perhaps imposed on the participants by the particular technology. What all the footage had in common was that all the participants had at least one shot of objects that are manmade signs (advertisements or road signs, or objects that are a sign of our consumer culture). The shooters could minimize these images through a conscious choice, but these images are also our common denominator in the city, and points of reference to place, culture, and nation.

What makes these shots of objects that are signs so interesting is the way in which the technology collaborates with them. These signs are clear forms with

highly saturated colours. Although shot under different light circumstances, these shots are the closest match between the real colour and the colour filtered through the program. These shots can be seen as a moment where digital technology and visual “reality” are closely knit. In these images there is an accurate colour representation by the digital technology; a collaboration happens between the program’s representation of colour and the materialised colour.

If, however, one is looking at natural colours, like trees, grass, flowers, sky, but also people, these images are more susceptible to difference in luminosity. As a result, often no image shows up because the program does not read the colour as green; for example a green object in the shadow. Or it shows a colour that doesn’t match reality; for example, a tree that we perceive as green is read as yellow. The technology seems to prefer saturated colours, and shows this by collaborating with them. The rough conclusion is that luminosity affects the colour match between digital technology and the “reality” of artificial colours much less than with natural colours.

I’ve described the general effect of the R.g.b-project; now will examine what each apparatus contributes to it. Does the camera have an inclination to present colour in an optical way? And is its development geared towards filtering out noise that would disturb the creation of this optical colour presentation? How does the computers colour algorithm deal with these two qualities of colour perception, imported from the digital camera? What role does the monitor play in this “filtering out of noise”?

2.4 Colour and the three apparati

2.4.1 Introduction: Colour and the Three Apparati

> .... I always think how different everything would be if we in the Orient had developed our own physics and chemistry: would not the techniques and industries based on them have taken a different form, would not our myriads of every day gadgets, our medicines, the products of our industrial art-would they not have suited our national temper better than they do? (Tanizaki 17)

It was four years ago that I was in Beijing. My host, Zhu Jinshi, took me on a labyrinthine bicycle ride through the city. We ended up at a small concrete shack, and his friend invited us in. When entering the shack the first thing I saw was a G3 computer. An odd feeling of familiarity and bonding came over me. Later, after pondering over this odd moment of connection with a machine, I realized how much the computer was a representation of western culture, and how much I took it for granted. I tried to imagine the computer other than it was, namely a logical consequence of the western sciences and culture. The difficulty of imagining this has motivated my research.

Three apparati are used to create and present the R.g.b-project: the digital video camera, the computer and the monitor. All these tools have influence on the palette of colour in the final product. What follows is a technical breakdown of these three tools. I will examine how they deal with and process colour, and how this processing induces a particular quality of image. The reader will note that

there is a fundamental difference between the single-function video camera and the computer, which is multi-functional. To stay within the R.g.b-project's concepts I will focus on one aspect of the computer, namely the manipulation of video and sound through the program.

I will examine the notion of 'a particular quality image' through the concepts of optical and haptic. In psychology, the haptic sensory modality consists of refers to tactile and kinaesthetic perception both within and on the surface of the body (Wilson 360) For the R.g.b-project I will make a distinction between the haptic interface, haptic visuality, and the haptic colour representation.

In some cases, depending on the participants' own tendencies, the haptic interface between the participants and the camera is emphasized in the resulting footage. For example, Malahat Hosseini, emphasized the relationship between the camera and her body as one of extension—"the camera is a friend." She experiences the camera as an extension of the body. This friendship was noticeable through her inquiring way of shooting, like she was scanning the surface of the city with the camera. As if she was asking the city of Vancouver the question: how do I belong here as a just emigrated person from Iran.

More important is the role of haptic visuality in the project. Deleuze and Guattari make a distinction between the haptic and tactile. ""Haptic" is a better word than 'tactile" since it does not establish an opposition between two sense organs but rather invites the assumption that the eye itself may fulfil this nonoptical function" (Deleuze 492). Footage shot for the R.g.b-project by Chris

O'Connor provides an interesting illustration of the haptic interface. For his green footage, Chris wore green shoes and green pants; he pointed the camera at his feet, and went on a walk. The footage reflected his rhythm of walking.

Laura Marks, expanding on Deleuze and Guattari's distinction, introduces the term haptic visuality:

> "Haptic visuality is distinguished from optical visuality, which sees things from enough distance to perceive them as distinct forms in deep space: in other words, how we usually conceive of vision. Optical visuality depends on a separation between the viewing subject and the object. " (Marks 162).

With haptic visuality "the eyes themselves become organs of touch" (Marks 162) Haptic and optical visuality is the quality of the relationship created between the eye and the object. Haptic visuality opens up the possibility for the camera to become an instrument of touch, an extension of the eye as an organ of touch. Due to the inherited quality of the lens the norm of the camera is to create optical visuality. By using the camera in a haptic manner, visuality is created which goes against the grain of the camera's optical predisposition. The footage Vish Judgeo shot gives an example of haptic visuality; he followed the grass in the cracks of the pavement creating an image that slowly skims over the surface of the grass and is barely recognizable at moments.

The difference between the optical representation of colour and the haptic representation of colour is, roughly, a difference between the uses of colour to provide information about a representational form. An optical image is one in which figure and ground are clearly differentiated and the edges of the figure are strong and stand out from the background; strong differences in colour contrast

and illumination create this optical image. In contrast, the haptic image is softer: the background and foreground are not as distinct and the colour palette is based on nuanced differences rather than on contrasting differences. The image presents less concrete information, and more of what we might call experiential information. For an optical image colour is used to illustrate the form (meaning, form first and colour after). With a haptic image, colour is the main information source and form comes second; colour does not necessarily deliver form.

2.4.2 The Camera

A camera has to subtract from an environment, that information that the given society considers relevant. What does the society in which the digital camcorder is developed in, see as relevant information? How does this society want its colour to be represented? I will examine this question of colour representation by tracing the history of colour film stock, and question whether biases imbedded in colour film stock are still present in digital video.

The camera I used for the R.g.b-project is a MiniDv format, 1-chip, Canon video camera. My motivation to use these so-called “one-chip” camcorders is based on the notion that any bias towards colour and luminosity imbedded in the camera technology will be more apparent in consumer model cameras. These biases include: opticality, luminosity, and colours. Consumer cameras have automated settings named after particular genres such as “sports”, and “portrait”. I argue that the biases are accentuated in the automated settings of the camera.

My choice of camera was also based on economics. (This argument might seem obvious, but putting it in the context of the political preferences these

cameras represents, it is an important consideration.) There is a significant price and quality difference between the professional and consumer model (although these prices are coming closer together). As a result, the consumer is left with a camera that has been predominantly designed to capture a “high quality” image through automated choices.

These particular cameras are very small and easy to use, and produce a sharp image with crisp colours. These properties indicate a bias toward the trend of smallness, efficiency, and better image quality. The assumption is that this trend is a natural progression of this technology, which I argue is incorrect. “When historical references are called ‘natural’ in an uncritical affirmation, identifying the empirical course of their development as progress, the result is myth.“ (Buck-Morss 68)

Photographic technologies are marketed in terms of ever-greater verisimilitude, as though this were the natural development of these media. This “natural history” of technology can turn into an ideology. The danger of this assumption is that if not questioned, the technology can become a propaganda tool for a visual language that is readily portrayed by this technology. Questioning the technology does not have to lead to the rejection of it, but through creating images which make visible the gap between the sign and referent we open up this discussion, and show that what digital technology constructs is based on choices, not facts.

The properties of a camera are normative choices against which the quality of the technology and the resulting image are measured. The advantage

of these properties is that very little technical knowledge is necessary to operate these cameras. For my purposes this means that a broader variety of artists can participate in the R.g.b-project. The smallness of the cameras makes the shooters less obtrusive and creates the possibility of blending in with the Vancouver cityscape, where it is so common to see tourists videotaping the city.

Nevertheless, Linda Meckling, a participant in the Winnipeg version, made an interesting observation: “People would look at us fussing about a blue garbage can, obviously not knowing why we were concentrating on such a mundane object.” On the other hand Remi and her friend Nomi felt self conscious walking around with a what kind of camera, and ended up shooting Nomi, a dancer, tap dancing in the fire escape wearing, blue shoes, green socks, and red pants. This self-consciousness was magnified because the camera they were using was not a consumer camera.

In the R.g.b-project the camera operators were crucial. Their subjective engagement with the subject matter and the technology made it possible to juxtapose different perceptions and preferences for a more haptic or optical image. For example Chris O’Conner, when shooting blue, looked for torn candy rappers, and created an image that is barely recognizable at moments. Malahat Hosseini, on the other hand, who was interested in signs and objects, observed how few of these kind of green objects there are in Vancouver compared with red, or “Canadian red” as she called it.

When looking at the results of the R.g.b-project, it becomes evident that in most cases, the program collaborates with the visible—with clearly recognizable

objects and situations. Signage, cars, people, buildings are recognizable if these objects don't blend in with the background. This means that there had to be a significant difference between colour saturation of object and background to establish collaboration between the computer and the camera.[6] This collaboration of program with the image degrades as the reconcilability of the image lessens. When the image loses form and becomes more haptic, the program does not know what to do. There seems to be a bias imbedded in the digital cameras to emphasize form. This bias would result in a more optical image. In this footage, the shooter would have to focus on an image that has "readable" information, meaning, they have to focus on a green object, other than a green experience.

As Deleuze and Guattari have written,

> If we now turn to the striated and optical space of long-distance vision, we see that the relative global that characterizes that space also requires the absolute, but in an entirely different way. The absolute is now the horizon or background, in other words, the Encompassing Element without which nothing would be global or englobed. It is against this background that the relative outline or form appears. (Deleuze 494)

The encompassing element Deleuze and Guattari mention can been seen in relationship to the lens of the camera, which only captures what is within the vicinity of the lens' focal point. Against the background of the frame created by this focal point the composition takes place.

[6] In Winnipeg where the light is brighter then Vancouver, footage shot at 9 Am in the morning, showed a higher amount of saturation.

Figure 2: On the left hand side the progression of the colour change applied to natural scenery: top image is the original, then the image after saturation, last the image created by the R.g.b-program. Note how the colours of the trees change to a yellow. On the right hand side are samples of the RGB values. Source: Jacky Sawatzky, 2004 (Used by permission)

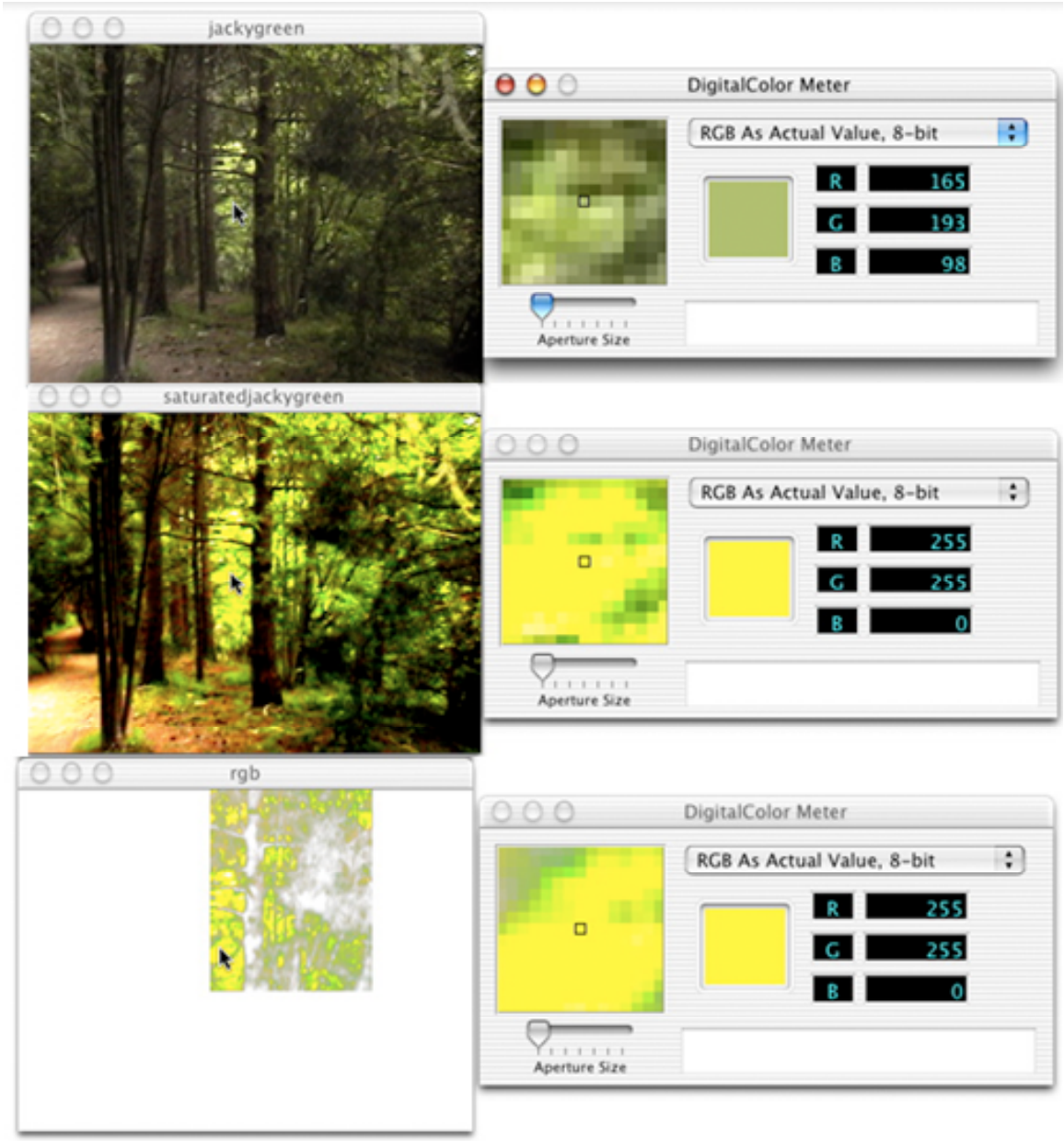
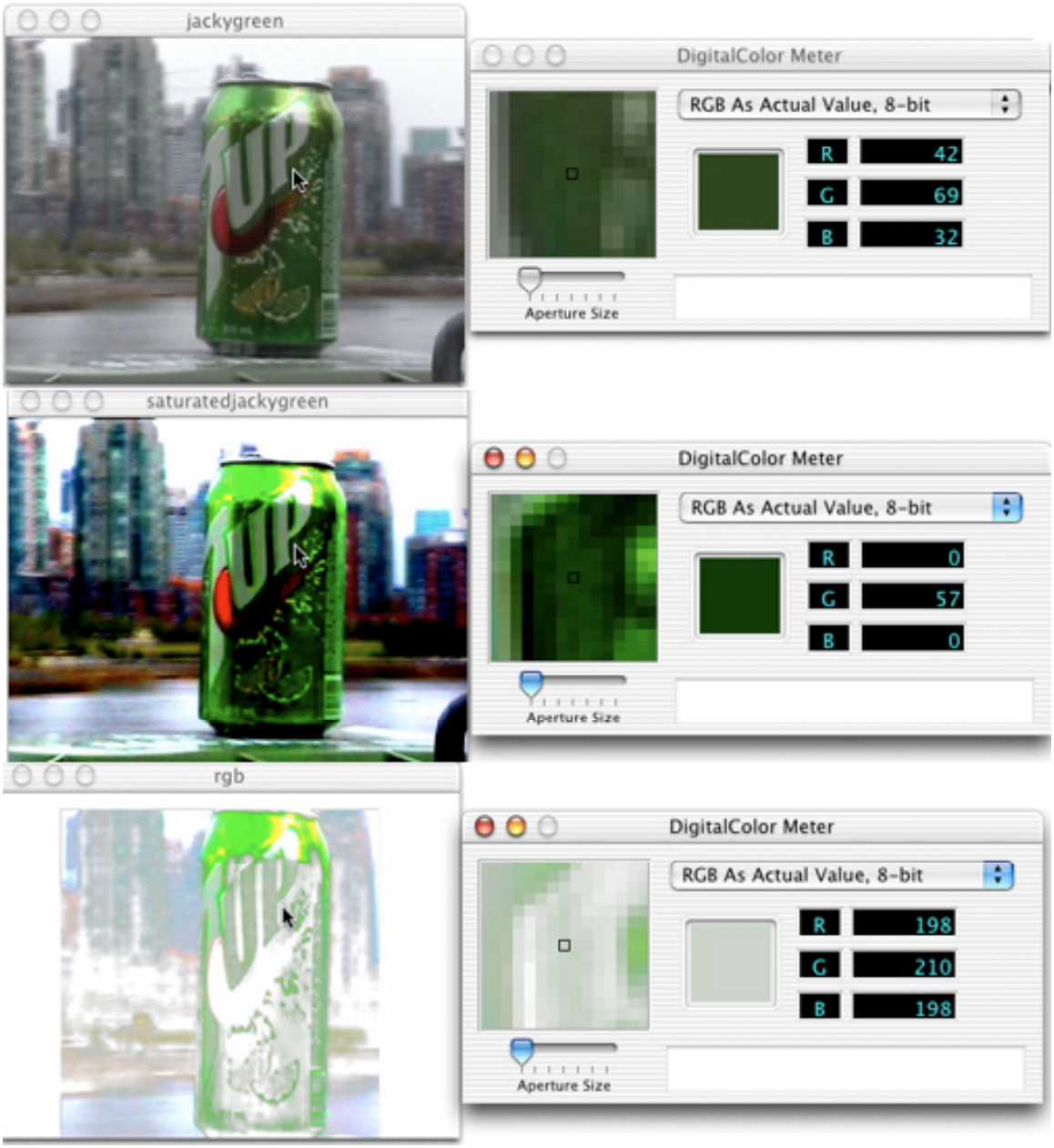


Figure 3 On the left hand side the progression of the colour change applied to a manmade object: top image is the original, then the image after saturation, last the image created by the R.g.b-program. Note how the colours of object maintain their hue. On the right hand side are samples of the RGB values. Source: Jacky Sawatzky, 2004 (Used by permission)



Perhaps one can argue that the camera is more inclined to create an optical image, based on the inherited qualities of a lens, the base technology of the camera. Through the lens an image is created that is an extraction from an environment. This image space is measured according to the light reflected off surfaces, the angle at which the lens captures the light, the lens opening, and the size or aspect ratio of the film/tape. When shooting, one is constantly analyzing the environment by considering the light and the object one wants to focus on. This analysis can be haptic, wherein the camera acts as an apparatus that registers an experience, with visceral communication as goal.

Footage shot for the R.g.b-project by Nicole Shimock provides an interesting illustration of the camera as extension of the haptic eye. For her green footage, Nicole went to the paint store, and with the camera slowly moved over the green colour charts. The result was a sensuous image of a colour chart, which from the perspective of relevant information is not that interesting.

The boundaries between an optical and haptic image are not clearly defined. An optical image can change into haptic, and vice versa. The norm of cameras might be an inclination towards the optical, but a haptic image is lurking on the boundaries of the optical norm. The way in which auto-focus fails in very low light is an example of a haptic image lurking behind the inclination of the camera to create an optical image. This automated function of the camera is constructed to produce images that have good clarity focus. But if the light present doesn't illuminate the subject enough for the camera to understand

where to focus, the auto-focus fails to perform. Another example is that if there is a moving subject in the middle of the frame, the camera will zoom in and out, constantly trying to find “focus”. These two examples indicate the grumbling of the function when the threshold of the norm is crossed, and a more haptic image occurs. I instructed the participants not to use auto-focus, because the image constructed with this feature is over determined by technology.

2.4.2.1 Comparison between the 8mm camera and the video camera

I will now illustrate a comparison between the digital-camcorder and a 8mm film camera. Both cameras are products of consumer technology. The development of the digital video camera was based on the 8mm camera and adopted similar properties such as smallness and ease of use, while developing them even further. Instruction manuals like “Digital video for Dummies” have only one small chapter on how to use the camcorder, and the rest of the book is devoted to post-production. The operation of a camera is seen as relatively easy, and any “mistake” can be corrected in the post-production process. To operate an 8mm camera on the other hand, a basic knowledge of focus, iris function, and how light affects the subject is necessary. These are particular technical terms, which only make sense in the context of operating a film camera. With camcorders these technical terms are further removed, collapsing the possible settings into categories: sports, portrait, and indoor/outdoor white balance setting. Camcorder technology produces an associative relationship with the environment, as opposed to the more analytic relationship produced by film technology. With a MiniDV camera, the actual interpretation of settings happens

in the factory, where there is a hypothetical setting for an outdoor white balance setting and the iris function.

The advertisements for various camera companies generally show images of kids playing in the snow, landscape with nice weather, sports, or beach attivities. These are presumably moments one wants to remember, and show to people. Who wants to show the image of a suburban bus station with overcast weather, such as Aretha Aoki shot for the R.g.b-project? This footage by Aretha seemed to have a veil over it, as if it “never should have been shot”. With a camcorder, an image should portray what one wants to remember. What are images one wants to forget?

To answer this question from a camera’s technical point of view what comes to mind are fluorescent lights, in situations like shopping malls, a doctor’s or the dentist’s offices. Fluorescent light imposes a specific problem for a digital camera. The manual of the cameras indicates this as an abnormality: special arrangements must be made to get a satisfying result. These images are, from a consumer point of view, less likely to be captured and so the labelling of these images as “problematic” would generally not be an issue.

Thus both film stock and automated settings on a camcorder are derivative of a standard that represent the norm. Who determines this norm? This represents a complex accumulation of perceptions, from the consumer to the material properties of the technology, to cultural and economic conditions. These norms are not set overnight, but go back to the development of colour film stock. What should not be forgotten is that these norms regarding colour

representation are not natural at all and are based on ideological choices regarding colour. As Richard Dyer argues,

> Stocks, cameras and lighting were developed taking the white face as the touchstone. The resultant apparatus came to be seen as fixed and inevitable, existing independently of the fact that it was humanly constructed. It may be—certainly was—true that photo and film apparatuses seemed to work better with light-skinned people, but that is because they were made that way, not because there could be no other way. (Dyer page 88)

After WWII, colour film stock was produced by two techniques, corresponding to two companies, Agfa and Technicolor (later Eastman Kodak). Agfa film stock was developed in Germany during the Second World War and confiscated by the Russians when they invaded Berlin. Technicolor stock was developed in the United States. Brian Winston writes,

> Agfacolour became a 'socialist' stock: it had paler colours, muted edges, and increased sensitivity to pastels. This was in contrast to Technicolor, which was "purer than reality, needing strong artificial light, aggressive, almost whorish". (Winston 117)

In digital technology the difference is imbedded in the camera itself in the quality of the CCD-chip which "translates" the light coming through the lens into a digital array of Red, Green, and Blue values, and the image processing chip. This image-processing chip tweaks the image to the norm the company, such as Canon, Panasonic, or JVC wants. So if one wants a pastel look, one needs to buy a different brand of camera.[7]

[7] There is a significant difference in look between a Canon camcorder and a Panasonic camcorder. Canon has a pastel like look, compared with Panasonic's slightly crisper image.

Through the possibilities of editing and image composing software the biases of the camcorder become fluid. The footage can be transformed through the seemingly endless possibilities of plug-ins and effects of the editing software.

2.4.3 The Computer Colour Software

Software and plug-ins are costly. Artists on a low budget often use illegal means—e.g., hacked software—to access these tools. In creating my own software for the R.g.b-project I wanted to free myself from the pressure of purchasing expensive software. The resulting R.g.b-software is freely downloadable from my website. I encourage people to use the software and experiment with it.

The camera**,** as I noted, is inclined to create an optical image; it is a subtraction of an environment. The computer program, which processes the image through a programming language, has an inclination to deal with the image not in a global sense but pixel per pixel—to not take in the context established by the surrounding pixels. While the camera extracts information from an environment, the computer further abstracts this information. The program looks first at each individual pixel, and then builds up a new picture according to a standard set of rules digital technology assigns to the video data. I do not think the program has an inclination towards a haptic or optical image. The image the programming language produces is determined by the kind of image imported into this computer, and the programmers' preferences as to how to process the image.

Whereas the colour values of a city are determined by cultural, geographical, atmospheric, and political circumstances, the colour space used for imaging technologies, as discussed earlier, is determined by the material properties of the medium. For example, print has CMYK as its colour space, while digital imaging technologies have RGB as their colour space. Colour for a computer is a linguistic agreement based on scientific knowledge regarding the calculations of wavelengths, translated into binary code. These wavelengths represent colour independently of individual perception. The linguistic agreement is based on a cultural perception that a particular wavelength corresponds with the colour red.

> The study of vision must therefore include not only the study of how to extract from images the various aspects of the world that are useful to us, but also an inquiry into the nature of the internal representation by which we capture this information and thus make it available as a basis for decisions about our thoughts and actions. (Marr 3)

The first part of this sentence by David Marr is applicable to the function of the video camera. The second part, regarding “the nature of the internal representation” is applicable to the computer. What is this nature of internal representation by the computer? How does the computer represent an image?

The semantics of the programming language Max, the language used for the R.g.b-project, analyzes the image according to a set of rules. These rules are partly set by the programmer, and partly by the various levels of operation in the computer. How red, green and blue are defined are based on values taken from

the physiology of the eye.[8] Different basic colours could be chosen, such as purple, blue, and green, but this would represent only a small palette, leading to a bigger gap between the actual colours and the represented colours.

The colours red, green and blue act as references for the other colours coming in to the computer. Video has three values assigned to each pixel. These values indicate how much the colour deviates from what the computer norm is for pure red, green and blue. The computer deals with colour as "just colour"—information translated into binary code. Colour is for us humans always related to a material value, but with digital technology colour loses its material value. The agreement that this specific kind of numeric information is colour can be altered; the numbers can be translated into other media, for example, sound. This happens in the R.g.b-project where the quality of the sound is determined by the amount of colour present in the video.

Doug Lewis, a participant in the Winnipeg version, wanted to challenge the norm by attempting to shoot footage that would crash the computer. He shot while he was driving a car, thereby taking the risk of crashing more than the computer! He hoped to get footage blurred by the speed of the car, so that the computer would not know what to do with it. No crashes happened, partly because the computer doesn't distinguish between footage shot under different

[8] Primary colors are related to biological rather than physical concepts, based on the physiological response of the human eye to light. The human eye contains photoreceptor cells called cones which normally respond most to yellowish-green, green, and blue light (wavelengths of 564nm, 534nm, and 420nm respectively). The color yellow, for example, is perceived when the yellow-green receptor is stimulated slightly more than the green receptor, and the color red is perceived when the yellow-green receptor is stimulated significantly more than the green receptor. Although the peak responsitivities of the cones do not occur at the red, green and blue wavelengths, those three colors are described as primary because they can be used relatively independently to stimulate the three kinds of cones. (Biological basis of primary colors)

circumstances, it is programmed to analyze the footage frame per frame. Due to his nine-to-five job, and the amount of daylight in mid-October, Doug was confined to do the shooting during rush hours, which slowed down his driving. He called the clip “In-transit”.

2.4.4 The Monitor.

I am concerned to know whether the bias imbedded in the processing of film stock towards white skin is carried over towards digital technology. Historically in the colour processing of film stock the quality of colour depended on the correct representation of Caucasian skin. In the portrayal of this correct representation, white ideological values are imbedded. What these ideological values are depends on what is perceived to be a healthy white skin tone. As Brain Winston remarks:

> Increasingly the intensity of the red and blue lights or dyes restores the white but at the cost of distortion in the relative chromatisities and intensities—which, as it happens, is psychologically (or, perhaps better, ideologically) less offensive than off-white. And there is opened a whole can of colored worms, especially close (chromatically speaking) Caucasian skin tones. (Winston 112)

Globally there are different formats of video corresponding to different monitor formats; there is the European standard Pal/Secam and NTSC, the North American standard. I was confronted with the bias of NTSC against certain colours when I had to switch from Pal to NTSC. While the red titles that I made on the monitor looked great, when transferred to an NTSC-video tape, the red looked “washed out”. The technical staff at Videopool, the production centre I was working at, mentioned NTSC’s biases to saturated red. During the past six

years I have been working with the NTSC video format, I have found especially irritating the lack of nuance in the greyscale values. It is almost impossible to get a nuance in the darker part of a video, such as shadow part, and dark object or dark skin. This bias of NTSC is partly due to the standard white point, which gives a bluish white, and thus darkens the black.

Richard Dyer writes,

> At the point of reception, I will recall the advice that first-time purchasers of colour television were given about how to adjust their sets: get people's faces right and everything else would fall into place. This is good advice, as long as you take the white face as the norm and don't mind non-white faces looking odd. (Dyer 89)

The standard NTSC white point setting dates from 1953, and this setting creates the bias Dyer talks about. But with the present day computer monitors the choices of display profiles bypasses the biases of the NTSC standard. Through having a choice as to which colour profile one prefers and adjusting the white point towards one's own preferences, biases become less a question of one a default setting and more a personal preference of the viewer. The colour profile is fine tuned through enabling the "expert settings" while colour calibrating one's monitor. The downside of this is that the term "expert settings" might be conceived as intimidating, and thus not give the average consumer the possibility of a nuanced and personal setting of a display profile.

The monitor has a higher resolution than the human eye can see. The high resolution has a different look than high-resolution film. The material property of film is a grainy structure. The consequence of this structure is that

there is always negative space. Computer monitors are an array of pixels. There is no negative space, and each pixel always has information. There is no inter-pixel. If one blows up a digital image the pixels become clearly visible. Blowing up a picture means compiling information of a group of pixels into one pixel; this is a very different material property then blowing up the grainy structure of film.

On a monitor each pixel has a red, green and blue value. The monitor can show millions of colours, but they are all derived from the primary colours red, green and blue. What would happen if the monitor uses a different colour space such as that used for printing Cyan, Magenta, and Yellow (CMY)? The particular colour space used is determined by the material properties of a medium. For example the CMY colour space is based on the colours of ink, while the monitor's material properties are based on three colour filters red, green, and blue. (A CMY colour space is still translated into RGB if shown on the monitor.) The consequence of these medium-determined colour spaces is that all the colours shown on a monitor will always be filtered through the colour space red, green and blue.

I cannot conclude that this filtering would show a preference for a certain kind of image, such as haptic or optical. While observing the audience engaging with the R.g.b-project I have noticed a broad range of response to the imagery. Some viewers focus on recognizable imagery, and some are delighted by textures, and the new images the program creates. I think that a preference for an optical or haptic imagery is located more in the viewer and the camera's prejudices then in the monitor's material properties.

3 THE ART OF PROGRAMMING

I have always been somewhat jealous of painters; the material they work with has a long historical background that I miss in my programming work. I loved to go to the pigment room at the art supply store and look at the hundreds of small pots with many different colours and fascinating names that often indicate the places or the stories attached to the colour.

When I began creating computer-based art, I found a similarity between the creation of digital imagery and painting. It was as if the sensuality I so envied in the materiality of paint was present in these digital images. Confronted with the Max programming environment and the possibility of manipulating each frame of a video, but also each pixel, I was hooked. The combination of objects, the logical structure of computer programming, the tweaking of the settings, and the particularities of an interface design has for me a poetic quality, as well as a historical background I was previously unaware of. The materiality of painting is situated in the relationship between paint, the canvas, and the brush. On the contrary, with the computer the materiality is expressed in the layers of the logical propositions from machine code to the interface, production of the hardware and the semantics of the programming language the artist is using.

The R.g.b-project is a place where a dialectical situation is created between the ideas of colour imbedded in computer technology, and individuals'

colour perception. The producers of digital technology create an expectation that a computer will “mould” footage in a predictable and reliable colour reproduction. But this does not happen; the digital medium alters the images significantly. The program created for the R.g.b-project magnifies this gap between reality and digital reproduction through cropping and filtering of the image.

The artistic signature in the R.g.b-project is predominantly located in the algorithm I created which manipulates the video and audio. The choices I made in the making of the algorithm intended to emphasise the biases of technology, through imagery that aesthetically has a painterly, animation-like quality. With this aesthetic choice, I hope to bring about the awareness that digital imagery is always manipulated.

To make video footage manageable for a computer it has to be compressed. The compression of a Mini-DV tape is standard 1:5, meaning the information regarding colour and luminosity is compressed five times. The “common” algorithm that reads and writes the QuickTime’s DV-NTSC compression packs the footage into an acceptable size for a video-editing program.[9] To make it possible to process the video in real time by the computer,

[9] For an interesting analyst on the progression of the QuickTime movie see the article by: Vivian Sobchack, Nostalgia for a Digital Object: Regrets on the Quickening of QuickTime. Miss Sobchack describes the loss of QuickTime movies unique quality -a quality she describes as ‘it’s stuttering attempts to achieve “real time” movement’, towards the development of ‘ the streaming momentum of real-time and live action-measured against the standard and semblance of cinema’. A similar loss happens with the development of video, where the analogue format s’ slightly washed out image, is measured against the more accurate and crisp image of the digital format.

which is done by the R.g.b-project, I compress the footage using QuickTime's MJPEG-B compression.[10]

There are a few consumer video formats on the market, the analogue formats Hi-8, VHS, and digital formats Mini-DV and DV-cam. The analogue tapes are slowly becoming obsolete. Each video format has its own particularity, and quality of images—Hi-8 has a look that is pastel like, opposite the crisp look of mini-DV. Standardizing the video format into predominantly the digital formats will monopolise the "look" of video into crisp imagery.

Digital video is advertised as having a better quality image than the older analogue format of VHS; "better" meaning sharper, more optical. The image is high-contrast, uses brighter colours and seems almost better than we can see. Emphasizing the superior quality of digital video over its analogue "sister" VHS sets the precedent for the notions that a good image is sharp and has bright colours and that digital video's colour representations are the right colours.

A crucial part of the R.g.b-project is the explanation of the algorithm to the participants. The question I pose first is: when does the digital technology take a liking to a particular colour resulting in the computer program "seeing" this colour as true? Which colour and light situation does the technology see as not true? Then I emphasize the rhythmic dialogue the algorithm creates between the absence and presence of colour and the corresponding absence or presence of sound. The participants have a rough control over image their footage creates,

[10] The choice of compression is a personal choice. Of the broad range of compressions available, true trail and error I found that MJPEG-B gave results, that did not sacrifice the colour information above bandwidth.

but there are still many uncertainties, one of them being whether the computer will read the colour in the captured video frame or not. This unpredictability plays with our human perception of colour, and the computer's perception of colour. The absence of the "right" colour (red, green or blue) has a consequence: the sound component is engaged. Over the year of the R.g.b-project's development, participants engaged increasingly with the sound, reflecting my own increasing understanding of the project.

The algorithm/program is like a musical instrument, an instrument that is susceptible to changes in external conditions such as the weather or the light circumstances, the colour palette of a city, and our human and idiosyncratic perception of colour. This dialogue between the program and the participants was more evident in the Winnipeg version than the Vancouver version. Rick Dyck, due to bad weather, stayed inside Plug-In gallery and moved a red folder in front of the lens of the camera. This process was repeated with a green, and a blue folder. Through this process the sound went on and off. In this clip Rick used the algorithmic properties to create a musical instrument.

The first question I ask myself when working with a programming language is, How does this language wants me to think? How does this language build the data structure of a video image? In learning a new program or a language, my emphasis is not only on what this program can accomplish but also on placing myself in the mindset of its developers. The two years of working on the R.g.b-project has been an intense learning experience. Through assuming the mindset of the developers of the technology—the camcorder, the computer,

and the monitor—my hunch regarding the biases imbedded in technology and the programming language has become rationalized.

As an artist I was looking for a way to subvert these biases, and this was becoming increasingly difficult, taking in account the technology's development towards closed, pre-packaged units. To an extent I found the creative potential of digital technology in the cracks of these biases. But with this development of technology towards pre-packaged units, it is difficult to get an understanding of its biases, and thus find the cracks. The information regarding the choices made in the construction of the camera, computer, and monitor is often too technical, or too simplified, to be of use. I found that working with computer programming even on a basic level gave me access to the biases in an indirect way. In the R.g.b-project, computer programming created an ability to use the RGB colour space as a dialectical tool for deciphering these biases.

APPENDIX 1

Participants Vancouver, 2003/2004

Aretha Amoki,
Chris O'Conner,
Helma Sawatzky,
Jeff Gray,
Malahat Hosseini,
Megan Wilson,
Rob Ochiena,
Vish Jugdeo

Participants Winnipeg, October, 2004

Erika Lincon,
Doug Lewis,
Nicole Shimock,
Nomi and Remi Huberdeau,
Richard Dyck,
Sandee Moore,
Steve Loft,
Zobida Ambtman and Linda Meckling

APPENDIX 2

Content of CD-Rom

- read me R.g.b-project

- application R.g.b-project

- documentation of the R.g.b-project launch at OurTown cafe on October 25, 2004 in Vancouver, Canada duration: 3.34

- folder example clips:
  redvancouver.mov duration: 2:53
  greenvancouver.mov, duration: 2:31
  bluevancouver.mov duration: 3.07

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