COLOUR DATA PROCESSING

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This paper discusses Colour Data Processing, a live-computing installation that explores contemporary relationships to data and colour representation through the analysis of the video signal of a customized colour rendition chart compared to its original referrant.

Colour Data Processing is a live-computing installation that explores contemporary relationships to data and colour representation through the analysis of the video signal of a customized colour rendition chart compared against the numerical values of each colour represented. The installation has three primary components: a 2m x 3m colour rendition chart, a webcam, and an exposed-circuit linux computer running a colour accuracy algorithm. The lynchpin of this project, both visually and conceptually is the colour rendition chart that situates Colour Data Processing within the realm of colour science and digital reproduction.

Our colour rendition chart is both an homage to, and a deviation from the form and intent of the original Gretag MacBeth ColorChecker1. The installation 2m x 3m colour rendition chart incorporates the 24 colour set intended to function as a broad/universal basis of representation while adding 40 carefully selected colours representative of the predicted palette of the skin-tones and wardrobes of our attendees.

Our proof-of-concept installation uses a webcam, custom-built computer, and a projector as a capture-processing-output device to implement the exploration and exposing of the colour representation. Processing2 was used to create custom software that determines the accuracy of colour by comparing RGB data to a pre-determined palette using Cartesian distance in three dimensional space. Two different representations are simultaneously processed and displayed by the system. The first feed shows a live representation of the viewers with their colours shifted to a colour palette consisting of 64 different colours. The second video feed displays a black and white representation of the amount of shifting (or error) that occurred when the colours were converted.

Colour Data Processing questions the veracity of photographic and digital reproduction, but not with the intent of challenging the context or state of photography, but rather establishing photography as a flawed method of reproduction.

Our system recontextualizes the functionality of the Gretag MacBeth ColorChecker, addressing the instance of digital reproduction and valuing data over the accuracy of reproducing the physical referent. However, our referent is collected data from a sensor rather than the colour rendition chart, removing our process from traditional calibrations by a full reproductive generation. We embrace the same deviations and error commonly found in digital reproduction to critique and analyze our current methods of digital photographic reproductions throughout the chain of custody of the digital image.

For example: if we reproduce the colour represented by the RGB values R113 G236 B27, the representation of those colours would be perceptibly different regardless of the consistency of data. The malleability of our perception is where we choose to investigate the shift from scientifically represented data to perceived data through translations from digital devices.

Our interests in the reification of this discrepancy arises from the invisibility of these processes. In a sense, these differences are never examined, as multiple versions of the same original are rarely compared to one another. Therefore, each viewer has their ownversion of the original that is an exact binary reproduction of every other original in existence, but visually and contextually each original is inherently different and unique to each individual viewer.

When a work of art exists first on screen, rather than in print (when reproduction precedes production), there is a lack of a perceptual referrant, a scientific control, if you will. Each instantiation, while an exact data replica, is merely one state of an infinite number of variations of the "original". Given that the technical reproduction of information is flawless, each presentation and viewing of the piece is still fundamentally unique, but not in a way that can be accounted for or controlled by the author of the image. Colour Data Processing examines this system through the perceptual replication of colour using a modified spectrophotographic method to calculate the numerical shift of perceptual color reproduction.

The first installation of our work was in October at TPTP Art Space in Paris, France. The space, approximately 6x6 meters, consisted of the four essential components: custom colour chart, webcam, custom computer, and projection. The space was designed so that viewers circulated directly in front of the large fields of colour while simultaneously confronting themselves in the two large digital reproductions on the opposing wall. The exposed-circuit computer and webcam (mounted to a tripod) were centrally positioned between the viewers and the projection and therefore was perceived as the nucleus of our work as well as seen an art object that encouraged introspection on the computer processes at work. The sole light source for the large colour target is the direct reflection from the projection of the new representations, providing an evenly lit space which allowed for consistent gathering of image data. Our installation is a closed loop reproductive system, where the viewers are cogs within the process itself.

The software evaluates every pixel in the image generated by comparing the pixel values for their proximity to the nearest colour in the pre-determined palette. The proximity is computed by calculating the Cartesian distance between the current pixel and every colour in the pre-determined palette. The colour in the palette with the smallest Cartesian distance from the current pixel is replaced in the modified image. Once this process is complete the colours in the modified image contain only colours in the predetermined palette. Cartesian distance is computed as follows with r,g, and b corresponding to the red, green, and blue values of each pixel where each pixel is indicated by a subscript c indicating the current pixel and subscript p indicating the the pixel in the palette for comparison.

$$d[n]=(rc-rp[n])2+(gc-gp[n])2 + (bc-bp[n])2$$

A second image is generated by using the smallest Cartesian distance and then mapping that value to a black and white colour palette. The result is that a colour close to the palette will have a darker colour and a colour that is distant from the colour palette will be brighter. This allows the viewer to have a representation of the accuracy of the colour matching algorithm. The threshold for the representation of the error was set to produce the best visual results. It was found through exhibiting the work in Paris, that even if all lighting variables were controlled (Color temperature, light evenness, etc.) and the control colours were adjusted within the software to reflect the actual colours perceived by the camera

within the space itself, our system still displays some amount of error. This underscores that variability and imperfection is inherent in any digital reproduction system.

Beyond the accuracy of reproduction, what are the implications of this phenomenon? Most importantly, when a work of art is first presented on the internet, every viewer has an equally authentic experience with the work. If, as Benjamin suggests, "The presence of the original is the prerequisite to the concept of authenticity" each viewer is experiencing a fundamentally different original while sharing in the collective experience of visualizing the exact same data. In this context, each experience is visually different in colour, quality, physical size, and context as well as the more subjective differences of perception.

We share an interest in questioning the representational nature of photography from technological, conceptual, and theoretical perspectives and what affect the instance of reproduction has on the perception of reality, or on the original. Colour Data Processing addresses the theoretical and practical implications of digital reproduction, colour sorting, and the function of algorithms (both practically and aesthetically) in image processing, reproduction, and manipulation.

References and Notes:

1. *C. S. McCamy, H. Marcus, and J. G. Davidson, "A Color Rendition Chart" inJournal of Applied Photographic Engineering 2, no. 3 (1976): 95-99.*
2. *Processing official Web Site, http://www.processing.org (accessed June 1, 2012).*