VISUALISING EMOTION: ENHANCING THE TYPOGRAPHIC DESCRIPTION OF PROSODY IN WRITTEN DISCOURSE THROUGH DYNAMIC TYPOGRAPHY.

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ABSTRACT

Uttering spoken words does not mean forever losing its attending emotions. In written discourse of speech the problem is not resolved, just expanded. Our speech is charged with meaning, interpretations, emphasis and feelings. These aspects are often lost when speech is represented as text. Despite decades of technological advances in speech and emotion recognition this barrier remains. Can we capture a glimpse of the typeface that translates our emotions? Is there a typography of our individual voice? In this paper I will provide an overview of the outcomes from my recently completed PhD research into dynamic typography and emotion. The principal aim of this investigation was to identify the attributes and behaviours of dynamic typographic form that may extend the limited visual description of spoken discourse and enhance the possibilities for representation of emotion through prosody within the context of oral history.

Keywords: Dynamic-typography, prosody, emotion, affective-computing, speech-visualisation.

INTRODUCTION

This study is applied research within the field of graphic design. Its focus is the intersection between new media/experimental typographic practice, speech visualisation and oral history. This research emerged from the practice-based investigation of a problematic situation identified within the field, drawing upon the exploration of an appropriate methodology that combines the studio-practice of the practitioner-researcher and existing social science methods. The principal aim of this investigation was to identify the attributes and behaviours of dynamic typographic form that may extend the typographic description of spoken discourse and enhance the representation of prosody in oral histories.

This research contributes a design process model and an underlying set of working methods that generate dynamic typography representations of prosody in recorded speech, addressing, therefore, the lack of a formalised model available for this purpose. The methods that comprise the model have not been amassed in this way before. These methods embody knowledge, and as constitutives of a process model can be used as a template to generate dynamic typography representations of prosody and by extension emotion.

NEW MEDIA AND EXPERIMENTAL TYPOGRAPHIC PRACTICE

The limitation of the current description of language has been widely acknowledged within critical theory, the humanities, and by artists, designers and poets. The problem of what happens to speech when it becomes text has been investigated within the creative arts and social sciences throughout much of the twentieth century. Artists, designers, and poets have attempted to address the expressive limitations of typography through an exploration of the materiality of the visual representation of language. These experimental typography practices have granted written discourse expressive visual significance and materiality, subsuming word into image in print, film and television. The potential of typography as a

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computational, responsive and temporal new media form has received less attention, despite offering immediacy and interaction between 'reader/user' and the digital application. The potential, however, is substantial. In fact, new media technologies are ubiquitous and form a significant part of our lives, but are limited in their ability to capture and express prosody and emotion. In this enquiry, these two possibilities are brought together: the potential to enhance awareness of prosody and emotion through text, and the potential to model prosody and emotion computationally. Aiming at the amalgamation of this potential, I have created an opening for human emotion engagement through dynamic typography. By using moving typography to read prosody, and by extension emotion, I have expanded the meaning and usage of typographic form. In this context of use, the way has been paved for typographic representations of spoken discourse to acquire a deeper meaning.

SPEECH VISUALISATION

Attempts to represent emotionality and the prosodic aspects of speech in typographic notation and transcription systems have to date focused on the representation of words, temporal sequence, phonetic variation, prosody and the poetics of discourse. Typographic notation systems using Standard English orthography in printed and screen-based media contexts either feature inappropriately matched typographic attributes, and/or lack the temporal range required to represent prosodic variation. Furthermore, methods developed to match typographic attributes to prosody are not documented or evaluated. In this context, this research builds on the work of creative practitioners and researchers to identify a set of methods that may improve awareness of emotion by representing prosody through dynamic typography. It focuses on design practices and research projects that have attempted to address the issue of the lack of emotion and prosodic expression in written discourse by extending the typographic description of spoken discourse with the view of intensifying the expressive potential of typography in multi-dimensional virtual spaces.

The approach adopted to represent emotion through visual form emphasises the mapping of prosodic features in speech to typographic form. This approach acknowledges the difficulty in categorising emotion and labelling prosody as exhibiting any particular emotion; instead, it requires the 'reader/user' to infer emotional types and intensity.

ORAL HISTORY AND KING'S CROSS AS A TEST SITE

The issue of the lack of emotion and prosodic expression in written discourse is approached in the context of oral history, and, in particular, the practice of transcription. I focus on the limitation of Standard English orthography, or on what is often referred to as the 'verbatim rendering of the spoken word into typescript', to represent the features of speech that convey emotional meaning and social connotations (British Library Sound Archive, 2007). There is an acknowledged problem in oral history practice that the audio recording is the richest artefact; yet, as digital and paper based transcriptions are found to be more usable, the original recordings can often go unused (Klemmer, Graham, Wolff, & Landay, 2003). The risk is that overreliance on transcripts reduces the meanings that can be interpreted from oral testimonies, as some aspects of speech are not represented in transcripts using Standard English orthography and syntax (Portelli, 2006). As part of this enquiry, I worked as an oral history volunteer interviewer for the King's Cross Voices Oral History Project from 2005 to 2007 (figures 1 and 2). The project supplied the majority of the speech extracts that comprised the speech corpus used. Conducting oral history interviews as an interviewer for the project provided not only insights into oral history practice, but also a community of residents to interview and an oral history archive exemplar.

Figure 1: Culross Buildings, Battle Bridge Road, King's Cross, London. Culross Buildings inhabitants photograph taken in the early 1990s, and are from 'King's Cross: A Tour in Time' by Mark Aston and Lesley Marshall (2006).

Figure 2: Culross Buildings, Battle Bridge Road, King's Cross, London. Photograph taken in 2005 by the author.

DEFINITION OF KEY TERMS

Dynamic typography is defined as computational and temporal transformations to typographic attributes to extend the typographic description of language. The term dynamic typography emerged out of the thesis work of David Small (1994, 1996a, 1996b, 1999), Suguru Ishizaki (1996a, 1996b, 1997, 2003), and research work of John Maeda (1995, 1996, 1998, 1999, 2004) conducted at the Massachusetts Institute of Technology's (MIT) Visible Language Workshop (VLW) and Aesthetics and Computation Group (ACG), Cambridge, MA, USA, during the late 1990s.

Prosody is an important aspect of any discussion concerned with emotion recognition and expression. Prosody encompasses intonation, rhythm, tempo and loudness as they interact with syntax and lexical meaning in spoken contexts. Prosody reflects changes in the speaker's emotional state.

In this enquiry, oral history is defined as a tool for 'making informed reflection on historical memory' (Frisch, 1990 p.188). According to Michael Frisch, 'oral history emerges as a powerful tool for discovering, exploring and evaluating the nature and process of historical memory – how people make sense of their past, how they connect individual experience and its social context, how the past becomes part of the present, and how people use it to interpret their lives and the world around them' (Frisch, 1990 p.188).

RELATED WORK

THE SPEECH AND WRITING PARADOX

The relationship between verbal and visual forms of communication have framed debates in the visual, graphic and literary arts throughout the twentieth century. The 'speech/writing' opposition as originally framed by Ferdinand de Saussure (1916), and subsequently reframed by Jacques Derrida (1973, 1998), amongst others, assumes relevance in typography discourse as it sets the scene for experimental typography practice at the outset of the twentieth century. The debate emerged as a reaction to a conception of the relationship between speech and writing in which the primacy or idealisation of speech resulted in a limited recognition of writing's function. Aspects of writing remained un-named or unrecognised and 'the forms and material properties of writing went unacknowledged' (Drucker, 1994 p.13). For linguists, writing and its subset typography had no function. Ellen Lupton and Abbott Miller, in 'Design Writing Research' (2006), have argued that the opposition between 'speech/writing' served an ideological bias, as it assumed there are fundamental and transcendental meanings that reside in speech. Lupton and Miller (2006) contend that 'writing is not merely a bad copy, a faulty transcription, of the spoken word; writing invades thought and speech, transforming the sacred realms of memory, knowledge, and spirit' (Lupton & Miller, 2006 p.4). According to Johanna Drucker (1994), in 'The Visible Word: Experimental Typography and Modern Art, 1909-1923', at the outset of the twentieth century: 'the role assigned to writing within the science of linguistics was riddled with paradoxes and problematic conflicts' (Drucker, 1994 p.13). On the one hand, writing was an indispensable tool of linguistics as 'linguistic studies were largely based upon the ritual examination of written texts subjected to detailed morphological analysis. Writing also played a part in the transcription for analysis of spoken language' (Drucker, 1994 p.13) On the other hand, speech was seen as more authentic, where meaning resided. The paradox was that the inscription, the written text, was ultimately subjected to analysis, unlike the elusive, ephemeral sound.

The problematic nature of the 'speech/writing' opposition subsequently informed debate within critical theory, digital media studies, digital poetics, humanities computing, hypertext theory, oral history and the graphic arts. Derrida's (1973, 1998) theory of deconstruction and critique of the 'speech/writing' opposition developed out of this reading of Ferdinand de Saussure's 'Course in General Linguistics' (1916); this approach has had a significant influence on typography discourse related to the function of writing (Lupton & Miller 2006), and to the 'impulse to physically integrate form and content' (Lupton & Miller, 2006 p.74). According to Ellen Lupton and Abbott Miller (2006):

"Deconstruction aimed to show that speech is characterized by the same failure to transparently reflect reality […] there is no innocent speech […] the fact that our culture developed a phonetic writing system – one that represents the signifier in isolation from the signified – is indicative of our primary alienation from the spoken language" (Lupton & Miller, 2006 p.12).

Lupton and Miller (2006) argue that speech evolved in its phonetic form; in contrast, the phonetic writing system in which sequences of sounds are presented as text evolved very slowly. As a result, discrepancies emerged which introduced a wider separation between speech and writing, creating a gap between the signifier (speech) and signified (concept). Phonetic writing, because 'it exploits the gap between signifier and signified, is not simply a secondary reflection of language (speech), but is a symptom of language's (speech) own lack of presence, its lack of completeness' (Lupton & Miller, 2006 p.12). Typography is, therefore, another layer in the sequence of representation, and functions as an interpretation, manifesting additional layers of interpretation between the communicator and audience.

The paradoxical relationship between speech and writing informs the conditions in which interview recordings (speech) and transcripts (writing) are utilised in oral history practice. In oral history practice, the interview recording (speech) is seen as more authentic than the transcription (writing). However,

this positional bias, which assumes the primacy of speech over writing, appears to inform a preference for transcripts as a tool to interpret the interview recording. oral historians and researchers prefer to use transcripts to access and interpret oral history interviews.

Within the field of oral history, the relationship between the oral history interview and the printed transcript has been scrutinised and debated widely (Dunaway & Baum 1987; Klemmer, Graham, Wolff, & Landay 2003; Portelli 2006; Ritchie 2003; Frisch 2006, 2008; Good 2006; Maze 2006; High 2010). For example, Klemmer, Graham, Wolff and Landay (2003), in 'Books with Voices: Paper Transcripts as a Tangible Interface to Oral Histories' (2003), observed in their review of literature of oral historians reflecting on practice on this topic that 'a common frustration amongst oral historians is that the audio (or video) recording is the truest and richest historical artefact, yet a paper transcription is so much more usable that the original recordings go almost unused' (Klemmer, Graham, Wolff, & Landay, 2003 p.1). Similarly, oral historian Donald Ritchie has noted that 'given a choice researchers prefer transcripts over recordings' (Ritchie, 2003 p.64). Michael Frisch also acknowledges that 'even when the flattening of meaning inherent in text reduction has been recognized, transcription has remained essential and something close to natural' (Frisch, 2006 p.102). The risk is that overreliance on transcripts reduces the meanings that can be interpreted from oral testimonies, as certain aspects of speech are not represented in transcriptions (Olson 1996; Portelli 2006; Good 2006; Frisch 2006, 2008); for instance, the emotional sub-texts in speech utterances, meaning 'what the speaker meant by it, or more precisely how the speaker intended the utterance to be taken' (Olson, 1996 p.92).

PRECEDENTS FOR MAPPING TYPOGRAPHY TO PROSODY AND EMOTION

The expressive limitations of typography and the phonetic writing system derived from the Roman alphabet as a representation of speech have been widely investigated throughout the twentieth century. In response to the limited role assigned to writing, an engagement with the forms and material properties of

writing and typography became the focus. Artists, designers, and poets attempted to address the expressive limitations of typography through an exploration of the materiality of the visual representation of language.

These practices extended the purpose of typography beyond issues of legibility and transparency to other purposes, which may be illustrative, atmospheric, interruptive or expressive (Mealing, 2003). This expressive form of typography acquires the role of an interpreter of content, and is in contrast to Beatrice Warde's (1955) view of textual form as an invisible interface between communicator and audience. For example, the Dadaists aimed to emphasise the sound of words and individual letters visually. Similarly, during the 1960s and 1970s, French graphic designer Robert Massin (1970) not only coined the term 'Expressive typography', but also experimented with the characteristics of typography to convey emotion. Massin's (1970) interpretation of Eugene's Ionesco's absurdist play explored the juxtaposition of type and image to express the inflections, intonations, and pauses of the actors as they spoke. The approach materialised through giving each character a different typeface, varying the size, angle and placement to convey the nuances of spoken dialogue (figure 3).
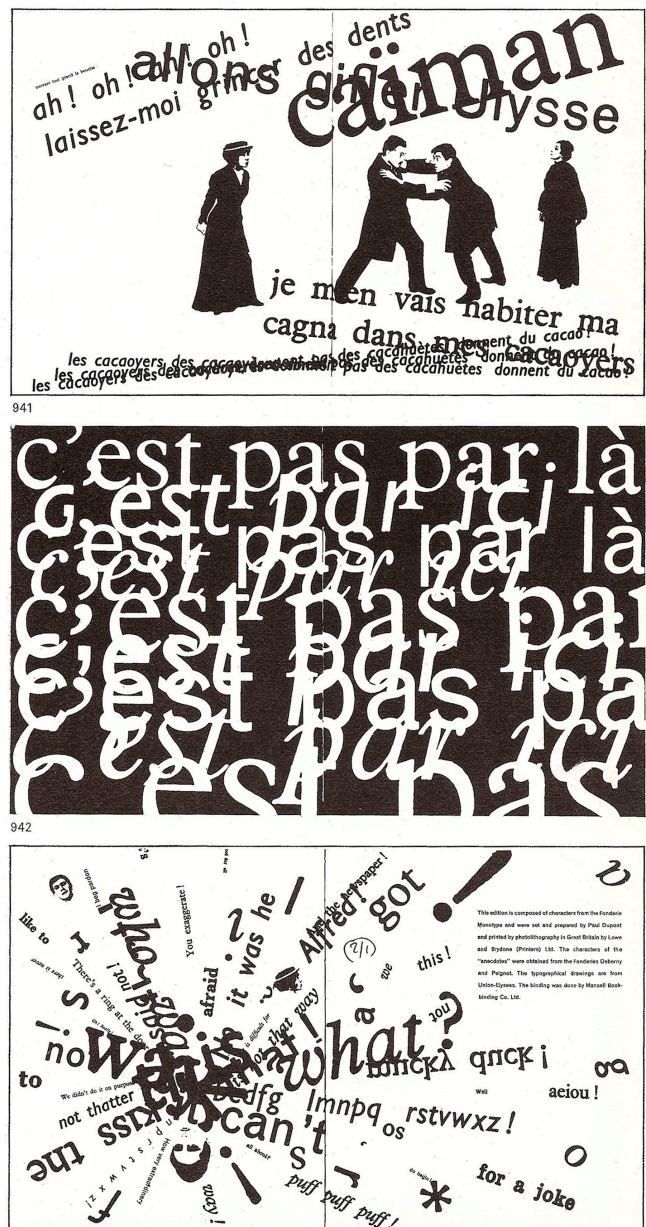

Figure 3. Double-spreads from Ionesco's La Cantatrice Chauve ('The Bald Primadonna'). Typographic interpretations by Massin and photographic interpretations by Henry Cohen. Images are taken from Robert Massin's book 'Letter and Image' (1970).

More recently the expressive and interactive possibilities of typography within a computational context provide an opportunity to enhance the representation of the emotional subtexts in speech. A transition occurs from reader to user through which interactive and dynamic typography can extend beyond the stasis of print based media.

There are certain matches that appear consistently in research projects that explore the representation of prosody through typographic form (figure 4). Forlizzi, Hudson and Lee (2003) refer to these matches as 'reusable abstractions'. The authors argue that

'certain prosodic features have been effectively conveyed' through dynamic typography (Forlizzi, Hudson and Lee, 2003 p.4). The authors argue that 'certain prosodic features have been effectively conveyed' through dynamic typography (Forlizzi, Hudson and Lee, 2003 p.4). For example, 'the prosodic effect of rising pitch at the end of a sentence to indicate a question has been successfully mimicked using an upward movement of a final word, while loudness has been expressed by sudden changes in type size and weight' (Forlizzi, Hudson & Lee, 2003 p.4).
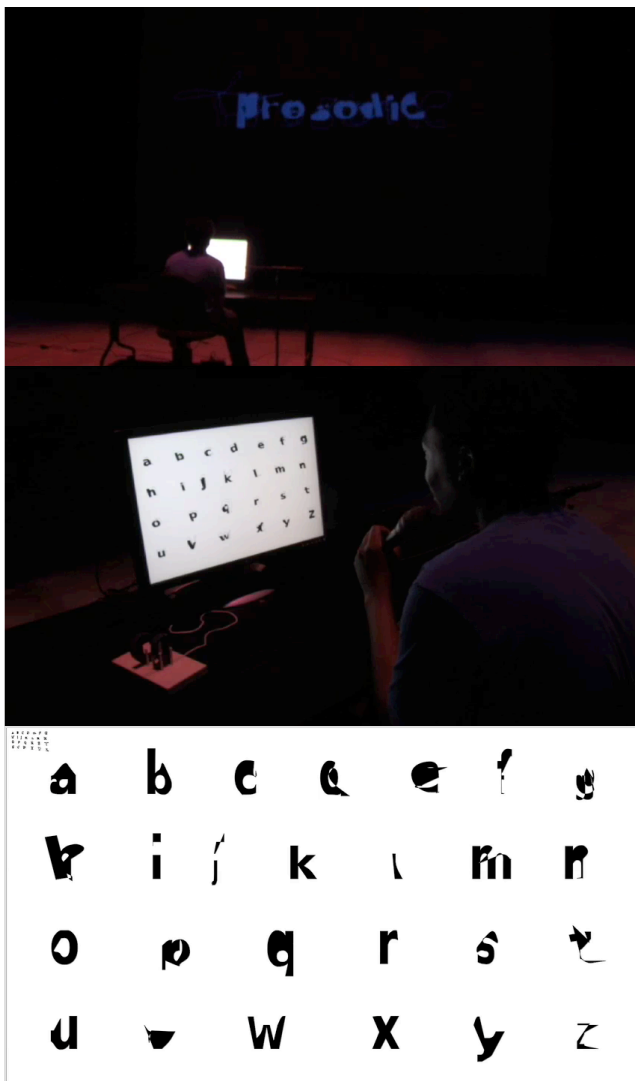

Figure 4: Precedents for matching the 'size' typography attribute to amplitude. From Assogba and Lewis (2007) 'The Quick Brown Fox: An Experiment in Creating a Soft Prosodic Typeface'.

These reusable abstractions provide a foundation for dynamic typography practice.

METHODOLOGY AND METHODS

A naturalistic (Lincoln & Guba, 1985, 2000) and reflective (Schön 1995) methodological approach was taken, encompassing qualitative and quantitative methods. The methodology incorporated a multi-method and flexible design (Robson, 2002) to investigate through practice the potential of dynamic typography to express the prosodic traces in speech lost in static text-based representations. The methods, procedures and interpretive theories that form the methodology emerged during the course of the enquiry.

PRACTICE BASED RESEARCH

The main research activity was carried out through the medium of design practice or 'practitioner activity' (Archer, 1995). This type of research activity is also referred to as 'research through practice' (Frayling, 1993) or 'practice-based research'. 'Practice-based research' is defined as developing and making creative work as an explicit and intentional methodology for specific research purposes (Malins & Gray, 1995).

In practice-based research, the creative work is a significant aspect of the research outcome in which knowledge is embodied. Practice-based research is situation specific, subjective, conducted in real world settings and addresses real world problems; furthermore, it locates the 'practitioner-researcher' (Robson, 2002) at the centre of the enquiry.

The 'practitioner-researcher' is defined as someone who is part-practitioner and part-researcher (Robson, 2002). It is a term employed in 'real world research' to convey the hybrid mode in which a researcher may conduct systematic enquiry, which may be of relevance to the job the researcher may be carrying out (Robson, 2002). It has similarities with the design practitioner and design researcher axis in practice-based design research. The researcher conducts systematic enquiry in which the researcher's design practice constitutes the main method through which the enquiry is conducted. The outcomes may be of relevance to the researcher's design practice, and that of the discipline of design research as an integral part of professional design practice.

MULTI-METHOD RESEARCH DESIGN

This study employs both qualitative and quantitative methods in a multi-method research design. The research design incorporated a flexible design (Robson, 2002), comprising both exploratory and fixed elements. At the outset, the research design was exploratory due to the lack of precedents to develop, evaluate and interpret dynamic typography representations of prosody. As the enquiry unfolded and methods were developed, the research design incorporated more focused experiments that can be characterised as a fixed design. For example, the final evaluation adopted a fixed design, as the interview-based questionnaire survey method provided answers to the main research question, leading to the identification of the most effective dynamic typography representations of prosody. Dynamic typography representations were evaluated on two occasions using the interview-based questionnaire survey method. The first evaluation, a pilot evaluation, informed the design of the interview-based questionnaire survey, and provided some insight into which typographic attributes were the most effective representations of prosody. The pilot work provided the opportunity to test the feasibility of the fixed design strategy. The second and final evaluation consisted of six combinations of dynamic typography attributes mapped to either amplitude or pitch accent speech data.

OUTCOMES

This investigation builds on the work of previous researchers to identify a model and set of methods capable of enhancing awareness of emotionality and prosody in spoken discourse through dynamic typography. This approach draws from existing research and practice into the expressive potential of typography in multi-dimensional virtual spaces and affective computing. In addition to existing quantitative and qualitative methods of data collection and analysis drawn from the social sciences, an investment in the development of innovative methods occurred. This exercise was accompanied by a survey of current discourse related to critical theory, and interpretive and representational issues identified in transcription practice. The method selection and adaptation was informed by an acknowledgment that

meanings and interpretations may be associated with dynamic typography representations of prosody from the moment they begin circulating as new instances of discourse. The key frameworks and methods identified are:

SPEECH CORPUS DEVELOPMENT AND PROSODY DATA COLLECTION

The King's Cross Voices Oral History Archive was chosen as the testing ground due to variations in prosody expressed in oral history interviews, providing the majority of the speech corpus used for experiments. During development of the speech corpus, there were no established tools for detecting prosody in speech. Procedures for generating prosodic data were developed from the very beginning of the enquiry. Amplitude and pitch accent variations were detected and labelled through a combination of 'manual', 'semi-automated', and 'instrumental' approaches to acoustic analysis and prosody recognition. The methods employed and the resulting prosodic data models formed the basis for algorithmic transformations to typography attributes.

MAPPING PROSODIC DATA AND RELATED WORD UNITS TO TYPOGRAPHY ATTRIBUTES

The combination of three data types was used to determine the movement, size, position, and other manipulations to typographic attributes. The three data types consisted of prosodic data, related word units, and typography visual effects parameters. These data types enabled algorithmic transformations of typography attributes. These algorithmic models, developed to link prosodic data and related word units to dynamic typographic attributes and behaviours, provide the basis of a technical implementation of these research outcomes as a fully functional software tool (figure 5).

THE USE OF THE INDIVIDUAL VOICE TO GENERATE TYPOGRAPHIC FORM

Dynamic and temporal transformations to typographic attributes were generated from continuous and discrete phonetic and phonological speech parameters. The method positions the 'reader/user' as interpreter and producer of meaning, acknowledging the contextual and subjective nature of interpretation. I drew from Rosenberger's (1998) work into 'Prosodic

font' the design of a bespoke typeface that took its temporal form from continuous and discrete phonetic and phonological speech parameters. I argue that Rosenberger's approach to emotion enhancement through the mapping of prosody to typography constitutes a method. For the purposes of this study, I drew on, and adapted, Rosenberger's method.

Figure 5: Dynamic typography and emotion. Mapping prosodic data and related word units to typography attributes.

ENHANCEMENT TO THE RSVP TEXT DISPLAY METHOD

In order to fulfill the aims of this research, Rapid Serial Visual Presentation (RSVP) was chosen as the text display method best suited to provide the platform for dynamic typography representations (Potter 1984, Mills 1987). Word memory retention and the static position of the word emanation point are acknowledged limitations of the RSVP method. These two limitations of RSVP influenced the approach adopted to represent pitch accent variation through dynamic typography, improving perception of pitch and, by extension, prosody. This resulted in an enhancement to the RSVP text display method.

DESCRIPTION LANGUAGE FOR DYNAMIC TYPOGRAPHY

Yin Yin Wong's (1995) characterisation scheme for describing elements and behaviours of temporal typographic form was created for designers to describe and design typographic forms that change over time in a computational context. The scheme abstracts elements of the typographic description of language to arrive at a descriptive structure for specifying typographic attributes. This scheme was adapted and then used to guide experiments into matching spoken prosody features to attributes of typographic form.

BINARY OPPOSITION DESCRIPTIVE FRAMEWORK

Through critical analysis of the basis in which temporal typographic characterisation schemes used in this research were framed, the theory of binary opposition was identified as a rationale to match typographic form to variations in prosody. In this enquiry, the theory of binary opposition was employed to interpret findings. Thus, this study expands interpretive options applicable to dynamic typography through the identification of binary opposition as a framework to characterise/describe typographic forms that change over time. This proposition accounts for the mode in which Wong's (1995) descriptive framework may inform dynamic typography signification. The framework in question provides an explanation as to why particular mappings were chosen over others.

CONCLUSIONS

Developing coherent typography representations of prosody and by extension emotion is an involved work. The research outcomes are embodied in design practice in two places: first, in the identification of methods to generate dynamic typography representations of prosody; second, in recognising and characterising two attributes and behaviours of dynamic typographic form that extend the typographic description of language, and enhance the representation of prosody in oral histories.

My research although situated within the context of this enquiry demonstrates that dynamic typography can enhance the representation and interpretation of

prosody. The spatial temporal mappings and methods presented here may evolve with further research, but they already offer sufficient evidence of the potential of dynamic typography to represent the prosodic features of spoken discourse lost in static text-based representations of speech.

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