Typography in Motion: A Framework of Moving Type Use

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Abstract: - Typography is increasingly undertaken with and mediated through Information Technologies. One of the most visible manifestations of this change is the expansion from the printed page to screen environments and device displays. Moving type is an example of a new quality of text made possible by the use of new technologies. In this study we propose a framework that can help answer questions such as why type should move at all, what benefits moving type can offer, and how it can be best used to enhance the visual display of text. The framework categorises the uses of moving type, based on whether the movement of text enhances reading, viewing or using of a text, or a combination of the above. The categories are illustrated with examples of existing moving type works, which provided a basis for discussion of various challenges and issues specific to each category.

Key-Words: - typography on screen, moving text, moving type use, studies of use

1 Introduction

Today's visual representations of texts are manifold. Typography - the task of choosing, combining and arranging typefaces, thereby structuring textual information to make it meaningful for audiences - is mainly concerned with the visual quality of text, and its interplay with meaning creation. It is therefore important in two respects: 1. the legibility and readability of a given text (literal meaning of content) and 2. the expressiveness of form (meaning through connotation).

Typography is increasingly undertaken with and mediated through Information Technologies. The way we consume textual information is changing. One of the most visible manifestations of this change is the extension from the printed page to screen environments and device displays. Type in motion is an example of such new qualities of text made possible by the use of technology and screen displays. The motion in this case refers to both temporal and spatial changes. Not much is known about this new quality of text, not present in printed texts before; this emerging field has not yet been studied extensively to date. There has been a special lack of empirical studies that would focus on implications for 'readers' of this new textual display method.

Without Typography, our modern communications would be unthinkable. The New Typography, enriched by dynamic movement, provides an opportunity to make our communications even more effective, expressive, and engaging than ever.

2 Previous Studies On Moving Type

Most of the existing studies on moving type lack discussion of issues and challenges concerning this new text quality. Many works describe projects and prototypes with plenty of technical details; very few of them provide any additional analysis, or discussion of underlying theories or implications, especially for the audiences involved. Very few also include any empirical research on movement and type, except for reading experiments with scrolling text, as described later in this section. Some of the few theoretical and empirical studies are summarised below.

The question why text should move or change over time at all was posed by Negroponte, Bold & Cooper [1]. Five reasons are considered in their proposal: 1. to convey information that itself is changing, 2. to pace the observer, 3. to save screen or display 'real estate', 4. to amplify and 5. to get attention. These may have provided enough explanatory power in 1978, where the focus was on translating printed typography into a screen environment; recently, new technologies and interactive possibilities however dictate the need to revise these answers, hence the importance of our study.

Bergfeld-Mills & Weldon [2] similarly focused on typography on screen, and specifically on empirical studies about on-screen legibility and readability. Among other possibilities that a computer screen offers, the above-mentioned authors also discuss movement of text. They present

a thorough compilation of results of empirical studies dealing with moving type, their focus however is limited to vertical and one-line display scrolling text, Rapid Serial Visual Presentation (RSVP), as well as segmented and controlled-rate text. The studies summarised in their work all focus on reading experiments (measuring the number of eye fixations, comprehension rates, etc.); expressive or interactive typography are not considered in this study. Our research on the other hand is concerned with more than just reading, analysing the experience of 'viewing' and 'using' type as well, which is explained in the next section.

The expansion from print to screen was also the main concern of Small's [3] Doctoral Thesis during his time at Massachusetts Institute of Technology. One chapter of his work is devoted to movement of typographic objects. Specific techniques are explored to enhance the readability of moving type forms in a 3-D environment; the aesthetic qualities of dynamic typography are of additional concern.

A book by Bellantoni & Woolman [4] provides an overview of basic terminology and principles of typography in motion, as well as showcases students', educators', and designers' projects with short descriptions of their own work. This project focuses on classification of moving text forms, and methods to produce moving type. The questions posed at the beginning of the book on whether there is a need for type to move, and what the benefits of moving type for viewers and readers are, remain unanswered in Bellantoni & Woolman's [4] work.

The framework we present in this study is a step towards a better understanding of these fundamental questions that have been asked since the emergence of moving text on screen.

3 Methodology

Our moving type use framework was developed as follows. The first step included an extensive review and analysis of existing examples of moving type. The examples were found through web- and literature searches, typographic journals, relevant conference proceedings, as well as through the first author's extensive experience working and teaching in the field of typography.

After the examples were collated, a coding process was performed independently by three practitioners in the field of digital typography. For each example the coders were asked to indicate whether the movement of the type enhances 'reading', 'viewing' or 'using' of the text in the example, either to a small (small square in Table 1) or to a large extent (big square in Table 1), or not at all. Subsequently, the results of this analysis were compared and minor differences discussed and resolved.

The framework's categories, 'reading', 'viewing' and 'using', were informed by the conclusions of our previous research [5, 6]. Reading involves attending to a consecutive text, with the reader immersed in its content. This 'reader' is scarcely aware of the typographic form of the text, as long as it does not interfere with the immersive state of reading. This form is used to improve both legibility and readability, although it happens in the background, without the reader needing to be aware of it. When the 'reader' starts viewing a text, the formal aspects of it overpower the content, taking centre stage. The form starts interpreting and affecting the textual content. The 'reader/viewer' not only reads the text but also views the formal aspects of it, attending a typographic performance. Finally, using a text happens when the 'reader' can actively control it, being able to interact with the text and decide how to read it. The 'reader/user' can be in control of both spatial and temporal movement.

The significance of our study is discussed in Section 4. The results of the categorisation of moving text uses are presented in Section 5. Section 6 discusses the various categories of moving text use, exploring how each of them can enhance textual displays. A number of examples illustrate how these benefits can be achieved in practice, showing how the experiences of readers/viewers/users can be enhanced by computer mediated moving text. This examples validate our framework and emphasize its applicability for practitioners working with typographic designs. Conclusions and further research are presented in Section 7.

4 Significance Of Our Study

The technology to move text is readily available, and capabilities exist to move text in various forms on screen. How to make the best use of these capabilities is a different issue though, and it is the focus of our study.

Many other qualities of text have been extensively discussed in studies about printed text, but the same cannot be said about new qualities, such as type movement, that have only been made possible by new technologies. It seems important to discover how designers can best use the potential of moving text, and how these new capabilities can enhance textual displays. Designers of text should not create moving text just because they can. Our study is an attempt to better explain moving text use, and how it can enhance visual presentations of text on screens.

Further significance emerges from the fact that the systematic categorisation of type in motion in this study aims to increase our understanding of this new area of digital typography. The framework not only organises existing knowledge, but also

provides a structure for further investigations. The implications and challenges for moving type uses in individual categories can be differentiated by taking into account their separate purposes, contexts and potentials. Very distinct issues and forces need to be considered when text movement is used to increase reading speed, for example, as opposed to movement as expressive form to interpret content.

Furthermore the framework presenting the possible benefits of the moving text use makes it easier for designers to understand when and why they could use movement as their method of enhancing textual display. Additionally, we provide relevant examples illustrating all the discussed reasons to use moving text, which provides guidance on how these benefits can actually be achieved in practice.

5 Framework Towards Understanding Principles Behind Moving Type Use

As explained in the methodology section, we aimed to create a framework that would help to categorise moving type uses based on how they affect reading, viewing and using of text. Table 1 on the following page exemplifies the framework with a number of existing cases of moving text. The criteria used to select these particular cases of moving text were: moving type use, in a screen environment, and at a functional level (prototype user tested or publicly exhibited). Our analysis revealed five categories that constitute our framework: 1. moving text enhancing reading (readability), 2. moving text enhancing viewing (typographic form), 3. moving text enhancing both readability and form, 4. moving text enhancing both readability and using text (interactivity), and finally, 5. moving text enhancing both form and interactivity.

6 Discussion of the Framework

This section further explains each category comprising the framework of moving type use. The cases summarised in Table 1 are discussed in greater detail at the beginning of each section, followed by a relevant discussion.

6.1 Readability

Cinema display boards provide timely and important information to the patrons and passers-by alike. One of such installations is the *Electronic Readerboard* at the Greater Union Cineplex in Bondi Junction, Sydney. The multicoloured LED (Light Emitting Diode) board, comprised of 8 lines with 60 one-character LED elements each, provides flashing announcements, scrolling text and an ever changing content. Because of the amount of information to be displayed (variety of movie titles and show times plus additional content, e.g. special promotions), the limited display space becomes an important issue to overcome; temporal changing of the displayed text aims to provide an answer to this problem.

On a smaller scale, one or two-line LED *Moving Message Signs* are used to display scrolling text, a text movement from right to left, sometimes referred to as 'Times Square Scrolling' [2]. The company Computronics designed and manufactured a range of such custom Electronic Message Signs for Melbourne's Federation Square complex. Over 165,000 individual LED modules have been used. Text presented in the 'Times Square Scrolling' can move either in a smooth manner or in saccadic jumps. It allows an endless stream of text to be presented in a very limited space.

In the examples above, moving type is used solely to improve the reading process. Such a treatment of text links back to what Beatrice Warde [7] describes in her essay 'The Crystal Goblet' as 'transparent' or 'invisible typography'. In the invisible typography, the formal aspects of a typeface and its treatment are used to improve readability of a text, but without the reader being aware of it. In this category of moving text, the kinetic type should ideally become such an invisible container for content. It should become what Warde describes as 'a non-intrusive servant', aimed to improve effortless reading, not interruptive to the reader.

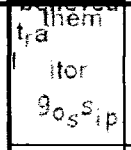
This presents a number of challenges in this group of moving text uses. The 'non-intrusiveness' is particularly hard to achieve because formal aspects of typefaces used on LED message systems are still not well developed. Furthermore, the speed is constant and does not take into account the content to be read, where some words may take longer to understand than others.

Why do those projects aim to use moving type to improve effortless reading? The moving text is seen as a way to address the problem of confined screen space, or emphasise the actuality of content. According to Johnson [8] from Dynamic Digital Signage, research suggests that motion in Point-of-Sale advertising displays results in greater retailer receptivity (70% of retailers would choose motion over non-motion) and higher sales at regular store prices (an 88% average gain above normal sales). The research provides the following reasons for retailers deciding to install motion signage: customers get up-to-date information about products or services, the displays can be used to educate consumers on products and entertain them while they shop, as well as advertise the latest specials; finally, they can make more efficient use of space without producing clutter that turns customers away. Moving displays also get customers' attention, and

may engage them even more when they wait for a next piece of text to appear.

Another finding that is important in this category of moving type use is Bergfeld-Mills & Weldon's [2] claim that having a stationary image of the text for a longer period of time at display appears to be more important to readers than having the continuity of movement that occurs with smaller jumps. Presenting whole words in 'Times Square Scrolling' appears to facilitate performance more than continuous scrolling where words are slowly revealed and do not appear as a unit [2].

table 1. framework towards understanding reasons behind moving type use.

	MOVING TYPE EXAMPLES	reading	viewing	using
	**Electronic Readerboard** *(GU Cineplex, Sydney)* Multi-coloured information board in cinemas, with flashing announcements, scrolling text and changing content	■		
	**Moving Message Signs** *(Federation Square, Melbourne)* Single and multi-line red and yellow LED modules installed at Melbourne's Federation Square complex	■		
	**Tide 'Shakespeare'** *(Cooper/Imaginary Forces)* Broadway Commercial at display on Times Square, New York, using animated expressive Typography		■	
	**Movie Title - 'Se7en'** *(Cooper/Imaginary Forces, 1996)* Title sequence from David Fincher's psycho-thriller 'Se7en'		■	
	**Active Text in 'It's Alive!'** *(Lewis, 1996)* Prototype that presents the reader with a text enhanced by the 'Active Text' component that allows to integrate animated text in chat-spaces, email, or web-sites	■	■	
	**A Typographic Movie** *(University of Technology, 2005)* Design project that uses moving type to represent an edited version of a text about typography in an animated form for screen display	■	■	
	**Speeder Reader** *(Back & Harrison/Xerox PARC, 2002)* Prototype that allows people to navigate a text space using the driving metaphor (e.g. steering wheel used for navigation; accelerator pedal for display speed)	■		■
	**Virtual Shakespeare** *(Small, 1996)* Shakespeare's plays made available in an interactive form where the user is enabled to navigate a large body of text in a 3D screen environment without confined borders	■	▪	■
	**Interactive Poetic Garden** *(Small & White, 1998)* Art installation that uses a computer and a video projector to create the illusion of text floating on the surface of the water as it flows through an artificial garden	▪	■	■
	**Letterspace** *(Cho, 1998)* A tool for manipulating type within a 3D screen environment using a gestural interface		■	■

6.2 Typographic Form

The groundwork for literally moving type was laid when cinema started to explore the possibility of flying titles and expressive, animated type. This includes early works of Saul Bass - e.g. title sequences for Alfred Hitchcock's 'Vertigo' (1958) or 'Psycho' (1961) - that were however still designed using traditional production methods for cinema, for instance multiple exposure or cell animation [9]. The shift to computational devices contributed to further expansion of expressive typography, and moving type in particular. Kyle Cooper with his visually groundbreaking work for the intro-sequence in the film *'Se7en'* (1995), not only made type move in unpredictable ways, anticipating the tension of this thriller, but he also created a trend amongst visual designers to engage with the expressive possibilities of type in motion. The letters in the intro-sequence of 'Se7en' play their own roles, or as Cooper puts it, they are actors, taking on characteristics of their own [10].

The significance of expressive moving type was brought to public attention through the means of popular culture, primarily television and cinema, music videos and commercials. The use of moving type fitted the broadcast media. In *'Tide Shakespeare'*, Cooper used moving type to get attention of busy New Yorkers. The electronic billboard broadcasted an animated type commercial with a Shakespearean theme. The type moves in a whirling fashion mimicking the motion of the insides of a washing machine drum. Not without a reason - the advertised product proves to be a washing detergent. The form and content of the type hint the Shakespearean writing style, although it does not communicate any meaningful information.

Moving type in this commercial serves not only to attract attention of busy passers-by in Times Square, but the movement also helps to convey its meaning because the animated type itself cannot perform this function well. According to Worthington [11], there could be one additional reason behind the pacing employed in this commercial: by using moving type in broadcast media, "the story is read to us in a particular voice" [11, p.39] - the reader attends to a visual narrative, a story is told - all of which stresses the relation to oral history rather than writing [12].

In contrast to Beatrice Warde's [7] view on textual form as invisible interface between reader and author, as discussed in the previous section, the above examples mainly focus on a 'visible' aspect (form) of text. Where legibility was key to please the reader of consecutive texts, the reader now becomes a viewer, viewing a text, engaging with its positioning on the page, and the formal relations constituted within the text and expressed through diversity in typographic treatment (in this case, movement). Form overpowers the content, and the reader/viewer not only notices the form but needs to attend to it. Reading for understanding becomes less important or not important at all.

The movement of type as a new formal aspect adds another layer to the content of the advertisements and movie titles described above, sometimes to a degree where the actual meaning of the words is erased by their typographic form - instead of conveying actors' names in the title-sequence of 'se7en', the type rather communicates suspense, mood, and anticipation. The letters are meant to be viewed, rather than read, and the movement greatly influences this viewing process.

6.3 Readability & Typographic Form

'It's Alive!' [13] is a prototype that presents the reader with a text enhanced by the 'Active Text' component. It allows to integrate animated text in a variety of software applications, from chat-spaces, email, web-sites, fiction and poetry writing, to low-end film & video titling. 'It's Alive!' attempts to address the much wider audience created by on-line communication.

Active Text follows the tradition of the 1950's and 1960's Concrete Poets, where the visual appearance of text is seen as influential in producing meaning from a text. Active Text presents the reader with the new visual appearance of text, in the form of glyphs, words or paragraphs in motion [13, 14]. It treats text as both character and image. Text is given dynamic 'behaviours' at various levels of granularity. These behaviours can include 'happy text' jumping around or 'sad text' moving at a slow pace back and forth.

A similar approach was driving a project undertaken by the first author with undergraduate visual design students at the Faculty of Design Architecture and Building at the University of Technology, Sydney. The students were asked to develop an animation for one sentence each in an essay about typography. While illustrating typographic principles, the students had to interpret the given text and construct a typographic time-based narrative with the means of expressive animated type. All sentences were strung together to a 14-minute animated text called *'The Typographic Movie'*. The speed of reading was very much dictated by the designers' choice of how to present the text in the sequence. Based on the students' feedback after watching the movie, it seems that these time-based decisions are very significant in long animations. When text is presented in a sequential manner, leaving text too long on screen seems similarly significant in forming the reader's understanding as is displaying the text for too short. The movement of type becomes the way to carry the reader from one thought to the next.

The students' solutions ranged from simple cuts and time-based morphs of letters to complex animations. Besides the motion in the pieces being used to guide the viewer through the reading process (where to focus and when), movement was also used to grab the viewers' attention. Furthermore, the moving type was used to enhance the meaning of words or word groups (e.g. the word 'heavy' is set in extra-bold and moves very slowly on screen).

The examples in this category of our framework use moving type to enhance both reading and viewing processes. Moving type greatly influences the formal aspects of visual displays, but, as can be seen through both examples, it does so to improve the readability aspect of a text. Here, moving type takes up the role of the interpreter of content. Although still bridging the gap between reader and author, this time typography pre-digests content according to beliefs and tastes of its individual designer, helping to understand the content in one, specified by the designer, way.

A new formal aspect, in case of 'It's Alive!' called 'behaviour', is meant to help the reader understand the content of, for instance, an e-mail message. In the typographic movie, movement of text adds another interpretive layer that is meant to be 'viewed', not just 'read'. The aim of this new formal aspect however is still to improve understanding. The movement of the text helps the content to be understood better. What is more, it also becomes the way to carry the reader from one thought to the next.

These examples show how moving type can be used to affect the typographic form of text, which in turn is meant to enhance understanding of it.

6.4 Readability and Interactivity

In the mid 1980's a technique called Rapid Serial Visual Presentation (RSVP) was introduced [15, 16], which is very effective in presenting text in limited spaces and small screens. Movement of text occurs mainly along the time axis, leading to reading speed increases of a 3-4 fold [17]. One problem with RSVP text however is how to navigate the text. How can the reader find different sections, appropriate speed, or replay parts of the text at will?

These questions motivated the development of a Xerox PARC prototype, *Speeder Reader*, based on RSVP. It allows people to navigate a text space using the driving wheel metaphor [17]. The steering wheel acts as navigational tool to switch from one lane - one stream of text - to the next. An accelerator pedal controls display speed; subchapter navigation is mapped onto the gear stick. The user is in control of both spatial and temporal movement [17].

In *Virtual Shakespeare*, Small's [3] aim was to enable the user to navigate a large body of text - in this case the works of William Shakespeare. Each character in the play 'A Midsummer Night's Dream', for example, is marked in a different colour. Different typefaces distinguish stage directions, names, dialogues, and commentaries. Each of the five acts of the play are arranged from left to right; additionally, the various Shakespeare plays are stacked one above the other.

To navigate the described typographic landscape, a virtual camera is moved through the three-dimensional (3D) space. Therefore the user can explore the information by using the text's overall shape and colour as cues for orientation.

The examples presented in this section add interactivity through a movement of text. The sheer amount of text in Virtual Shakespeare seems to emphasise interaction with users, and diminish the expressive possibilities implied. In both projects, the reader becomes a user who can navigate the text as they wish. The users are given power to find required sections, replay parts, etc.

As Speeder Reader illustrates, this interactivity can often be achieved through the use of familiar metaphors. The power and ease of the familiar driving metaphor as a navigation device is a significant part of this project. Similarly, in Virtual Shakespeare, the typographic landscape hints a metaphor of a terrain with physical features that help with orientation and navigation.

In both of these works however, moving type is used not only to enhance interactivity, but also to improve reading as such. Speeder Reader aims to increase reading speeds, and Virtual Shakespeare improves accessibility of huge amounts of text.

6.5 Typographic Form and Interactivity

In the 'Stream of Consciousness' project by Small, later developed into an art installation called '*Interactive Poetic Garden*' [18], the interaction component of typographic treatment becomes even more apparent.

> *The computer is used to drive a video projector, creating the illusion of text floating on the surface of the water as it flows through the garden. [The user] can control the flow of words, blocking or stirring them up, causing them to grow and divide into new words that are eventually pulled into the drain. [3, pp.74-75]*

The words are meant to mimic the physical behaviour of objects floating in a real fountain. As the pool circulates, old words are removed, so that over time the words in the water are the words that have been chosen as interesting. The reader, thanks to the movement capabilities of text, can therefore not only control the form of the 'layout', but also the content of the read text.

Small describes the responses of audiences as warm and enthusiastic, emphasising the experiential dimension of his installation:

> *Some people were content to passively watch the words, others would repeatedly damn up the words into chumps and then release them, and others would attack the words so that they divided out of control and filled the water with hundreds of words. [3, p.77]*

Another example of the interactive possibility of moving text is displayed in Cho's gestural interface in *'Letterspace'*, a tool for manipulating type within a three dimensional screen environment [19]. In Letterspace, the user can morph individual letters into different ones or move letters in a three dimensional space, rotate them around or make them disappear into the background. That is achieved by the user holding a 3D magnetic field sensor in each hand, where each sensor represents a letter on the screen. Cho [19] describes the user's reaction to Letterspace as follows:

> *Users of this piece become engaged for a number of reasons: often they see a connection between the physical actions and the visual response, but not an immediate correlation, so they become engaged in "figuring it out"; along more basic lines, they are also engaged physically – they have to stand and flail their arms about. [19, p.46]*

The examples above emphasise the use of moving type to enhance typographic form (viewing), and interactivity (using) of text. What takes centre stage is the expressive formal aspect of type, and the active interplay with the user. The importance of actual reading for understanding is diminished. In the Interactive Garden the words and their actual meaning are less important to the user who is immersed in the interactivity of the piece. A content emerges only as a by-product of this interplay, created by the floating words that are left in the water and generate meaning by their presence.

The users' open ended interaction with the text in an unusual form goes far beyond the passive reception of expressive typographic performance. If text in expressive typography is interpreted by the designer through the form they use, text in an interactive environment is interpreted by audiences in new, non-content related ways within a set of possibilities constructed by the designer [3].

While in the Interactive Garden reading for understanding is not important but still present, the gestural interface in Letterspace and the interaction with type overpowers the content component of the text completely. Letter transitions (viewing) and the physical act of transforming them (using) immerse the user.

The interactivity of the works grouped in this category of our framework does not seem to be utilitarian. While in the previous section user actions were meant to improve accessibility and navigation of read text, in the examples above the interactivity is used a) to engage the user, immerse them, and emphasise the playfulness of moving type in screen media, and b) to empower the user so they themselves can become 'creators' of either content (Interactive Garden) or form (Interactive Garden & Letterspace).

7 Conclusions and Further Research

This study explored a new quality of text offered by the use of technologies and on-screen displays - type in motion. The significance of it is a contribution to the knowledge-base of an area where research is very sparse. The paper aimed to explore why type should move at all, what benefits it can offer, and how it can be best used to enhance the visual display of text. A framework to categorise moving type uses was developed, based on whether the movement of text enhances reading, viewing, or using of a text. This is an attempt to better explain moving text use, and, through the systematic categorisation of type in motion, to increase our understanding of this new emerging quality of digital typography.

Our analysis revealed five categories that constitute the framework: 1. moving text enhancing reading (readability), 2. moving text enhancing viewing (typographic form), 3. moving text enhancing both readability and form, 4. moving text enhancing both readability and using text (interactivity), and finally, 5. moving text enhancing both form and interactivity.

The various categories were illustrated with examples of existing moving type works, which provided a basis for discussion of various challenges and issues specific to each category. Different purposes, contexts and potentials were explored.

In the first category (moving type enhancing readability), the main reason to use moving text seems to be to save 'screen estate' and enable a text to be viewed in confined display spaces. Non-intrusiveness of the moving type seems the biggest challenge. In the category of type in motion enhancing mainly expressive form, the rationale seems to be mainly to attract the user's attention, to set the mood, or to create a new meaning with the formal aspects of a text. The third category includes works where moving type is used to affect typographic form, but mainly with an aim of improving the reading process: guide the reader through the process (pacing), help the reader to understand the content in one, specified by the designer, way, etc. In the next category, improving the reading process is an aim again, this time though

through enhancing interactivity of the work. Moving type is used to increase reading speeds or to improve accessibility of a text - mainly the navigation and orientation aspects. The final category groups projects where type in motion is used to enhance expressive form and interactivity. Engaging and immersing the user in an activity concerned with typographic form seems the main reason to use moving type here.

Hopefully, the proposed framework will help designers to understand when, why and how they could use movement as their method of enhancing textual display. Our further research will try to deepen this understanding of textual movement through empirical studies on the experience of type from a reader, a viewer and a user's perspective.

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WSEAS TRANSACTIONS on INFORMATION SCIENCE & APPLICATIONS

Issue 10, Volume 3, October 2006

ISSN 1709-0832 http://www.wseas.org