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ABSTRACT

To code and analyze research data on videotape, a methodology is needed that allows the researcher to code directly and then analyze the observed degree of intensity of the observed events. The establishment of such a methodology is the next logical step in the development of the use of video recorded data in research. The Technological Innovations in Educational Research (TIER) laboratory has been researching the direct analysis of video records and is developing the VTLOGANL (Video Tape Logging and Analysis) methodology that focuses on the video record as the basic unit of analysis. The first two stages of development have resulted in methods to capture and analyze pulsed and duration events; the third stage will add intensity event coding to the system, as well as the use of a programming language that will provide an interface to the Windows operating system. Technical specifications and program features are described. In addition to providing pulsed and duration coding, VTLOGANL will move video methodologies forward as it incorporates the concepts of intensity coding and fuzzy logic analysis in the stage-three design effort. Four figures illustrate the discussion. (Contains 46 references.) (SLD)

VTLOGANL: A Computer Program for Coding and Analyzing Data Gathered on Video Tape

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VTLOGANL:
A Computer Program for Coding and Analyzing
Data Gathered on Video Tape

Social science researchers employ a wide variety of research methodologies to gather and analyze data. Researchers observe their subjects, conduct interviews and surveys, collect and analyze physical evidence, and examine patterns of erosion. A variety of manual paper-and-pencil techniques, and several computer-based methodologies, help systematize data recording and analysis. Although these qualitative methodologies may be widely varied, commonalities do exist.

Tesch (1990) outlined an number of these commonalities. Among these commonalities were the concurrent collection and mindful, systematic analysis of data, and the ongoing examination and comparison of this data driving the researcher's understanding. For this reason qualitative data manipulation is sometimes seen as an idiosyncratic process, though guided by the desire to create flexible categories that aid in further understanding. Tesch states, "Strictly speaking, there is no such thing as qualitative research. There are only qualitative data." (p. 55). In this way "Qualitative data is any information the researcher gathers that is not expressed in numbers" (p. 55); rather, it is "those kinds of research that predominantly or exclusively use words as data" (p. 56).

Notetaking

One of the least expensive and easiest implemented methods of collecting data in the field is, of course, the taking of written notes with paper and pencil. Gardner, Clements, and Rodriquez (1982) observed that, with written notetaking, the observer can be writing of one event while simultaneously being aware of another. That latter event can be held in the researcher's memory until the current writing is accomplished, then either written immediately following or noted at some later time. The observer also has instantaneous access to context and prior knowledge in making real-time decisions as to what information to record (what events are observed and deemed important for noting) and how that information should be recorded (what words are written in the notes) (p.12). Handwritten notetaking methods of data collection can be quite useful when this kind of on-the-scene information filtration is desired. Another advantage to the notetaking methodology is that the data are immediately for analysis activities. Further, several computer program exist to aid the researcher in the sometime burdensome tasks of written note storage, organization, and retrieval.

Hand-written notes, however, do suffer from a shortcoming. Neal (1989) observed that less data are captured with notetaking, and there is no chance to review the actual phenomenon being observed. Notetaking necessitated preconceived goals and hypotheses if consistency in observations was desired. Notetaking also relies and a consistent application of observer attention to both task and detail, and the ability to accurately recall dialogue and events happening faster than one's ability to write.

Audio Recordings

Audio recordings improve on notetaking, capturing exact words that can be later transcribed and analyzed. The researcher can revisit the field through the audio record, capturing nuances of speech patterns, dialect, and intonation that oftentimes subtly shade the meaning of spoken words. Audio recordings also enable researchers to keep track of the exact words that a person used during a transaction. Relieved of having to rely on subjective memory the researcher can dedicate field time to making written notes of other facets of the interaction, leaving the machinery to reproduce the exact dialogue.

Audio recordings are especially useful when one or two people are being observed, and there is relatively little background noise. Higher levels of background noise, the inability to place to place microphones near enough the speakers for adequate sound reproduction, and multiple and/or simultaneous speakers all reduce the effectiveness of this research tool. In addition, the transcription of audio tapes is a time consuming and expensive task. While a professional stenographer might be able to reproduce a dialogue from audio tape in playback time such transcripts can cost three or more dollars for each double-spaced typed page. Kieren and Munro (1985) found that non-stenographers can take up to two and one-half hours to transcribe 10 minutes of audio tape (p. 13). An additional limitation of audio recordings is that they do not keep track of the nuances of communication – the proxemics and kinetics that we use as a part of our communication.

Video Recordings

Video recordings provide the researcher both auditory information and also visual information. Video captures the voices and the words of the speakers, and also their other modes of communication – what their faces and their bodies say. Video records the ambient sights and sounds as well, information that a researcher might disregard at first, but later come to realize as important. Video recordings relieve the researcher of the mechanical task of transcribing words, picturing environments and describing actions while in the field. Researchers are free to engage more fully in an interview with their subjects. Field notes can be more oriented towards the interpretation of the activity than its verbatim reproduction. Video recordings also allow researchers unlimited opportunities to revisit and reexamine the observed situation. Events can be timed, accurate transcripts of speech written, settings and movement drawn and described, and grounded theory developed then tested against a framework of replayable data, multiple researcher analysis and subject feedback.

As early as 1984 Ingle noted that "videotape recordings represent a powerful tool for capturing and preserving an event in ways that no paper-and-pencil measures, paired human observers, prose, anecdotes, or audiotapes can document totally" (p. 46). Video is especially useful for preserving events that might have been lost but for the use of video. A superb example of the capacity of video recordings to inform comes from Schnell, who in 1992 used C-SPAN videotapes to study the "language of aggression" during the Persian Gulf war. Repeated watching and listening of tapes allowed Schnell to uncover that President George Bush's pronunciation of Saddam Hussein's name carried a pejorative meaning. Schnell's observations of these speeches revealed that President Bush's pronunciation of Saddam Hussein's translated as "orphaned shoe shine boy" rather than "revered one", as his name means when properly pronounced. He observed that this finding, which could not have been made from written transcripts alone, is useful in explaining some of the dynamic of tension between these two leaders during this period in time.

Video, by the very virtue of the greater amount of information it provides, also creates a problem for the social science researcher. Data overload is intensified by video, since so much more detail of the event is preserved and available for analysis. While this heightened level of detail can lead to a better understanding of people and situations, the sheer volume of available information can overwhelm even the most practiced analyst (Knapp and Harrison, 1972). As Carter and Anderson (1989) note, researchers must develop, prior to actual data collection, a methodological framework that identifies video as the appropriate technique for collecting the detail and type of data appropriate for investigating the question(s) at hand.

Analyzing Video as Text

Two techniques have emerged for analyzing video recorded data: a verbatim transcripting of spoken language, including a descriptive narration of actions, settings, and activities; and word or short phrase coding of conceptual expression, representing an interpretation of verbal and visual observations. A review of the research literature reveals that many researchers who use video for original data collection first transcribe the video tape then analyze the resulting transcript using textual analytical processes. Barba and Rubba (1992) used this procedure to develop a procedural task analysis of students' existing knowledge and misconceptions while solving science problems. In another study of students' thinking, Shotsberger (1993) used video and transcripts to help develop a generic means of analyzing think-aloud protocols. Lo, Wheatley, and Smith (1991) studied how students talked about mathematical processes. Scarselletta (1987) created an instrument to code processes of various kinds of children's play using transcripts of videotape.

Other researchers use some form of concept coding to analyze their videotapes. Stallings & Giesen (1977) used general codes to describe the behaviors of children in their study of reliability of coding procedures. In her study of prelingual children with choclear implants, Tait (1993) used a combination of transcription and coding, wherein the way words were written combined with various symbols held meaning for analyst. In all of these studies, the unit of analysis from which the theory or the findings are derived is the document resulting from transcription or coding. Packer and Richardson (1989) attempted to preserve the richness of the video data by tagging video and transcripts with codes that would allow for later access and retrieval.

A major advantage of using text as the unit of analysis is that the analysis of text is a relatively straightforward process. Glaser and Strauss (1967), Miles and Huberman (1984), and Guba and Lincoln (1986) have developed, tested and refined means for collecting, sorting, aggregating, analyzing and reporting data expressed in a written format. Several computer programs have been developed that can aid the researcher in both the management of the textual data and its analysis. Winer and Carriere (1990) describe the use of a relational data base to analyze qualitative data. In their paper, they discuss how to set up the conceptual model, then use the Reflex Plus relational database to manage the links and relationships. Beer and Jensen (1991) discuss Hypertext and how it enhances in the researcher's ability to create and understand multiple explanations of the data collected. Walker (1992) compared three software packages: Ethnograph, GATOR, and Martin. Walker found that the strengths of The Ethnograph and GATOR included Boolean search capabilities, useful when analyzing coded data, and the ability to create "nested codes". Martin was similar to hand-analysis, with "cards" and "folders" providing the sorting mechanisms. Other computer-based methodologies include: HyperRESEARCH, Max, AQUAD, NUDIST, Textbase Alpha and QUALPRO.

The re-expression of audio and video data into written text for classification and analysis is compelling. Although familiar and comfortable, the analysis of text derived from a video record runs the risk of disregarding the complex interrelatedness of words and actions, expression and activity (Knapp and Harrison, 1972). The richness of events captured on the video tape sit unexamined in the plastic cassette, supplanted by the flat, written word. Only by using the audio-video recording as the basic unit of analysis can this wealth of information not be lost.

Analyzing Video as Video

Since the advent of video tape technology, researchers have sought means to avoid this discarding of useful information by performing their analyses directly from the video tape. Early researchers were hampered by overly complicated and costly video equipment not designed for this task, and the lack of a coherent methodology for categorization and review. Many report having used video to collect and analyze their data, using a process best described as having watched and re-watched the field video over and over until the meaning becomes clear. In the past few years, though, several systematic methods have emerged as potential ways to conduct an analysis of video data.

Videologger, a software package and methodology described and developed by Krauss, Morrel-Samuels, and Hochberg (1988), provides the user with a way to document specific, preordained events having multiple durations. Videologger uses one of the audio tracks available on a video tape as a marker, creating an audio notation when the videographer pushes a button on the camcorder indicating that a desired event is beginning and ending. EVA, developed by Wendy Mackay (1989), allows for annotation of the videotaped data as it is collected in the field. It can also be used to find tags created by the researcher, then to transcribe the audio track, then view the video with the transcription running at the same time. Roschelle and Goldman (1991) developed the VideoNoter, a methodology that links the video record with transcripts, codes, annotations, and other secondary records of data. They describe their method as a system of progressive refinements, enabling the researcher to focus in on the most interesting or applicable parts of the data. A later version, called CVideo, became available in 1992.

In 1993 Goldman-Segall reviewed three software packages designed to aid in the analysis of videotaped data: CVideo, VANNA, and Learning Constellations. According to Goldman-Segall, CVideo allows the user to keep linear records of the data for later analysis, but it does not allow for manipulation within the database it creates. Transcription and annotations can be added to a window, and a bar at the edge of the window allows for easy scanning of the events contained on the video tape. VANNA, the Video ANNotation and Analysis Tool, was not commercially available at the time of their review. This package will purportedly allow for real-time annotation and coding of data, presumably in the field, since it can be hooked up to a camcorder. Learning Constellations, Goldman-Segall's own video annotation system, allows the researcher to code and analyze video, sound, or textual data into what are referred to as "star chunks". Star chunks can be any kind of data, and they can be later retrieved and manipulated for analysis.

Limitations of the Current Methodologies

An examination of the current methodologies, whether text based or video based, reveals a commonality for recording and analyzing two distinct kinds of events: pulsed events and duration events. A pulsed event is one where the researcher codes only for the occurrence of the event and not its duration. It may be that these events do not have a meaningful duration, or an analysis of the duration of the event is not of interest. Pulsed events are common in behavioral studies, where an animal's press of a bar (for a food reinforcer) or a student's raising of a hand (during a class session) are the events of interest. The researcher want to know when these events occur, how much time goes by between events, and the ordering and simultaneity of different events under study.

A duration event, on the other hand, is one in which the researcher codes both the occurrence of the event and the amount of time that event lasts. The researcher is concerned with how long the event lasts, and must indicate when the event starts and stops in order to compute the event's term. Duration events are also seen in behavioral studies (such as the amount of time spent on particular tasks), and in studies of higher order processes (such as patterns of speech relating to certain topics and movement in an environment). In addition to the kinds of analyses done on pulsed event codes, duration events also allow the computing of basic descriptive and relational statistics concerning the span of the event, the interval between events, and event periodicity.

Fortunately, human interactions are not limited to just pulsed or duration events. Human beings express degrees of saturation and intensity in interactions with others and our environment. For example, a researcher might be studying the reaction of a subject to a particular occurrence. It would be possible, in this example, to code every instance the subject smiles in response to a purportedly humorous situation as a pulsed event (see the bottom portion of Figure 1). It would also be possible to code the length of time the student spent laughing as a duration event (see the middle portion of Figure 1). These pulsed and duration codings are coarse attempts to discretely measure a continuously occurring conceptually-based phenomenon, which might be referred to by the label "happiness".

Insert Figure 1 about here

What is needed is a methodology that allows the researcher to directly code then analyze the observed degree or intensity of the observed events. Such a coding scheme might establish a sliding scale ranging from 0, where the event is not observed to any degree, to 100, where the event is observed in its highest degree. A single codeword would be established for recording the continuously variable observation with the researcher free to vary the <u>intensity</u> of the expression of that codeword depending on their interpretation of the observed events. This record would be much more reflective of the true state of change over time, much more sensitive to small variations in intensity, and much easier for the researcher to accomplish (see the top portion of Figure 1).

The establishment of a methodology to record and analyze intensity coded multivalued events is, however, the next logical step in the development of the research use of video recorded data. Intensity (or degree) coding promises to more accurately reflect subtle changes in the intensity of an observed event. Directly varying the intensity of a single codeword, instead of using many codewords with different degrees of meaning, greatly simplifies the data recording task. Intensity coding also holds the promise of a higher quality of analysis, with combinations of varying amounts of overlapping codewords forming the basis for generalization and conceptual organization.

The VTLOGANL Development Effort

Since 1991 the Technological Innovations in Educational Research (TIER) laboratory has been conducting research on the direct analysis of video records. Unlike other text and video analytic methods the TIER lab methodology de-emphasizes transcript and written description as an unnecessary complication of the analytical process. The VTLOGANL (for Video Tape Logging and Analysis) methodology focuses on the video record as the basic unit of analysis. While relieving the researcher of the burdensome task of transcription, VTLOGANL does require the researcher to form conceptual interpretations of the audio and video record under scrutiny.

The VTLOGANL methodology is being developed and refined using a staged strategy. Stage one in the process required the acquisition of computer and video equipment, and learning the different ways video camcorders and recorder-players could be interfaced to a computer system. This initial development was designed to provide coding capabilities for pulsed event recording. It involved a fairly rudimentary computer control of the video deck, and storage of codes in a Dbase IV data base file. While this stage provided important information about coding and software development the production methodology (no longer available) was slow, difficult to learn and master, and could only simulate duration events through repeated pulsed codings.

Stage two involved the development of methods to capture and analyze both pulsed and duration events. This work moved the development environment from a Dbase IV platform to the faster environment of Microsoft's Professional Development System (PDS) Basic version 7.10. The interface between the computer and video deck was improved for speed and reliability, and a faster ISAM data structure created for codeword storage and retrieval. The current version of the methodology (2.79) expresses this accomplishment.

Stage three, currently under development, will add intensity event coding to the system. For future portability, maintenance, and operational speed the entire project is being recoded in Borland's C++ programming language. This change will also provide an interface to the Windows 3.1 operating system, giving the software and consistent and easy to learn user interface. In addition the number and kinds of interfaces among computer and video hardware is being expanded.

VTLOGANL v 2.79 Technical Specifications

The current version of VTLOGANL (version 2.79) is designed to be used on a MS-DOS computer system. The software was written in the Microsoft Professional Development System (PDS) BASIC language (version 7.10) and has been tested under MS-DOS version 6.0 and greater. The development system is a 486/33DX computer with 8MB of memory, 240MB of hard disk space, dual floppy drives (3.5" and 5.25"), a

VGA color monitor, a mouse, two serial ports, and a parallel printer port. VTLOGANL has been run successfully on as small a system as a 386/25SX with 4MB of memory and 80MB of hard disk space.

VTLOGANL uses Indexed Sequential Access Method (ISAM) data files with in-memory buffers for high speed data retrieval and access. In its logging mode VTLOGANL must be constantly communicating with the slaved video tape recorder/player (VTR), its own ISAM data base, and the user operating the keyboard and mouse controls. A minimum of 2MB of memory beyond the 640KB of base memory found in most MS-DOS machines is required for adequate performance. In addition, the faster the processor the better able VTLOGANL is to keep up with the demands of the equipment and user at high speeds. Finally, a minimum of one available serial port is needed in order to connect a VTR to the computer for real-time playback and control.

VTLOGANL will also interface with selected video tape decks that are capable of being controlled through the standard RS-232 serial port on the computer. The TIER lab has tested two decks to date: the Panasonic AG-1960 (with RS-232 serial control) and the Panasonic AG-5700 (with RS-232 serial control). Version 2.79 of VTLOGANL will also interface, with the appropriate communication cable, to certain of video camcorders and VTRs using the SONY Control-L (or LANC) communications protocols. This option is not as fully developed as the RS-232 interfaces, however, and may not work correctly with all equipment or under all circumstances.

VTLOGANL v 2.79 Terminology

Four basic data elements are defined within the VTLOGANL system: project, tape, codeword, and logged event. VTLOGANL creates a separate data file for each and every project defined. The name of the project data file (always ending in the suffix .VTL), in addition to a project description, help to identify the project and keep it separate from other project files. The number of projects used is limited only by the amount of disk storage available on the computer system.

VTLOGANL is designed to log information captured on video tapes. Before any logging of recorded events is done the researcher must define the video tape to be logged to VTLOGANL. Each reel of video tape is given a unique tape number (from 1 to 999). Broad-scope descriptive information about the events recorded on that video tape are stored (see Figure 2). VTLOGANL also requires the researcher to declare the events to be coded as either free events or fixed events. A free-events tape allows codes to be logged at any time index on the tape. Free coding usually occurs when an entire tape is observed. Sometime, however, a research design call for observing for a certain amount of time every so often. Fixed-event tapes allow the research to declare the span of coding interval and its period (for example, observing 30 seconds every five minutes).

Unlike for free-event tapes, VTLOGANL will force logged codes to adhere to the interval and period defined for the fixed-event observations.

Insert Figure 2 about here

Information is expressed through the use of codewords (see Figure 3). A codeword is an eight character (maximum) shorthand for the conceptual meaning attached to a particular event observed on a video tape. VTLOGANL will allow a maximum of 9999 codewords in any single project file. In addition to the codeword name and description, the researcher can designate default duration of the codeword when it is applied to an observed event. A duration of 00:00:01 (one second), the shortest period of time that can be logged, describes a codeword representing a pulsed event. Duration events, on the other hand, can have either a specified duration or a duration of 00:00:00 (zero seconds). VTLOGANL interprets a zero second duration codeword as one which the researcher will manually indicate a starting and stopping time for each time the codeword is used. Codewords are also assigned an outline number, useful for organizing the presentation of codewords according to a larger, thematic structure. VTLOGANL also allows the researcher to assign up to 45 different codewords to double-key combination quick-keys, speeding the task of logging.

Insert Figure 3 about here

A logging of events is done through a logging window in VTLOGANL. This window may be accessed in either Actual mode (with a VTR slaved to the computer system) or in Virtual mode (with the computer system's internal clock simulating VTR playback). The bottom portion of the logging window presents the researcher with graphic controls (accessed either through the computer's mouse or function-key presses) for controlling the operation of either the actual or virtual VTR. VTLOGANL allows for the simultaneous expression of up to 30 different codewords for each second of tape time. Each codeword is displayed in a particular slot on the logging window. along with the starting and stopping time of that codeword's current duration. During logging VTLOGANL will place new codewords in the first available slot, or the researcher can designate certain codewords to only appear in certain slot locations, organizing the logging screen according to major themes being logged (see Figure 4).

Insert Figure 4 about here

VTLOGANL v 2.79 Features

The major purpose driving the second stage VTLOGANL development was to provide social science researchers using video tape a quick and easy method that could be used to attach pulsed and duration coded meaning to recorded events. VTLOGANL accomplishes this purpose though a combination of important features:

- Menu-driven software. Researchers with limited computer experience find the VTLOGANL interface quick to learn and easy to master.
- VTR slaved directly to the computer. This feature allows the researcher to control all VTR function directly from the VTLOGANL logging screen. It also allows for an accurate recording of coded event start and stop times (up to 1/30 of a second accuracy depending on the VTR equipment).
- Fast coded event retrieval. VTLOGANL's in-memory indexed sequential access method data files allow it to display, in real-time, previously coded events while simultaneously adding new codewords. This same access system also speeds the production of printed reports.
- Virtual mode operation. By using the computer system's internal clock to simulate a VTR researcher's can revisit the logging task without the need for having a real VTR running. This feature permits an off-line examination of logged events when critical VTR equipment is at a premium.
- Simplified report production. VTLOGANL allows for the printed reporting of all data elements. Codewords can be reported in either alphabetical or outline number order, and several options exist for aggregating and reporting logged events (including the calculation of basic descriptive statistics). Logged events can also be selected to report to either a comma delimited ASCII text file (for those researchers desiring to move data into another software package for more detailed analysis) or an Edit Decision List (EDL) ASCII text file (for those researchers having access to computer-controlled video editing equipment). An EDL can be used to automatically assemble a single tape showing one (or more) coded events copied from different points on several source tapes. This VTLOGANL feature makes it possible to revisit similarly coded events that might have occurred across several different tapes by combining the events end-to-end on a single tape.
- Automatic recoding and code reduction. A feature of the logging module is the ability to automatically rename codewords. Codewords originally given confusing labels can be renamed, and several different codewords collapsed into one. Reorganization of the coding schema is possible since automatic recoding affects all logged events in the project.
- Data import and export. Any of the four data elements can be exported from the project file or imported into the project using this feature. VTLOGANL uses standard comma-delimited text files for data transfer,

allowing VTLOGANL data to be freely interchanged with other data analysis software like Dbase and SPSS/PC+.

- Project file integrity. Both internal and separate stand-alone programs are provided with VTLOGANL to insure against data loss in the event of unexpected project file corruption. While VTLOGANL has been engineered to be fault tolerant, these utilities provide a means for salvaging logged data in the worst computer hardware failure situations.

VTLOGANL Stage Three Development

The traditional method for making a knowledgeable decision in the case of uncertainty is based on modern extensions of Aristotelian logic. This system of logic holds that phenomena can be classified as either belonging or not belonging to a set of similar phenomena. Boolean combinations, commonly used during the analyses of pulsed and duration coded events, allow the researcher to query: one event AND another, one event OR another, one event NOT another, and the like (Kandel, 1982). Working well for discrete events (such as the pulsed or duration events available in the current version of VTLOGANL), this same system of analysis suffers when set definitions are not crisp. Pulse or duration methods of coding would inform us whether a subject was viewed as happy or not at a particular moment in time, while degree coding tells us the researchers interpretation of how much happy the subject was. A logical system recognizing varying degrees of set membership is needed to fully analyze and understand the data intensity coding will produce.

Fuzzy set theory, as it has been described by its chief advocate (Zadeh, 1965), describes things as they are, without seeking to draw artificial lines between being and not being. According to McNeill and Frieberger (1993, p. 35), "Fuzzy sets glide smoothly across the truth continuum". By allowing partial membership, fuzzy sets give more information and allow for better discrimination among members of the set. For example, a crisp (Aristotelian) distinction would declare that a person is either happy or not. In the formal language of traditional logical reasoning the person would either be a member of the set 'people who are happy' or they would not. A definition would have to exist carefully defining when someone is happy and all would have to agree to that definition. In a system of multivalued logics, however, observations would be graded on the degree to which the subject exhibits the qualities of happiness. The amount of their membership in the set of 'people who are happy' is dependent on the degree of the expression and the researcher's interpretation. Fuzzy logic seeks to use language and interpretations the way that people actually use it, rather than to force language and definitions that are not natural or intuitive (Zadeh, Fu, Tanaka and Shimura, 1975).

Although the application of fuzzy logic has become well known in the areas of process control and manufacturing, it has been somewhat slower to gain widespread use in the social sciences (Wang and Chang, 1980; Wang, 1983). An increasing number of studies, however, validate the utility of reasoning through a system of multivalued logics in economics, psychology, sociology, and education (Zimmerman, 1985). In 1977 Gregg Oden applied the principles of fuzzy logic to research on semantic memory, discovering that a fuzzy model predicted the students' responses better than any traditional model could. Paul Kay and Chad McDaniel (1978) developed a fuzzy model explaining the neurophysiology of color visual perception. Arne Pfeilsticker (1981) proposed that economic principles were better expressed and understood through fuzzy principles. Methods exist for building, maintaining, and searching fuzzy databases (Zemankova-Leech and Kandel, 1984). Bart Kosko has been developing a system for building and validating fuzzy cognitive maps (FCMs) (McNeil and Frieberger, 1993). Kosko expects that "analysts will be able to work easily with the maps, as they have with other fuzzy devices, because they can comprehend them. They don't have to understand mathematics. They can just common-sense argue it" (p. 239). This movement to common language and graphical representation mirrors the development and proliferation of the more quantitative techniques of structural equation modeling and their orientation towards model building and confirmation (Bentler, 1989).

The third stage development efforts currently underway are planned to allow VTLOGANL to handle all three kinds of event coding requirements: pulsed, duration, and intensity. In addition to traditional boolean logic queries VTLOGANL will include fuzzy analytical methods that can be applied to intensity coded events.

Conclusion

VTLOGANL has been instrumental in the conduct of several research efforts including Project Homeroom and Project FIRST (Hecht and Dwyer, 1993; Roberts and Hecht, in review; Hecht, 1993a and 1993b; Hecht and others, 1992 and 1993; and Dwyer and Hecht, 1992). The VTLOGANL method is also gaining acceptance as it is disseminated through research meetings (such as this session and in Roberts, Hecht, Dwyer and Schoon, 1993). This development is important, since the acceptance of data collected and analyzed through the use of video tape will remain somewhat suspect until more refined and tested methods are in use by the research community. In addition to providing pulsed and duration coding, VTLOGANL will move video methodologies forward as it incorporated the concepts of intensity coding and fuzzy logic analysis in the stage three design effort. The combination of these techniques will provide systematic, reproducible methodologies that allow social science research both flexibility in coding and new means of understanding the nature of human interactions.

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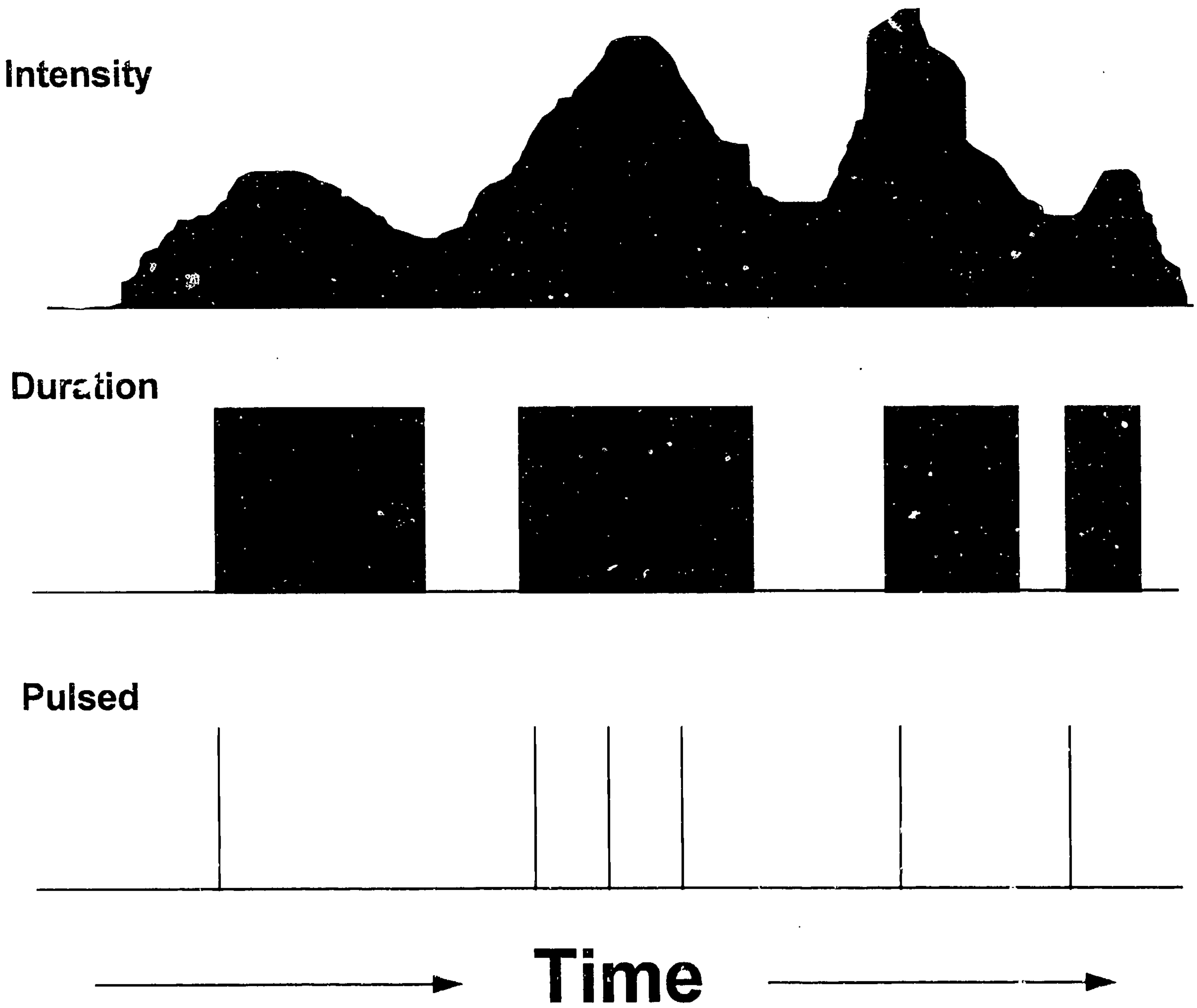
Intensity
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Maintenance Tape Descriptors

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Maintenance Codeword Definitions

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[VTLOGANL]   Command:{   }   {TEST}

Tape #1

Description: This is the first tape in a test project   Free coding

	<SHIFT> (Slots 1 - 10)	<CTRL> (Slots 11 - 20)	<ALT> (Slots 21 - 30)
F1			
F2			
F3			
F4			
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F8			
F9			
F10			

<F> Key: <1> <2> <3> <4> <9/10> <5> <6> <7> <8> Virtual

Stop  : : 0