THE STATISTICAL CHARACTERISTICS OF EVENT DATA

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ABSTRACT

This paper explores event data as an abstract statistical object. It briefly traces the historical development of event data, with particular attention to how nominal events have come to be used primarily in interval-level studies. A formal definition of event data and its stochastic error structure is presented. From this definition, some concrete suggestions are made for statistically compensating for misclassification and censoring errors in frequency-based studies. The paper argues for returning to the analysis of events as discrete structures. This type of analysis was not possible when event data were initially developed, but electronic information processing capabilities have improved dramatically in recent years and many new techniques for generating and analyzing event data may soon be practical.

Key words: Event data, statistical analysis, machine coding

INTRODUCTION

Event data — nominal or ordinal codes recording the interactions between international actors — are one of the most common types of information used in quantitative international relations research. McGowan et al (1988) note that the CREON, WEIS and COPDAB event data sets are collectively comparable in numbers of citations to the *World Handbook*[1], itself second only to the Correlates of War data set. The aforementioned event data sets plus the event data portions of the *World Handbook* and Gurr data sets account for 41% of all institutional requests for international relations data sets from the ICPSR (McGowan et al, 1988: 111). The advantages and disadvantages of event data have been extensively discussed elsewhere (e.g. Andriole and Hopple 1984; Azar and Ben-Dak 1975; Burgess and Lawton 1972; Gaddis 1987, Howell et al 1986; *International Studies Quarterly* 1983; Laurance 1990; Merritt 1987; Merritt, Muncaster and Zinnes, 1993; Munton, 1978; Peterson 1975; Schrodt 1994) and while the approach is not without problems, there is every reason to believe these data will be in use of some time to come.

Event data come in a variety of forms and coding schemes. The most widely cited sources are Azar's (1982) COPDAB (Conflict and Peace Data Bank) and McClelland's WEIS (World Events Interaction Survey). Both are comprehensive: they attempt to code all interactions by all states and some non-state actors during for a period of time. In contrast, specialized event data sets such as Hermann's (1973) CREON (Comparative Research on the Events of Nations) and Leng's (1987) BCOW (Behavioral Correlates of War) focus on specific subsets of behavior, foreign policy and crises respectively. A variety of domestic and international event data collections, usually focusing on a limited set of actions such as uses of force, domestic violence, or changes of government, are embedded in other data sets such as Rummel's DON (Dimensionality of Nations), the *World Handbook*, and various Gurr data sets[2]. In addition to the data sets in the public domain, event data have also been collected by governmental agencies such as Department of Defense and various intelligence agencies in the United States (see Andriole and Hopple,1984; Hopple, 1984; Daly and Andriole 1980; Laurance 1988) and private consulting firms such as CACI Inc. and Third Point Systems (Howell et al 1986).

Despite their prevalence in contemporary quantitative studies, event data are odd statistical objects: they are nominal random variables occurring at irregular intervals over time subject to non-random selection bias. The conventional statistical repertoire has almost no techniques explicitly designed for such data and, as Achen (1987) points out virtually no original statistical work has been undertaken to fill these gaps. As a consequence, event data are commonly aggregated and then analyzed using interval-level statistical techniques.

This article will provide an overview of the statistical issues inherent in event data and provide some suggestions as to how those issues might be addressed. The discussion is necessarily somewhat abstract, and as such differs substantially from most of the event data literature, which tends to emphasize concrete issues as such source biases in the *New York Times*, whether there is a cooperation-conflict dimension, and methods of improving intercoder reliability[3]. In contrast, I focus on the theoretical *what*, not the *how,* of event data generation and analysis. I assume a familiarity with the basic concepts and implementations of event data and basic statistical terminology; the discussion is largely oriented towards the two comprehensive event data collections, WEIS and COPDAB, though most is also relevant to specialized data sets such as CREON and BCOW.

STATISTICAL ANALYSIS IN THE EARLY DEVELOPMENT OF EVENT DATA

The development of event data sets is well documented: Merritt (1987) provides an excellent overview; Azar, Brody and McClelland (1972) provide a series of papers coming out of Azar's Michigan State University event data conferences during 1969 - 1971. The early theoretical development of WEIS is thoroughly discussed in a series of papers by McClelland (1967a, 1967b, 1968a, 1968b, 1969,1970)[4]; Azar's early development of COPDAB is also fairly well documented (see for example. Azar and Ben-Dak. 1975, Azar et al 1972; Azar and Sloan, 1975).

In these early discussions, neither the statistical characteristics of event data nor the formal specification of the models for which the data were appropriate are commonly mentioned. Instead, most of the discussion focused, as it does today, on issues such as the definition of an event, coding reliability, event categories and coding scheme, and source bias and language problems. Issues of statistical modeling are almost always implicit rather than explicit in the event data literature. As Achen (1987) notes, this distinguishes event data research from most of the statistical social sciences (e.g. econometrics and survey research) where the statistical characteristics of data have been exhaustively specified and researched.

McClelland (1970) provides one of the earliest and most theoretically sophisticated discussions of the role of events in the study of international behavior. For McClelland, event data form a bridge between the then-prevalent general systems theories of international behavior, and the empirical basis of our understanding of that behavior through textual history.

> ...International conduct, expressed in terms of event data, is the chief dependent variable of international relations research. ... It is interesting that a starting point is provided as readily by the ordering principle of classical diplomatic history as by the basic concepts of general system analysis. Thus, we may assert that the prime intellectual task in the study of international relations is to account for actions and responses of states in international politics by relating these to the purposes of statecraft or, alternatively, we can say that the problem is to account for the relations among components of the international system by analyzing the characteristics of the various components of that system by tracing recurring processes within these components, by noting systematically the structure and

> processes of exchange among the components, and by explaining, finally, the linkages of within-component and between-component phenomena. Obviously the classical definition of diplomatic history is less ponderous and more literary than the general system definition of the task but both, as we shall seek to show next, carry about the same information and involve nearly the same range of choices of inquiry and analysis. (McClelland, 1970:6)

McClelland did not adopt the approach of diplomatic history completely. He would explicitly reject the utility of motivational information, which is necessarily inferred, and also reject the "Ranke tradition of painstaking research and recovery of all extant evidence" (McClelland, 1968b:163) in favor of focusing on overt actions recorded in a single source. However, McClelland accepted most of the standards of theory and evidence from diplomatic history as a starting point and wanted to supersede these with the more rigorous and systematic approaches of general systems theory. McClelland, in short, was proposing a Lakatosian, rather than Kuhnian, transition from traditional to behavioral models; an evolution rather than a revolution.

In McClelland's assessment, however, this transition failed. After some years of work with event data focusing on several crises, he concluded:

> It proved relatively easy to discern event patterns and sequences intuitively. We found we could follow the successions of action and response in flow diagram form. Stages of crisis and the linkage of event types to temporary *status quo* situations also were amenable to investigation. We were defeated, however, in the attempt to categorize and measure event sequences. This was an early expectation that was disappointed by the data which showed too few significant sequences to support quantitative or systematic treatment. (McClelland, 1970:33)

As a consequence of this failure, McClelland's "World News Index" project, published in the mid-1970s, used continuous variables in its measures. With the hindsight of two decades, the failure of a discrete event approach appears due to a paucity of data and processing capability. McClelland writes of analyzing hundreds or at most thousands of events; a contemporary event data researcher has available hundreds of thousands of events and computer power sufficient to work with millions.

After this early definition of international politics as event sequences, the field of quantitative IR moved rapidly to analyzing events with interval-level techniques. This change was probably due to the general shift in quantitative IR in the late 1960s away from historical approaches towards theories based on the model of the physical sciences and economics. By the 1970s a Kuhnian split was underway in international relations with the traditionalist and behavioralist camps proudly speaking totally different languages, whereas when McClelland's 1961 *World Politics* article was written, this split was not apparent. For example, Rummel (1972) proposes a science of international politics similar to meteorology, using interval-level metaphors such as field theory and interval-level techniques such as factor analysis. Azar, while using WEIS as the model for COPDAB, abandons McClelland's nominal categories in favor of an interval-level measure and approached coding as a scaling problem. Azar and Sloan (1975) consists entirely of interval-level data and Azar (1980:150) emphasizes

> quantitative aggregations, called here 'analytic data', [which] are summaries of the weighted frequencies of interactions. They describe the amount of conflict or cooperation exchanged between or within nation-states over some unit of time.

This conversion of discrete entities to interval-level data is somewhat puzzling from a statistical standpoint. The reason probably is due as much to paradigmatic developments in quantitative international relations as in the nature of the data. During the 1970s, data-based studies of international behavior saw the ascendancy of correlational analyses, particularly regression. The mathematics behind these techniques had been fully developed by econometricians and could be easily applied to international relations data using SPSS and other statistical packages; comparable tools were not available for sequence analysis. The successful formal theories were continuous-variable models such as the Richardson arms race model and DYNAMO-like global models. Rational choice models preserved some discrete variables, particularly in game theory, but even these models used continuous variables in expected utility calculations[5].

The emphasis on crisis, initiated by McClelland and expanded in a large event-based crisis management literature (e.g. Hoople, Andriole and Freedy 1984, Azar et al. 1977) also contributed to the emphasis on interval-level variables. Implicit in most of the crisis models is either a simple distinction between crisis and non-crisis or a unidimensional ordinal set of "steps" to crisis (e.g. Hoople, 1984). Crisis forecasting is reduced to a problem of monitoring some activity—usually some aggregated measure—to ascertain when the system is going to change states. The crisis literature also frequently emphases the concept of the "intensity" of events, another interval measure.

A STATISTICAL DEFINITION OF EVENT DATA

The study of the statistical characteristics of event data must start with a formal definition of those data in mathematical terms; this section will provide one such definition. I will also deal with the issue of what an event coding system seeks to achieve.

International events are reported through natural language text. Coders work in the peace and quiet of an office creating data from secondary sources, rather than coding from direct experience[6]. Between the occurrence of an international event and the datum being entered into a computer, information passes through a textual phase.

These text strings form a very large—but still quite finite—set **S**, the set of all possible texts one might conceivably code as events. **S** is not the same for all event coding schemes: an event in BCOW is not necessarily an event in COPDAB. Every event data coding scheme has a finite set **C** of discrete event codes. In COPDAB these are the integers 1 to 15 combined with the issue and area codes; in WEIS they are the 63 WEIS nominal categories. The set **C** is dramatically smaller that the set **S.**

An event data coding scheme is simply a function E that maps text strings into codes:

E **: S -> *Pow*(C)**

where *Pow*(**C**) is the power set of **C** (all possible subsets of **C**)[7]. Because **S** is very large, the function E is not explicitly specified in human-coded data. E is instead implicit in the coding manual and training of the coders; each coder should be meticulously trained to emulate the ideal E function. In machine-coding system, E is explicitly specified in the coding algorithm..

Text strings are also mapped into a set of actors and targets. This set and the coding rules relevant to it may differ substantially between coding schemes, particularly when dealing with quasi-international actors such as national liberation movements. While generally the problems of identifying actors are less difficult than those involving events, a similar implicit function exists for actor coding, and the statistical problems are similar.

A specific event data set is dependent on the choice of the source text and the choice of a particular coding system; these, in turn, are determined by the theory or set of theories that a researcher wishes to explore. The purpose of event data research is to find statistical regularities and this differentiates the event data approach from the diplomatic history approaches advocated by Gaddis (1987). If one is not interested in statistical regularities—and Gaddis m(1987), for example, clearly is not—then event data are useless, but in statistical studies, the approach can be quite serviceable.

To use an analogy, the works of Thomas Wolfe, Norman Mailer and Hunter S. Thompson provide one approach to understanding life in the United States circa 1970; the 1970 U.S. Census and the 1970 American National Election Study provide another.

Just as one would be ill-advised to attempt to fathom the *angst* of the urban liberals from the Census, so it is unwise to attempt to ascertain the subtle nuances of diplomatic strategy through event data. However, the Census and NES are far more useful in studying economic and demographic change in Arkansas in 1970 than Wolfe, Mailer or Thompson, and in a similar fashion event data can reveal statistical patterns not apparent in conventional history.[8]

Gaddis, having criticized event data as shallow in 1987, observed five years later (Gaddis 1992) that *none* of the major theoretical approaches to IR correctly predicted the most dramatic political transformation of the last quarter of the 20th century—the fall of communism in Eastern Europe. Event data analysis has problems, but the traditional approaches it seeks to supplement are not exactly flawless.

A good event coding system leads to theoretically-informed statistical regularities; a coding system must therefore be closely linked to a theory or set of theories about international behavior. The WEIS and COPDAB codes, for example, were constructed in a realist milieu that placed primary emphasis on diplomatic and military behavior; CREON focuses on the elements of foreign policy behavior identified by the theories developed in James Rosenau's Inter-University Comparative Foreign Policy Project (see Hermann et al 1973:8-15); none of these are particularly useful in studying contemporary international economic or environmental issues. The detailed reports of the event data collection efforts (for example Azar, Brody and McClelland 1972; Azar and Ben-Dak 1975; Burgess and Lawton 1972; Hermann et al 1973; Merritt, Muncaster and Zinnes, 1993)—though not necessarily the codebooks for those data—clearly indicate a deep awareness of the linkage between theory, coding and data collection.

The choice of the source text to be coded affects the resulting data set, and the fact that event data is coded from a finite number of sources[9] has been criticized by Alker (1988), among others, as privileging some interpretations of history over others. While this may be true, it is no more or less the case than the situation facing traditional studies. Short of descending into a deconstructionist quagmire, any political analysis must assume that certain events, conditions, motivations and coalitions occurred, and others did not. The traditional method of constructing these accounts of political activities using a variety of documentary and autobiographical sources is one way of doing this; the processes by which text is selected for event coding is another. Each method is subject to selection bias and varying interpretation.

STOCHASTIC ELEMENTS IN THE MEASUREMENT OF EVENT DATA

As noted above, any event data analysis assumes, implicitly or explicitly, that the coded events reflect underlying statistical regularities in the political system; the nature of those regularities is specified by a theory. Since political systems are very complex, regularities will almost inevitably appear to be stochastic, but additional random variation is introduced into the data between the occurrence of an event and the assignment of the event code. The three major sources of variation are noise events, data censoring, and misclassification; Figure 1 summarizes this process schematically.

[FIGURE 1 ABOUT HERE]

Noise Events

Any event stream contains noise in the form of random events that appear to be endogenous to the process being studied but which in fact have been generated by other processes or are irrelevant to the model. The distinction between endogenous and exogenous events depends on the theory being studied. What is noise to one model may be the signal of another, just as the variation in growth of a soybean plant due to insect damage is noise in a study of fertilizers but signal to a study of insecticides.

In correlational studies, noise is usually assumed to be normally distributed. In an event data study, the default model for noise would be statistical independence and a Poisson distribution since the Poisson is the only temporal probability distribution that is memory-free.[10] Ideally, one could ascertain the Poisson intensity parameter for the distribution of noise affecting each event code and use that information in statistical studies, just as the mean and variance of normally distributed errors are used in correlational studies.[11] As in correlational studies, the actual noise will often not be distributed according to the assumptions of the model, and might exhibit non-Poisson behavior such as cyclicity or statistical interdependence.

Censoring

Censoring means that an event occurs in the system and does not appear in the data. The term is meant in the statistical, rather than political, sense: while overt censoring of information is certainly a factor in event data, far more problematic are the editing and coverage biases introduced in journalistic and historical sources; these have been discussed exhaustively in the event data literature.

Censoring occurs nonuniformly. Any event data set has a vector $\underline{d}_C$ (i.e. a vector indexed on the set of classification codes **C**)[12] that is the ratio of the frequency of codes in the observed data set to their frequency in an ideal data set where all events occurring in the system were reported. These ratios can be quite low—it is unlikely that existing data sets capture more than a few percent of all political activity except for extreme events such as the outbreak of war. To the extent that some events are more important than others in determining international behavior, censoring is probably inversely proportional to importance: the more important an event, the more likely it will be reported.

The converse of censoring is "disinformation": strings in the source text concerning events that did not actually occur. These might be introduced deliberately—for example the deception campaigns that preceded the US ground offensive against Iraq in 1991—but they are more commonly generated by rumors and second-hand information. While disinformation from deception and rumor is probably not a major component of event data, it is more problematic than pure noise because it is very non-random and is specifically designed to make the system appear as though it is operating under a different process than that actually occurring.[13]

Misclassification

Misclassification occurs when the code assigned to a text string does not correspond to the code that was intended when the coding scheme was designed. Any event data *set* has an error matrix **M** where e_{ij} gives the probability of misclassifying v_j as v_i. This error matrix incorporates errors due to both validity and reliability problems. Misclassification does not occur randomly: a trade agreement may be confused with a cultural exchange but it is unlikely to be confused with a war. In all likelihood **M** has a block structure—one can arrange the row and columns of **M** is a fashion where non-zero entries are most likely to occur in adjacent cells with the remainder of the matrix being zero.

STATISTICAL CORRECTIONS FOR CODING AND CENSORING ERRORS

The overall error structure of an event data set can be specified by combining the elements of noise, censoring and misclassification. Let $\underline{r}$ be the true frequency of the codes—the frequency generated from an ideal uncensored data source coded using *E* without misclassification errors. Let $\underline{n}$ be the frequency of the noise (both random noise and disinformation); let

$$\mathbf{D} = \text{diag}(\underline{d}_C)$$

that is, the matrix with the elements of $\underline{d}_C$ on the diagonal. Then $\underline{x}$, the observed frequency of events in the data set, is

$$\underline{x} = \mathbf{MD}\,(\underline{r} + \underline{n})$$

Using this relationship, it is possible to make several statistical corrections to an event set if one is interested only in the aggregate *frequency* of events; frequency is the key concern is most correlational and descriptive studies.

Assume that the misclassification matrix **M** can be estimated and let $\underline{t} = (\underline{r} + \underline{n})$ be the true event frequency vector. If there is no censoring, then the observed frequency vector $\underline{x}$ is simply

$$\underline{x} = \mathbf{M}\,\underline{t}$$

One can correct for misclassification and get an improved estimate of $\underline{t}$ by adjusting $\underline{x}$ using

$$\underline{x}^* = \mathbf{M}^{-1}\underline{x}$$

Under certain circumstances, **M** is very straightforward to compute. Suppose one has two coding systems, one very slow but accurate (e.g. coding by a principal investigator or well-trained and well-motivated graduate student coders), and the other fast but less accurate (e.g. machine coding or poorly trained, supervised or motivated work study students). Assuming that both coding processes are consistent, then **M** can be estimated by comparing two coding results on a suitably large and representative set of texts.

If the censoring vector $\underline{d}$ were also known, the correction can be extended further:

$$\underline{x}^* = (\mathbf{MD})^{-1}\underline{x}$$

$\underline{d}$ is less likely to be known with any degree of confidence than **M**, though efforts could be made to approximate it by comparing multiple sources.[14]

The standard technique for estimating the size of an unknown population is to sample the population twice and compare the number of cases captured in both samples[15]. Let N be the true population size, n_1 and n_2 the sizes of two independent random samples from N, and m the number of cases that occur in both random samples. The probability of a case being in sample 1 is $p_1 = n_1 \cdot N$; probability of a case being in sample 2 is $p_2 = n_2 \cdot N$, so

$$m = p_1 \cdot p_2 \cdot N \Rightarrow N = \frac{n_1 \cdot\ n_2}{m}$$

Once N is known, the number of cases being censored can be estimated by comparing the number of events found in a source to the estimated population size N.

The weakness in this approach is the requirement that the two samples be random. All text sources of event data are biased to report certain events while ignoring others, rather than randomly sampling from all possible events. However, comparing two sources that are attempting to provide equivalent coverage—for example the *New York Times* and the *Los Angeles Times*—would provide a rough estimate of the censoring probabilities. This technique could also be used to ascertain which event categories are more frequently censored.

The final issue that can be analyzed is the tradeoff between quantity and quality. If one is doing event data coding with finite resources, the greater the effort devoted to coding reliability, the fewer events can be coded. Consider the situation where event data are used to estimate a value, ô, (e.g. an hostility score) by taking the mean of a sample of observations:

$$\hat{o} = \bar{X} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

Assume that each x_i can be decomposed into three parts

$$x_i = \mu + e_i + m_i$$

where μ = true value; e_i = true error (in other words, deviation due to the intrinsic variability of the underlying random variable) and m_i = measurement error. Assuming e_i and m_i have mean zero[16], from the Central Limit Theorem, we know that ô will be distributed

$$\text{Normal}\left(\mu \,;\, \frac{\text{Var}(e) + \text{Var}(m)}{n}\right)$$

whatever the underlying distributions of e_i and m_i.

Suppose there are two measurement instruments A and B which have sample sizes N_a and N_b and measurement error variances v_a and v_b respectively. Assume that $N_a >$

N_b and $v_a > v_b$, in other words, A has a larger number of observations but also has a higher measurement error. Let s_a and s_b be the error variance of ô measured using A and B. Assuming without loss of generality that Var(e)=1, a bit of algebra will show that $s_a < s_b$ provided

$v_a < v_b$**Error!**) + **Error!**- 1)

Since the second term is greater than zero, this means that $s_a < s_b$ provided the variance of the less accurate measure increases proportionately to the increase in the sample size. For example, if method A provides twice the number of data points as method B, it can have measurement errors with at least twice the variance and still produce measures of ô with less variance.

McCLELLAND REVISITED: EVENT STRUCTURE ANALYSIS

An alternative to frequency-based approaches is a return to the discrete, event-sequence models originally proposed by McClelland. While McClelland abandoned the pursuit of event sequence models by the early 1970s, the reasons he elucidates for pursuing those models are still valid, and have a distinctly contemporary air:

> Prominent international crises are complexes of events which can be dissected, up to a point, to yield numerous sequences of related acts. … After a number of such sequences have been traced and studied, similarities are identities of form in some of them may appear. (McClelland 1961:185)

While McClelland was defeated by the relatively primitive information processing technology of the 1960s and the scarcity of data in the days prior to the contemporary thirty-year WEIS and COPDAB data sets, the use of event sequences has re-emerged in the artificial intelligence approach to IR models and the use of computational techniques to manipulate sequences generally. Alker (1987) discusses a variety of event sequence structures; Heise (1988a,1988b) proposes a specific formal model and computer program, ETHNO, for studying them; Sankoff and Kruskal (1983) discuss a variety of event sequence techniques from biology, linguistics and computer science; Mefford (1985, 1991) and Schrodt (1984, 1990, 1991) provide direct applications of event sequences to the study of international relations.

Two examples of event sequence structures will provide a flavor for how this type of analysis works. Mefford (1991) provides an example of how Edward Luttwak's general principles for implementing a *coup d'etat* could be rendered as a set of rules; Mefford's structure (Figure 2) can as easily be conceptualized as a set of events.

[FIGURE 2 ABOUT HERE]

When a political actor has a particular objective, the actor knows that certain actions must be taken in order to meet that objective. These actions are *partially ordered* and *disjunctive*. Partially ordering means that certain actions must be taken in a strict temporal order but others can be done in parallel and can be completed in any order. For example, in the Luttwak model, both the police and bureaucracy must be neutralized before the state is considered neutralized, but the exact order of that process would usually be irrelevant[17].

The sequence is disjunctive because a variety of different actions can serve the same purpose in a sequence. This is equivalent to the concept of "foreign policy substitutability" discussed in detail by Most and Starr (1984). For example in Luttwak's model, "consultation with allies" could occur in a variety of different ways—meeting with ambassadors in Washington, meeting with the foreign ministry in the ally's capital, discussions at a allied summit meeting—that would be equivalent for the purpose of satisfying this objective.

Another example of an event structure is Lebow's (1981) concept of a "Justification of Hostility Crisis". Lebow originally developed this model by studying a number of pre-1970 crises, but it fits the 1990 Iraq-Kuwait crisis almost perfectly.

[TABLE 1 ABOUT HERE]

Much of international politics can be conceptualized as event sequences. A foreign policy bureaucracy has a certain objective in mind—an image of the final state of the world they wish to create through foreign policy initiatives. Actions are undertaken to gradually piece together that sequence—the entire sequence might take literally decades to complete, such as the Bismarckian reorganization of Europe, or it might be done in a few hours, such as an international response to a fall in the value of the dollar. At any given time, a variety of parallel efforts are underway to lay the groundwork for subsequent actions; when those prior actions are completed, the plan moves ahead. False starts are common, but because the overall plan is disjunctive, when one sequence hits a dead end, it can be abandoned and another sequence pursued.

International actions are not taken in a vacuum but rather against rational opponents who, depending on their interests, will seek to enhance or thwart the successful completion of the plan. Hence international politics is analogous to two children playing with a single set of blocks, one child trying to build a model of a house and the other a model of a bulldozer, each cleverly trying to build on the model the other has created but also tearing out the unnecessary parts when the other is distracted or working on subassemblies. Equivalently, to use one of the oldest metaphors for international politics, international politics is a game of chess or *go*: each player has envisioned complex sequences of actions ending in a victory, but must continually alter those plans to counter the moves of the other player.

Several attributes of traditional international relations analysis can be conceptualized using the event sequence analysis (ESA) approach. First, human *understanding* of an event sequence—that intuitive comprehension of event patterns mentioned by McClelland—is simply the associative recall of an event structure (or set of event structures) satisfying an observed sequence of events. Second, h*istory*—the fascination of traditional theorists—provides the empirical evidence for event structures implemented in the past, and furnishes templates for future structures. Third, event structures provide a simple *error-correction* mechanism for missing data: if one assumes that a particular structure is being followed, and actions are observed which are predicated by events not observed, and there are reasons to assume that the missing action might not be detected (e.g. it was secret or an event not likely to be reported), then one can assume that the event occurred unobserved, rather than rejecting the model. Finally, this approach provides a formal means of characterizing *motivation* based on observed events: the motivation for a particular sequence is its end state or objective.

ESA requires a huge information base and very substantial information processing capability in terms of associative memory and pattern recognition. The human brain is intrinsically very good at the latter two tasks, and through formal education an expert in international affairs painstakingly acquires the last. Doing ESA by machine is more difficult, and McClelland in 1970 clearly did not have the machine capabilities commensurate with this task.

In 1990s, however, enhanced computer processing capabilities and algorithms provide considerably greater pattern recognition capabilities. While ESA is less developed than correlational and frequency analysis, three things are likely to be characteristic of the approach. First, ESA requires a greater amount of data than do frequency and correlational analyses. Second, because of substitutability, there is a closer interplay between the coding and theory in ESA than in correlational studies. Third, short sequences of international behavior are more easily studied than long sequences, and ordinary behavior is more easily studied than extraordinary behavior.

More Data

Frequency-based correlational studies are subject to the law of large numbers and hence there is a diminishing return on the information provided by additional data. In addition, most intensity-based coding schemes—for example COPDAB—have an inverse relationship between the magnitude of the code and the probability of censoring: the events with the highest numerical values are those least likely to be missing from the data.

This is less likely to be the case in ESA because of substitutability, and more generally because the structures themselves are complex. Substitutability makes modeling a *given* set of data easier, but it is correspondingly more difficult to induce the underlying structure[18].

Closer Linkage Between Coding Scheme and Theory

Event structures allow multiple events to serve the same function. Coding errors within these substitution sets will have no effect on the fit of the structure, since all events within the set are equivalent. The existing coding schemes of COPDAB and WEIS implicitly use a high degree of substitution, since they map many distinct text strings into the same event code. However, the substitution mapping is done at the *coding* stage rather than the *modeling* stage.

If one were dealing with a set of models where the substitution sets were always the same—if a pair of events v_1 and v_2 were found in one substitution set they would always be found in a substitution set whenever one or the other were present—then the problem of determining the details of a coding scheme would be solved. Again, existing event sets implicitly do this already. However, the substitution sets probably vary across models. For example, the event

[move an aircraft carrier from the Mediterranean to the Gulf]

and the event

[move an aircraft carrier from the Pacific Ocean to the Gulf]

are roughly equivalent as far as US relations with Iraq are concerned, but have very different implications for relations between the US and Italy. The specific event structure being analyzed—the *context* of the event—is important

When used inductively, however, ESA techniques likely to be robust against the most common coding errors: those caused by the intrinsic ambiguity of the event as interpreted by a human observer. The events most likely to be miscoded by a human, such as a *protest* coded as an *accusation*, or a *promise* coded as a *grant*, are those most likely to be equivalent in an event structure. Consequently, regularities could be detected in an inductive analysis despite miscoding, though the models would less specific than those constructed in the absence of coding errors.

Short Term Regularity

Fully completed complex event sequences are rare in international politics. Even when a long sequence is completed it provides only a single instantiation of the possible ways that the sequence might have developed. Complex structures can be induced only when multiple instances of the same structure manifest themselves, a slow process in the empirical world. Thus, for example, while there are probably very real parallels between the US involvement in Vietnam and the Soviet involvement in Afghanistan, the entire event structure for "Superpower intervening to support weak and unstable allied government fighting an unpopular guerrilla war where the superpower has limited national interests" still only has an N = 2 in the post-WWII period. In some theoretical contexts, one could go further afield to try to make comparisons with, for example, the Syracuse campaign during the Pelopponesian Wars, or to deal with contemporary regional powers such as Israel in Lebanon or India in Sri Lanka, but in the Cold War context, the sample size will remain permanently at 2.

In general, the shorter the structure examined, the more likely one will be able to find sufficient instances to study it in detail; "short" refers to the number of events in the sequence rather than calendar time. Short sequences are also more likely to be successfully completed as part of a larger task, even though the larger task itself was not successfully completed.

Event sequences may exhibit a hierarchical structure, with large sequences constructed of identifiable subsequences which may themselves have subsequences. The short inner structures may be easier to study than the longer structures because of their frequency. The comparison between Vietnam and Afghanistan may be due less to the macro-level, N=2 comparison as to the large number of substructure parallels, such as holding the cities while bombing the countryside, civilian and conscript discontent, disagreements between civilian and military leadership and so forth. If substructures are important, micro-level coding is important, certainly to temporal levels more finely grained than a month and political levels more detailed than the nation-state.

Machine Coding

Advances in data storage and the development of machine coding techniques are likely to increase the amount of event data available to researchers by two or three orders of magnitude in the near future. In the past, event data have been produced by coders working with paper copies of source documents, usually books and periodicals. This process is very labor intensive and coders are rarely able to generate more than a dozen or so events per hour. Recoding an existing large data set has also been impossible due to the labor required, which leads to event data sets being used in situations perilously remote from their original theoretical context.

Advances in storage technology and data distribution over the past decade have changed this situation substantially. Commercial on-line databases such as Dialog and NEXIS provide international news wires such as UPI, Agence France Presse and Reuters, as well as the full text of newspapers such as the *New York Times*, *Washington Post*, *Wall Street Journal* and several of their non-English-language counterparts. Table 2 shows the Reuters "lead" sentences for the key events leading up to the 2 August 1990 invasion; there is clearly sufficient information here for a human analyst to match the sequence of events to Lebow's "justification of hostility" sequence.

[TABLE 2 ABOUT HERE]

The on-line databases are still relatively expensive, but these are likely to be replaced by CD-ROM in the near future. *Facts on Files* is currently available on CD-ROM for 1980 to the present; the full text of the *New York Times* will be available from

1991 onward. CD-ROM prices are currently around $100 for about 500 megabytes of information and with CD-ROM, the computationally-intensive searching process can be done by the individual user rather than at a centralized site, reducing the cost of using the resources.

The substitution of electronic search and display capabilities for paper can generates substantial increases in coder productivity, but even greater economies are achieved by totally automating the coding process. The automated categorization of natural language text is an important research topic in computer science, and a variety of research projects are underway that deal with problems at least as complex as event coding (see for example Lehnert and Sundquist, 1991). Gerner et al (1994) describe a Macintosh computer program that can duplicate the 3-digit WEIS coding of a single human with around 80% - 90% accuracy in either English or German; validation tests comparing machine-coded data for the Middle East to a human-coded data set show no systematic differences except those due to the higher density of the machine-coded data (Schrodt and Gerner 1994).

Machine coding from machine-readable source material means that event data sets to be maintained in real-time, simplifies the implementation of alternative coding schemes, provides a complete and unambiguous record of the actual coding rules, removes the cultural and perceptual biases introduced by human coders[19], and can handle languages other than English more easily than can English-speaking human coders. With these improved data processing capabilities, event data sets which currently contain several thousand events per year for the entire international system might easily be increased to several million events per year without significant additional labor costs. These denser data sets, in turn, may provide sufficient detail about international interactions to allow the use of analytical techniques such as ESA which were not effective on the earlier, sparser data sets.

CONCLUSION

The appropriateness of event data analysis ultimately depends on the theoretical model to which those events will be applied. Because of the labor involved in the collection and coding of the early event data sets, much effort was spent in carefully constructing and implementing coding schemes, and training coders, so that high intercoder reliability could be achieved. With the advent of inexpensive machine-readable text sources and machine coding, the cost of generating event data will drop dramatically, intercoder reliability will cease to be an issue[20], and considerably greater attention can be devoted to developing coding schemes that correspond to contemporary theoretical approaches.

The use of event data in correlational studies will undoubtedly continue, whatever the success of the ESA approach. Correlational analyses are the *lingua franca* of the social sciences, interval-level data can be processed with standardized and thoroughly tested statistical programs with known properties, and the frequency/correlation approach makes fairly efficient use of the available data. However, the use of event data in correlational studies quite unsophisticated, and as noted in this article, straightforward statistical corrections can be made for many source and coder reliability issues. With fundamental changes occurring in the information processing capabilities available to the average researcher, analyses of textual and event data are now possible which could not be done when event data were first developed. The past is a very poor guide to the future of event data and what was practically impossible a decade ago may be trivial a decade from now.

FOOTNOTES

[1] This is an underestimate: since the *World Handbook* itself contains events data, the total citations to events data are probably greater than those to the non-event parts of the *World Handbook*.

[2] See McGowan et al 1988 and Merritt 1987 for a general discussion.

[3] Howell et al (1986) provides a good discussion of these issues, as do most of the pre-1980 works cited in the bibliography.

[4] I am indebted to Harold Guetzkow for an extensive collection of the early WEIS memoranda.

[5] Another factor favoring continuous formulations may be the ease with which one can draw a line representing a continuous variable and call it a "pattern" (for example Brody, 1972) whereas discrete sequences are more difficult to visualize and explain (McClelland, 1961).

[6] In contrast, a sociologist coding the events of a child's play group, an ethnobiologist coding the behavior of chimpanzees or Alger's (1968) study of interaction in a UN committee involve event coding directly from observations.

[7] An alternative approach to nonevents is to note that $Pow(\mathbf{C})$ by definition includes the null set, and many text strings simply map to "this is not an event"; the function E therefore serves to filter all text strings. This is effectively the scheme used in most machine-coding systems, whereas in human coding system the decision that a text string constitutes an event may be separate from the assignment of a code.

[8] For example, Schrodt and Mintz (1988) use a conditional probability analysis of the COPDAB data set to study interactions between six Middle Eastern states: Jordan, Syria, Saudi Arabia, Kuwait, Iraq and Iran. In retrospect the most interesting finding of the study was the prominent role of Kuwait:

> The implication [of the study] is that when some interaction occurs with Kuwait, this interaction disproportionately sets off other interactions in the system. This initially seems counterintuitive because Kuwait is the least powerful of the states we are studying, though that status may be the *reason* Kuwait is so important. If this characteristic holds generally, we may find that minor powers are more important in determining interaction interdependence than major powers. (pp. 227-228)

This was written in 1984, six years before Iraq's invasion of Kuwait led to the massive international intervention known in the United States as Desert Storm. The importance of Kuwait was deduced exclusively from the event data itself, rather than from a traditional political analysis, and when Mintz and I first presented this paper at the International Studies Association, the discussant concluded that the Kuwait results were clearly incorrect and indicated a weakness in the approach.

[9] For example, WEIS was coded from the New York Times, which greatly over-samples events in Europe and the Middle East compared to events in Latin America, Africa, and Asia. However, Azar (1980: 146) states that COPDAB is based on "events reported in over 70 sources"; CREON is based on *Deadline Data on World Affairs*, which abstracts 46 international sources (Hermann et al 1973:18); and the BCOW codebook (Leng, 1987) lists dozens of periodical and historical sources. While the single-source criticism may be valid for WEIS, it certainly is not intrinsic to the methodology.

[10] Equivalently, exponentially distributed inter-arrival times.

[11] King (1989) shows a variety of techniques for doing this.

[12] In Figure 1, d is placed prior to the source text because that is where most censoring occurs in the real world — events occur but are not reported. For reasons that will be

clear momentarily, it is more convenient to index d on event codes rather than original events.

[13] In particular, rumors must convey plausible patterns of human behavior or they will not be voluntarily transmitted. For example, in the week following the June 1989 Tiananmen Square massacre in Beijing, many rumors circulated about pro-democracy military forces preparing to move against the city. These eventually proved completely groundless but were credible: when a comparable situation occurred in Rumania in December 1989, military units did turn against the government. The nature of rumors and story-telling means that a credible sequence of events is generated; if information is missing from the story, it will be provided in a fashion that makes sense to the teller and listener, rather than generated randomly. Rumors, as a consequence, may be more likely to fit models of political behavior than will actual events. Note that if regularity did not exist in the international system, disinformation and strategic deception could not exist since the entity being deceived must be able to fit the information to a pre-existing model of international behavior.

[14] Achen (1987) points out another means of handling censored data in a regression framework, citing Heckman (1979). Achen more generally calls attention to the fact that many problems of event data have statistical solutions in cognate fields.

[15] This method is typically used to estimate fish or insect populations; it has also been used to estimate the undercount in the U.S. Census.

[16] This is a weak restriction since any known bias can be adjusted by subtracting a constant from the biased estimator.

[17] Obviously there exist occasions when the order would be important — for example in many states a neutralized military will vastly simplify the task of neutralizing other components of the state — but there are many facets of political activity where

ordering is either unimportant or, more commonly, many tasks are undertaken in parallel.

[18] This is similar to the difference between checking the syntactic correctness of a sentence and deriving the grammar of a language. If one knows the grammatical rules of a language, then the correctness of most sentences can ascertained relatively easily; for example grammar checking programs can do this. Deriving a complete grammar, however, can be exceedingly difficult, even if a great deal of grammatically correct text is available.

[19] The biases in the coding system itself remain, but in machine coding these are at least explicit and reproducible.

[20] Machine coding systems make mistakes, but do so consistently and reproducibly so that statistical corrections (and recoding if egregious errors are found) are straightforward. Human coders, in contrast, are an amalgam of biases, misperceptions, sloth, confusion and neglect who graduate and vanish at the end of the year. Neither a human nor a machine coding system can perfectly implement the researcher's coding scheme, but from a statistical standpoint, the errors generated by the machine will usually be easier to deal with.

BIBLIOGRAPHY

Achen, Christopher. 1987. "Statistical Models for Event Data: A Review of Errors-in-Variables Theory". Paper presented at the Data Development in International Relations Conference on Event Data, Columbus, OH.

Alger, Chadwick F. 1968. "Interaction in a Committee of the United Nations General Assembly." In J. David Singer (ed.) *Quantitative International Politics.* New York: Free Press.

Alker, Hayward R. 1987. "Fairy Tales, Tragedies and World Histories." *Behaviormetrika* 21:1-28.

___________. 1988. "Emancipatory Empiricism: Toward the Renewal of Empirical Peace Research." In Peter Wallensteen (ed.) *Peace Research: Achievements and Challenges*. Boulder, CO: Westview Press.

Andriole, Stephen J. and Gerald W. Hopple. 1984. "The Rise and Fall of Events Data: From Basic Research to Applied Use in the U.S. Department of Defense." *International Interactions* 11:293-309.

Azar, Edward E. 1982. *The Codebook of the Conflict and Peace Data Bank (COPDAB) .* College Park, MD: Center for International Development, University of Maryland.

Azar, Edward E. 1980. "The Conflict and Peace Data Bank (COPDAB) Project." *Journal of Conflict Resolution* 24:143-152.

Azar, Edward E., Stanley H. Cohen, Thomas O. Jukam and James McCormick. 1972. "Making and Measuring the International Event as a Unit of Analysis." In Edward E. Azar, Richard A. Brody and Charles A. McClelland (eds.) *International Events Interaction Analysis: Some Research Considerations.* Beverly Hills: Sage Publications.

Azar, Edward E., Richard A. Brody and Charles A. McClelland (eds.) 1972. *International Events Interaction Analysis: Some Research Considerations.* Beverly Hills: Sage Publications.

Azar, Edward E. and Joseph Ben-Dak. 1975. *Theory and Practice of Events Research*. New York: Gordon and Breach.

Azar, Edward E. and Thomas Sloan. 1975. *Dimensions of Interaction*. Pittsburgh: University Center for International Studies, University of Pittsburgh.

Azar, Edward E., R.D. McLaurin, Thomas Havener, Craig Murphy, Thomas Sloan and Charles H. Wagner. 1977. "A System for Forecasting Strategic Crises: Findings and Speculations About Conflict in the Middle East." *International Interactions* 3: 193-222.

Brody, Richard A. 1972. "International Events: Problems in Measurement and Analysis." In Edward E. Azar, Richard A. Brody and Charles A. McClelland (eds.) *International Events Interaction Analysis: Some Research Considerations.* Beverly Hills: Sage Publications.

Burgess, Philip M. and Raymond W. Lawton. 1972. *Indicators of International Behavior: An Assessment of Events Data Research.* Beverly Hills: Sage Publications.

Daly, Judith Ayres and Stephen J. Andriole. 1980. "The Use of Events/Interaction Research by the Intelligence Community." *Policy Sciences* 12:215-236.

Gaddis, John Lewis. 1987. "Expanding the Data Base: Historians, Political Scientists and the Enrichment of Security Studies." *International Security* 12:3-21.

____________. 1992. "International Relations Theory and the End of the Cold War." *International Security* 17:5-58.

Gerner, Deborah J., Philip A. Schrodt, Ronald A. Francisco, and Judith L. Weddle. 1994. The Machine Coding of Events from Regional and International Sources, *International Studies Quarterly* 38:91-119.

Heckman, James J. 1979. "Sample Bias as Specification Error." *Econometrica* 47: 153-61.

Heise, David. 1988a. "Modeling Event Structures." *Journal of Mathematical Sociology* 13:138-168.

Heise, David. 1988b. "Computer Analysis of Cultural Structures." *Social Science Computer Review* 6:183-196.

Hermann, Charles, Maurice A. East, Margaret G. Hermann, Barbara G. Salmore, and Stephen A. Salmore. 1973. *CREON: A Foreign Events Data Set.* Beverly Hills: Sage Publications.

Hoople, Gerald W. 1984. "Computer-Based Early Warning: A Staircase Display Option for International Affairs Crisis Projection and Monitoring." In Gerald W. Hoople, Stephen J. Andriole and Amos Freedy (eds.). *National Security Crisis Forecasting and Management*. Boulder: Westview Press.

Hoople, Gerald W., Stephen J. Andriole and Amos Freedy (eds.). 1984. *National Security Crisis Forecasting and Management*. Boulder: Westview Press.

Howell, Llewellyn D, Sheree Groves, Erin Morita, and Joyce Mullen. 1986. "Changing Priorities: Putting the Data back into Event data Analysis." Paper presented at the International Studies Association, Anaheim.

International Studies Quarterly. 1983. "Symposium: Event data Collections." *International Studies Quarterly 27*.

King, Gary. 1989. "Event Count Models for International Relations: Generalizations and Applications." *International Studies Quarterly* 33,2:123-148.

Laurence, Edward J. 1990. "Events Data and Policy Analysis." *Policy Sciences* 23:111-132.

Lebow, Richard Ned. 1981. *Between Peace and War: The Nature of International Crises*. Baltimore: Johns Hopkins.

Lehnert, Wendy and Beth Sundheim. 1991. "A Performance Evaluation of Text Analysis." *AI Magazine* 12: 81-94.

Leng, Russell J. 1987. *Behavioral Correlates of War, 1816-1975*. (ICPSR 8606). Ann Arbor: Inter-University Consortium for Political and Social Research.

McClelland, Charles A. 1961. "The Acute International Crisis." *World Politics* 14:184-204.

_________. 1967a. "Event-Interaction Analysis in the Setting of Quantitative International Relations Research." mimeo, University of Southern California, February, 1967

_________. 1967b. "World-Event-Interaction-Survey: A Research Project on the Theory and Measurement of International Interaction and Transaction." mimeo, University of Southern California, March, 1967

_________. 1968a. "International Interaction Analysis: Basic Research and some Practical Uses." mimeo, University of Southern California, November, 1968

_________. 1968b. "Access to Berlin: The Quantity and Variety of Events, 1948-1963." In J. David Singer (ed.) 1968. *Quantitative International Politics.* New York: Free Press.

_________. 1969. "International Interaction Analysis in the Predictive Mode." mimeo, University of Southern California, January, 1969.

_________. 1970. "Some Effects on Theory from the International Event Analysis Movement." mimeo, University of Southern California, February, 1970

_________. 1976. *World Event/Interaction Survey Codebook.* (ICPSR 5211). Ann Arbor: Inter-University Consortium for Political and Social Research.

McGowan, Patrick, Harvey Starr, Gretchen Hower, Richard L. Merritt and Dina A. Zinnes. 1988. "International Data as a National Resource." *International Interactions* 14:101-113.

Mefford, Dwain. 1985. "Formulating Foreign Policy on the Basis of Historical Programming." In Michael Don Ward and Urs Luterbacher (eds.) *Dynamic Models of International Conflict.* Boulder, CO: Lynn Rienner Publishing.

__________. 1991. "Steps Toward Artificial Intelligence: Rule-Based, Case-Based and Explanation-Based Models of Politics." In Valerie Hudson (ed.) *Artificial Intelligence and International Politics*. Boulder: Westview.

Merritt, Richard L., Robert G. Muncaster and Dina A. Zinnes (eds.) 1993. *International Event Data Developments: DDIR Phase II.* Ann Arbor: University of Michigan Press.

Merritt, Richard. 1987. "Event Data: A Synoptic View." Paper presented at the Data Development in International Relations Conference on Event Data, Columbus, OH.

Most, Benjamin A. and Harvey Starr. 1984. "International relations theory, foreign policy substitutability and 'nice' laws." *World Politics* 36: 383-406

Munton. Donald. 1978. *Measuring International Behavior: Public Sources, Events and Validity.* Dalhousie University: Centre for Foreign Policy Studies.

Peterson, Sophia. 1975. "Research on research: Events data studies, 1961-1972." In Patrick J. McGowan (ed.) *Sage International Yearbook on Foreign Policy Studies, 3*. Beverly Hills: Sage Publications.

Rummel, Rudolph J. 1972. *The Dimensions of Nations.* Beverly Hills: Sage Publications.

Sankoff, David and Joseph B. Kruskal (eds.) 1983. *Time Warps, String Edits and Macromolecules: The Theory and Practice of Sequence Comparison.* New York: Addison-Wesley.

Schrodt, Philip A. 1984. "Artificial Intelligence and International Crisis: An Application of Pattern Recognition." Paper presented at the American Political Science Association, Washington.

Schrodt, Philip A. 1990. "Parallel Event Sequences in International Crises." *Political Behavior* 12:97-123.

Schrodt, Philip A. 1991. "Pattern Recognition in International Event Sequences: A Machine Learning Approach." In Valerie M. Hudson (ed.) *Artificial Intelligence and International Politics*. Boulder: Westview Press: .

Schrodt, Philip A. 1993. "Machine Coding of Event Data." In Richard L. Merritt, Robert G. Muncaster and Dina A. Zinnes (eds.) *International Event Data Developments: DDIR Phase II.* Ann Arbor: University of Michigan Press.

Schrodt, Philip A. 1994. "Event Data in Foreign Policy Analysis" in Patrick J. Haney, Laura Neack, and Jeanne A.K. Hey. *Foreign Policy Analysis: Continuity and Change.* New York: Prentice-Hall

Schrodt, Philip A. and Alex Mintz. 1988. "A Conditional Probability Analysis of Regional Interactions in the Middle East." *American Journal of Political Science* 32: 217-230.

Schrodt, Philip A., and Deborah J. Gerner. 1994. "Statistical Patterns in a Dense Event Data Set for the Middle East, 1982-1992." *American Journal of Political Science* 38.

Sigler, John H., John O. Field and Murray L. Adelman. 1972. *Applications of Event Data Analysis: Cases, Issues and Programs in International Interaction.* Beverly Hills: Sage Publications.

Table 1

Justification of Hostility Crises

Lebow sequence	July 1914 Crisis	Iraq-Kuwait 1990
Exploit provocation	Assassination in Serbia 28 June	Iraq accuses Kuwait of disregarding OPEC quotas, 17 July
Make unacceptable demands	Austrian ultimatum to Serbia 23 July	Iraq demands Kuwait forgive loans, make reparations, $25 oil price 23-25 July
Understate objectives	Austria claims it does not wish to destroy Serbia	Iraq assures Egypt it will not invade Kuwait
Use rejection of demands as casus belli	Serbia rejects some Austrian demands, 25 July	Breakdown of Jeddah talks, 1 August
War	Austria declares war, 28 July	Iraq invades, 2 August

Table 2

Reuters Chronology of 1990 Iraq-Kuwait Crisis

July 17, 1990: RESURGENT IRAQ SENDS SHOCK WAVES THROUGH GULF ARAB STATES
Iraq President Saddam Hussein launched an attack on Kuwait and the United Arab Emirates (UAE) Tuesday, charging they had conspired with the United States to depress world oil prices through overproduction.

July 23, 1990: IRAQ STEPS UP GULF CRISIS WITH ATTACK ON KUWAITI MINISTER
Iraqi newspapers denounced Kuwait's foreign minister as a U.S. agent Monday, pouring oil on the flames of a Persian Gulf crisis Arab leaders are struggling to stifle with a flurry of diplomacy.

July 24, 1990: IRAQ WANTS GULF ARAB AID DONORS TO WRITE OFF WAR CREDITS
Debt-burdened Iraq's conflict with Kuwait is partly aimed at persuading Gulf Arab creditors to write off billions of dollars lent during the war with Iran, Gulf-based bankers and diplomats said.

July 24, 1990: IRAQ, TROOPS MASSED IN GULF, DEMANDS $25 OPEC OIL PRICE
Iraq's oil minister hit the OPEC cartel Tuesday with a demand that it must choke supplies until petroleum prices soar to $25 a barrel.

July 25, 1990: IRAQ TELLS EGYPT IT WILL NOT ATTACK KUWAIT
Iraq has given Egypt assurances that it would not attack Kuwait in their current dispute over oil and territory, Arab diplomats said Wednesday.

July 27, 1990: IRAQ WARNS IT WON'T BACK DOWN IN TALKS WITH KUWAIT
Iraq made clear Friday it would take an uncompromising stand at conciliation talks with Kuwait, saying its Persian Gulf neighbor must respond to Baghdad's "legitimate rights" and repair the economic damage it caused.

July 31, 1990: IRAQ INCREASES TROOP LEVELS ON KUWAIT BORDER
Iraq has concentrated nearly 100,000 troops close to the Kuwaiti border, more than triple the number reported a week ago, the Washington Post said in its Tuesday editions.

August 1, 1990: CRISIS TALKS IN JEDDAH BETWEEN IRAQ AND KUWAIT COLLAPSE
Talks on defusing an explosive crisis in the Gulf collapsed Wednesday when Kuwait refused to give in to Iraqi demands for money and territory, a Kuwaiti official said.

August 2, 1990: IRAQ INVADES KUWAIT, OIL PRICES SOAR AS WAR HITS PERSIAN GULF
Iraq invaded Kuwait, ousted its leaders and set up a pro-Baghdad government Thursday in a lightning pre-dawn strike that sent oil prices soaring and world leaders scrambling to douse the flames of war in the strategic Persian Gulf.

Source: Reuters

Figure 1

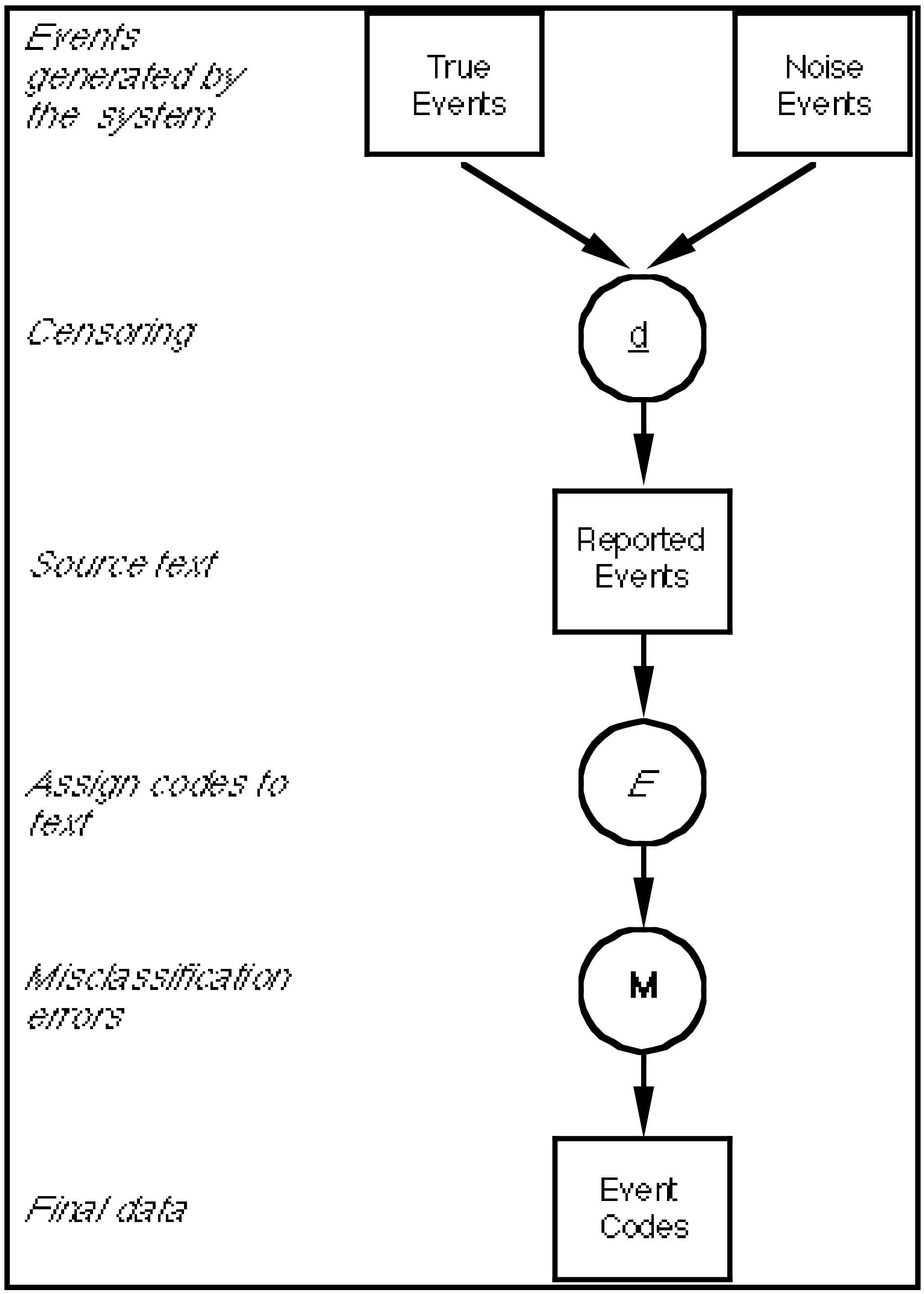
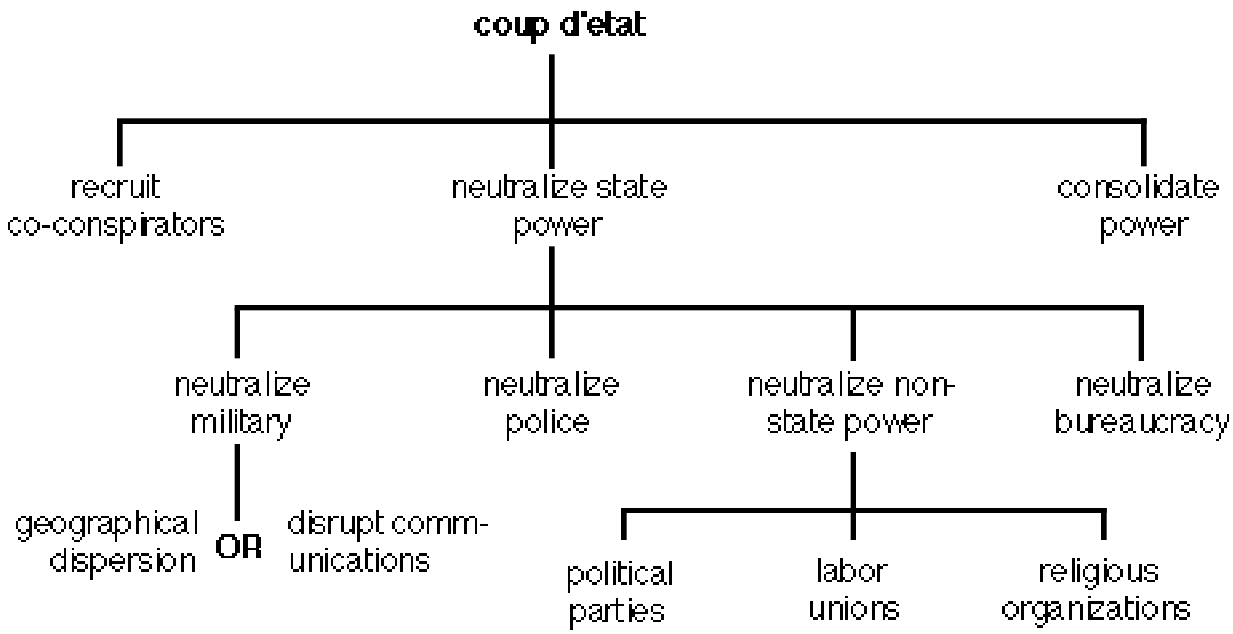

Events generated by the system
True Events
Noise Events
Censoring
d
Source text
Reported Events
Assign codes to text
E
Misclassification errors
M
Final data
Event Codes

Figure 2


coup d'etat
recruit co-conspirators
neutralize state power
consolidate power
neutralize military
neutralize police
neutralize non-state power
neutralize bureaucracy
geographical dispersion
OR
disrupt comm-unications
political parties
labor unions
religious organizations