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ABSTRACT

This paper describes an election simulation developed at Rutgers University (New Jersey) using Multimedia Toolbook. Toolbook has features which enable an information flow to be presented which mimics the flow of a campaign, using both text and video. Subjects are presented with textual information that flows across the screen, representing the passage of time. They may choose from a number of "headlines" in order to learn more about candidates; in addition, campaign commercial videos occasionally appear on the screen. This methodology allows for the presentation of a realistic campaign, using the computer to track all of the information examined by subjects and to create a "script" of the decision process. A more complete information processing-based model of voting is built using the data collected. In addition, Toolbook is used to present an online questionnaire prior to the experiment, from which political attitude and demographic information is collected. (Contains 37 references.) (AEF)

Conducting Political Science Research using Multimedia

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Abstract

Political scientists have long been interested in how people make voting decisions. A great deal of research into this topic has been conducted with the aim of building quantitative models that are able to accurately predict vote choices. But most of that research has been carried out using surveys, which capture the decision making process at only a single point in time. Because elections are dynamic, occurring over a period of time, and always changing, surveys may not be the best way to understand the decision process. Thus, some political scientists have chosen to develop election simulations, which attempt to model the election campaign, so that the information acquisition and decision process can be traced over time.

This paper describes one such simulation that we have developed at Rutgers, using Multimedia Toolbook. Toolbook has features which allow us to present an information flow mimicking the flow of a campaign, using both text and video. Subjects are presented with textual information that flows across the screen, representing the passage of time. They may choose from a number of "headlines" in order to learn more about candidates. In addition, campaign commercial videos appear on the screen from time to time. This methodology allows us to present a realistic campaign, using the computer to track all of the information chosen examined by subjects. In so doing, we create a "script" of the decision process. Using the data collected, we are building a more complete information-processing based model of voting. In addition, we are using Toolbook to present an on-line questionnaire prior to the experiment, with which we collect political attitude and demographic information. ! By using the on-line questionnaire, we eliminate the need to do data entry of paper questionnaire.

Introduction

This paper represents an update and extension of work presented at a prior ASCUE conference in 1992. (Redlawsk, 1992.) At that time Richard Lau and I had completed a conversion of a presidential election simulation which had been originally developed on an Apple Macinotsh system. The reason for the conversion and the choice of Toolbook 1.5 from Asymetrix Corporation were detailed in the earlier paper. Since 1992, we have made numerous changes to the original system, and have moved from Toolbook 1.5 to Multimedia Toolbook 3.0, which was released last summer. In doing so, we have been able to move from a simple text-based presentation of information to our subjects, to a system which includes text, pictures, and videos, better mimicking the range of information sources to which voters are exposed during a "real-world" presidential campaign. These changes would not have been possible without the advances in computer technology that have become available over the past three years. This paper discusses the nature of our project, including the psychological and political science theories which directed us towards simulation and away from traditional political science research methods. It particularly focuses on a project that I am overseeing, attempting to understand how voters process information that they receive during election campaigns. I will then describe the system as it is now designed, and discuss plans for future enhancements.

Theory

For many years the holy grail of voting behavior study has been the goal of predicting election outcomes. Beginning with the studies by researchers at Columbia University in the 1940's, (see Lazarsfeld, Berelson and Gaudet, 1948; Berelson, Lazarsfeld and McPhee, 1954, for examples) through an ongoing research agenda at Michigan (Campbell, Converse, Miller and Stokes, 1960, is the classic work in this area) and its followers, and on to the present day, political scientists have surveyed the public, and crunched the numbers resulting from those surveys in order to develop voting models with good predictive power. There is no question that much of this has been successful; our ability to predict vote results based on a range of factors is on the order of 90% accurate. But, while developing our standard models of the vote, researchers have developed a view of the typical voter as uninformed and relatively uninterested. We have become convinced that, because voters cannot ea! sily articulate the reasons for their vote, and because they often seem unable to place candidates on the various issue scales, that the public is just not paying a lot of attention.

During election campaigns voters are exposed to large amounts of information about candidates. In some cases voters can choose whether to pay attention, while in other cases the information is so ubiquitous that voters can hardly avoid it. But in all cases, the flow of information is dynamic -- one day information on a candidate's position on an issue is readily available; the next day it can hardly be found. Yet, nearly all of the studies that form the basis of our view of voters have relied on survey research as the methodology of choice, despite the fact that surveys can capture only one moment in time. Even panel studies only give us a snapshot of a few moments in an ongoing, dynamic campaign. So, we are forced to rely on respondent's memories of what they have seen and which campaign information affected them. The election's dynamic nature is missing. One important result of this mismatch is that while we can make good predictions of the vote choice, we cannot do nearly as good a job describing how voters come to their choice. To understand this point, we have to recognize that all standard models of voter choice conform to what is called a "memory-based model." That is, they implicitly (Columbia, Michigan) or explicitly (Kelly & Mirer, 1974) require the voter to maintain information about the campaign in memory and then to access and use that information "at the moment of decision" in order to evaluate candidates and make a choice. Kelley & Mirer probably provide the clearest example -- they propose that as voters encounter campaign information it is stored in memory. When the time comes to vote, the memories for each candidate are recalled and the likes and dislikes that they represent are added up. The candidate who emerges with the highest affective "score" is then chosen. If there is a tie, party affiliation b! ecomes the tie-breaker.

The underlying problem with this model is simple -- people just don't and can't process information this way. Cognitive psychologists since Simon (1955; 1956; 1957) have long recognized that humans are limited information processors. We have a serious bottleneck, called short-term memory, which limits how much stimulation we can absorb at any one time. Further, it takes cognitive effort to move things into long term memory and then to retrieve them again when needed. So, while political scientists have been developing models which require a significant investment of cognitive energy, psychologists have been showing us that people are, to use Taylor's (1991) term, cognitive misers. Recently, Lodge and colleagues Lodge, McGraw and Stroh, 1989) have proposed a new way of looking at how people process political information. They have begun to apply a model developed by psychologists Hastie and Park (1986) which recognizes the limits of human cognition. This on-line model, as it is known, proposes that people are constantly evaluating social information as they perceive it; that is, they maintain a kind of "on-line tally" which is used to keep track of current feelings towards a social object. Where memory-based processing reserves the evaluation phase for sometime after the information is received, the on-line model argues that evaluation is constantly occurring. More importantly, for our purposes, On-line processing does not require that any of the information originally received, be retained in memory. Whether remembered or not, the information is included in the constantly updated on-line counter. The on-line model suggests that as campaign information is attended to by the voter, a pre-existing affective tally about the candidate is recalled from memory. This tally, which contains a running score for each candidate, is then updated based on the voter's reaction to the new information. The updated tally is then restored to long term memory, and the information which was used to update it can be safely discarded. When the time comes to vote, one need only retrieve the tally for the candidates, compare each, and vote for the one with the more positive value. There is no need to search memory for information learned about the candidates; in fact, little of the information which informed the tally can be expected to remain in memory. Lodge and his colleagues, recognizing that voting is ultimately an evaluation task, argue that the on-line model is a better descriptor of how people process campaign information. They have run numerous experiments which have consistently shown that people do appear to use an on-line tally, rather than some type of memory process when evaluating political figures. They have routinely shown that there is no connection between the contents of memory and the evaluations their subjects report.

Implications of Current Views of Voters

Why do I think this matters? That is, since political scientists agree that existing models of the vote do an very good job of predicting vote choice, why we be concerned about how people process the information which leads to their decision? As long as we know the inputs and the outcomes, why should we be concerned with the "black-box" where inputs turn into outcomes? I have already alluded to one of the reasons why I think it is important earlier -- existing research paints a pretty negative picture of the voter as citizen. Unable to give a good account of his or her vote, and unable to tell us much in detail about politics and elections, we find voters to be almost derelict in carrying out their civic duty. Existing ways of looking at voter decision making makes us wonder how voters could ever manage to pick the candidate who is "right" for them. Even recent explanations for voter accuracy, such as Popkin's (1991) low information rationality, take as given that vote choices are made with very little real information. Of course, if it were only political scientists who take a dim view of voters, this might not matter much at all. But, our view of voters has become the conventional political wisdom -- issues don't matter, and flash is everything. The pictures we paint affect how politicians view voters and how they then respond to them. However, if the on-line model is an accurate description of how voters process information, then voters may well be taking large amounts of information into account in their evaluations of candidates -- large amounts that they cannot then regurgitate to the survey researcher. Why not? Because by processing it on-line and making evaluations on the fly, voters have no need to keep the details in memory, once it is included in the on-line tally. Taking this to its logical conclusion there is no reason for memory to play any role whatsoever in voter decision making, and Kelly & Mirer are simply wrong. If this is the case, then anything voters tell us after the decision has been made represents rationalizations, rather than memories. Recent work (Rahn, Krosnick, and Breuning, 1994) has come to a similar conclusion. They find strong evidence that our standard open-ended National Election Study1 questions elicit responses which simply do not connect with the actual vote choice. They argue that our traditional survey based methods of getting at vote choice cannot be counted upon to measure what we have thought they were measuring. This methodological problem, then, represents a second reason why it is important to understand how voters reach their decisions. The standard approach to determining the reasons for a voters choice is to ask a series of open-ended questions requiring respondents to list their likes and dislikes about the candidates. This questioning takes place after the election, after the decision has been made. Voters are expected to recall from memory reasons why they supported or opposed a candidate. But, if Lodge, and Rahn, and the psychologists who tell us that we make most evaluations on-line are correct, these recollections do not necessarily represent the reasons that really went into the voter's decision. If this is the case, how can political scientists be expected to ever truly understand why voters do what they do? The answer, I believe, lies in a technique called process tracing.

Process Tracing Analysis

Process tracing originated in marketing research's efforts to understand decisions like buying a car, or choosing an apartment. The design called for tracing each step that the decision maker applied to the task. By following subjects as they actually made a decision, researchers could study each step in the decision-making process as it happened. The ability to follow what is normally a private process, provided significant new insights into how people deal with complex decision environments. The tracing has been done either by asking subjects to "think-aloud" as they carried out the task, or, in some research, by attaching equipment to the subject which records eye movements as different items are examined. A third method consists of using an "information board" on which items of interest are arrayed in one dimension and the attributes of each item are arrayed in the other dimension. While these boards have had a long and fruitful history in the study of decision making, they have rarely been applied to the decision we are talking about today -- the vote. In fact, the only example of which I am aware is research by Herstein (1981) in which he used a traditional information board to trace evaluation of two candidates on a number of different attributes. Perhaps the most fascinating finding Herstein reported, was that political party did not matter much -- it was accessed by his voters to a much lesser extent than other information, and was chosen far later into the campaign than one might expect. But, despite these odd findings, which I believe to be methodological artifacts, the information board appeared to be a useful technique. Process tracing has proven itself as a good way to understand complex decision making. And, from a political science point of view. voter choice during a political campaign is certainly a complex decision. Herstein's problems stemmed from trying to study what is a dynamic election process with a static technique. What I have done is to take the traditional static information board, and modify it into a dynamic, ever changing design, which better mimics the flow of information during a political campaign. Political information comes and goes, certain types of information are available at different times during a campaign. To try to model this dynamic process on a static board has as many problems as using surveys to snapshot the dynamic nature of the campaign. Thus, a way to present something like an information board, but which mimics the dynamic nature of the political campaign, needed to be devised. Richard Lau and I have designed and implemented such an approach, using Multimedia Toolbook 3.0 running on Windows-based computers. Using our system, we can present a mock presidential election campaign to voters, with the computer recording what information was viewed, ho! w much time was spent on various kinds of campaign information, and the order in which information was searched. Using the data generated in this manner, along with a questionnaire following the campaign, we have the ability to examine the "black-box" that political scientists have generally ignored. We have called this simulation system Ballot Box.

The Ballot Box Application

From the perspective of the person using our simulation, the system appears relatively simple. After reading a set of instructions, subjects "register" to vote in either a Democratic or Republican presidential primary election. The primary election then begins, and subjects see information for a number of candidates, some of whom are from their party, while others are from the opposite political party. This information is presented in the form of short descriptive statements which appear in the middle of the screen, six at a time. These statements take the form of "Rodgers position on Haiti", or "Gallup Poll Results Released" where they provide a label that might represent a newspaper headline. To learn about the information represented by the label, a subject using the computer mouse to click on the label of interest. A new screen then appears which shows a paragraph of detailed information about the candidate. When finished reading, the subject returns to the initi! al screen to see more information labels.

The critical difference between our approach and traditional static information boards is that the labels on the screen keep changing. New labels appear at the top of the screen about every 4 seconds, and scroll down the screen for about 20 more seconds, and then disappear at the bottom. Subjects cannot know whether labels which disappear will ever be shown again -- information not accessed when it first appears may or may not appear again, much as information in a real campaign comes and goes. As the primary campaign progresses, voters are expected to learn everything they believe they need to know to make their vote choice.2 In the original version of Ballot Box, technological and financial limitations meant that all information presented to subjects was in text format and everything was read on the screen. Of course, while this mimics a newspaper reasonably well, voters get much of their campaign knowledge through television and pictures. Thus, as the technology available to us has improved, we have made significant changes to our system. First, we were able to scan in and present still pictures of each of our candidates. These pictures were digitized and presented as bitmaps using Toolbook's ability to show both graphic images and text. Then, with the release of Multimedia Toolbook 3.0 and its greatly enhanced capacity to handle digital video, last summer we enhanced the system again to include video campaign ads, as well as our standard text-based information. Thus, the system has truly become a multimedia system, incorporating text, still pictures, video, and audio into a single simulation.

As subjects go through the primary campaign, choosing information of interest, they are interrupted from time to time by the campaign videos, which overlay the label boxes, and temporarily disable the ability to examine text-based information. Thus, subjects have little choice but to watch the videos. When an ad finishes, the label screen reappears. After a preset period of time, the primary election ends, and subjects must vote for their preferred candidate. At that point, the general election begins, featuring one candidate from each party. Subjects may or may not see the candidate they chose in the primary end up in the general election -- in other words, sometimes they vote for "winners," other times for "losers." The general election is basically the same as the primary, with video, text, and pictures available. At the end of the general election, subjects make a choice between the two candidates and then end the simulation. Finally, some information is collec! ted via a pencil and paper questionnaire.

The System and Programming Environment for Ballot Box

While the presentation to the user of the system is reasonably straightforward, and appears relatively simple, the programming environment is actually quite complex. The original system was designed using Apple Hypercard, and ran on Macintosh machines. In 1991, we began converting it to Toolbook 1.5, for two basic reasons. First, we wanted to make full use of color, and color Macintosh's were relatively rare. Second, Rutgers political science had standardized on Intel-based machines. Conversion was relatively straightforward, and we began running experiments with it in 1992. As the technology improved, and available PC's became more powerful, we took advantage of new capabilities and the system grew more complex. With the arrival of Toolbook 3.0, both power and complexity increased again. In 1995, we are running the Ballot Box system under Toolbook 3.0a, in a Windows for Workgroups 3.11 environment. We acquired two IBM Thinkpad 750Cs portable computers in order to take the experiment into the field, rather than requiring subjects to come to our offices. These computers have 80486 DX33 processors, 8 Mb RAM, and 340Mb hard drives. The Thinkpads come standard with sound chips, eliminating the need for any kind of external sound device in order to play the videos. While they also possess good quality screens, we needed to present the simulation on relatively large screens, to make using the system easier for subjects. So along with the portable computers, we added two 15 inch external monitors by NEC. Each portable computer was configured in exactly the same way, so that there would be no variations in the way the system ran on either machine. The machines were also equipped with docking stations and ethernet adapters so that when returned to the office, ! all data on them could be accessed across our office Windows for Workgroups based network.

Because of the addition of video to our system, we needed to acquire a system powerful enough to produce and edit videos. We chose an 80486 DX2/66 machine initially, which has since been replaced with a Pentium-90 machine. This video production system has 32Mb RAM, nearly 2 gigabytes of fast hard disk space. It has been equipped with an Intel Smart Video Recorder card for video capture, along with a Soundblaster 16ASP card for audio capture and playback. We are using Adobe Premiere 4.0 to capture segments from videotape and create our own digital campaign ads. Voice overs are then added to the video and a complete 20-25 second campaign ad is produced and compressed. Even with compression, though, the campaign ads take up to 3Mb of disk space for each ad. Working with Toolbook means learning object-oriented programming (OOP). For programmers used to the more traditional languages like COBOL or BASIC, OOP based languages can be very confusing. Toolbook functions under a hierarchical structure. Messages are sent from the level at which they occur on up the structure until a script is found to handle that message. Clicking a button sends a BUTTON UP message to the script for that button. If there is no BUTTON UP handler defined for the button, the PAGE that the button is on will get the message. If it has no BUTTON UP handler, the message will be sent up to the BACKGROUND level, and so on, until a handler is found or an error generated. Every object that is defined on a screen can have a script associated with it. If there is a script, that script will define the events that occur when the user selects that object. If there is no script, the object is generally simply a graphic or a field into which data can be typed. ! It is the interaction of the scripts, and the messages that get sent through the hierarchy that define how the application operates.

Scripts are programmed in Toolbook using a language called Openscript. Openscript is very English-like in its syntax and use. It may remind programmers of BASIC in its simplicity. However, that simplicity masks a great deal of very powerful function. Openscript has a wide range of pre-defined functions which, when built into a script, allow for the complete control of every object on the screen. As will be seen in the examples below, Openscript is structured, and programming in it is a good test of the ability to master structured programming techniques. This structure is critical to Openscript, as there is no GOTO construct. Everything must be managed through looping structures, calling structures and through the hierarchy of objects. Perhaps one of the biggest culture-shocks for traditional programmers who face an OOP language is that there is no one place in which you can see the complete flow of the program, since the program does not have any kind of typical top to bottom flow. Instead, objects are identified and grouped together as needed. Scripts are defined for each object only once, and then re-used at an appropriate place in the application's hierarchy. Consequently, trying to see the big picture of an application can be difficult. Added to this is the fact that Toolbook does not have any way to print out all of the scripts associated with an application in one pass. Also, the data associated with an application is stored in a special format, within fields that are themselves objects. So, while it is very easy to manipulate the data from within a particular application, creating large amounts of text is better done outside of the application with a word processor. The text can then be imp! orted into the application and placed into appropriate fields.

The strength of Openscript and Toolbook is the ease with which it handles graphical objects and video. Candidate pictures in Ballot Box are bitmaps, which are stored on disk outside of the Ballot Box application. When a subject access a picture, the Openscript programming merely reads the bitmap in and places it on a predefined "stage" on the screen. This works very quickly, and provides incredible flexibility. For example, if we wish to vary the pictures of our candidates, while holding constant all other information, this is easily coded. Multimedia objects, such as videos, are handled in a similar way. Toolbook contains a number of functions which open, play, rewind, and close digital video and digital audio. Coding these objects is simply a matter of placing a pointer to the disk file and reading it.

Future Directions

We have now used our simulation to run six sets of experiments, though we have so far analyzed data from only three of them. (See Lau and Redlawsk, 1992; Lau and Redlawsk, forthcoming; Redlawsk and Lau, 1995 for reports of the data analyses.) Our studies have included manipulation where we have varied the number of candidates in the primary election -- so that some subjects got two candidates in their party and others got four -- as well as varying whether or not the preferred primary candidate becomes the general election candidate; that is, whether the candidate for whom the subject voted in the primary win the nomination. We have also varied the number and content of the campaign videos that are shown, as well as changed the gender of candidates. In our next study, to go into the field this month, we are varying the attractiveness of the candidates, to assess how personal factors influence the way people process political information. From the standpoint of our system, we have some plans for change. The campaign videos were currently use are very rough -- their quality is not as good as we would like. In addition, because we chose to use Microsoft's Video for Windows, and our portables do not have local bus graphics, we have been limited to running the videos in very small windows. Our plans include upgrading our equipment so that the videos can run in at least a 240 X 320 window. Further, as video capture technology improves, we expect to be able to get better images in our videos. The recent upgrade of our video production machine gives us a platform to improve this critical are of our application. Finally, the Ballot Box program is not unlike many programs that have been developed and changed over time. It contains code that is no longer used, as well as inefficient structures that need to be streamlined. Most importantly, for our purposes, we hope to simplify the system so that any researcher interested in similar questions would be able to use the program without the necessity of recoding large amounts of the system. For the kinds of questions were are asking in our research program, Rick Lau and I needed to have a methodology that is radically different from that employed by most political scientists most of the time. Thus, we borrowed the information board concept from psychology and consumer behavior studies. We then changed its very nature by making our system dynamic, where we could match the flow of campaign information over time, in order to understand how information affects the voting decisions that people make. We see this technology as continuing to support our research, as we find additional ways to apply it over time.

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