MacShapa

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Hardware:
Macintosh, System 7 + Optional equipment: high quality video recorder, Abbate VTK remote cable and software.

Type: Research Tools, Statistics and mathematics.
Function: Exploratory sequential data analysis.
Content: ✻✻✻✻
Presentation: ✻✻✻
Cost: US$80 for multi-user licence

This package provides a comprehensive workbench for analysing sequential data. MacSHAPA is a powerful research tool, but also straightforward enough to be used in undergraduate practical work.

Reviewed by:
Martin Arnold, George Kuk, & Frank E. Ritter
University of Nottingham

Hardware Requirements

A fast 68040-based Macintosh (e.g., Quadra 840AV) is recommended by the developers. MacSHAPA also works well on Power Macs and on some, but not all, Powerbooks. At least 8 MB RAM. System 7.0 or later. A large colour or grey scale monitor.

A VCR may be controlled through MacSHAPA; two separate configurations are supported:

(i) Panasonic AG-7750 VCR or Panasonic AG-DS850 with Panasonic AG-F700 Timecode Generator / Reader card. This configuration communicates directly with the inbuilt MacSHAPA VCR driver.

(ii) Abbate VTK Remote software and cable (US $79 to MacSHAPA users) in conjunction with a compatible VCR recorder. This software allows your Macintosh to control a wide range of VCRs. However, this set-up provides inferior performance compared to the inbuilt MacSHAPA VCR driver. A number of configurations using the VTK remote, such as VCRs using the Control M interface, may not work satisfactorily. You should contact the distributors (CSERIAC) for further information about using MacSHAPA with VTK remote and to try out the connection before committing to a VCR purchase.

We ran MacSHAPA on a Power Mac 7100 with 16MB RAM, 700MB hard disc and two Apple Multi Scan 17" colour monitors. Due to our hardware constraints, we are not controlling a VCR directly from MacSHAPA. Instead, we are using CVideo software to produce video transcripts that can be imported into MacSHAPA. CVideo allows a wide range of VCRs to be controlled via a Macintosh computer. It provides transcription facilities, such as capturing timestamps from video *(see page 29 in this issue of PSN)*.

Introduction

Recordings of behaviours can provide a rich source of psychological data. There are five common operations that may be applied to these recordings. Typically they are done in order, but often steps are repeated as later analyses inform the analyst and suggest changes.

1. *Transcribing:* producing written extracts or full transcripts of the recordings, sometimes with linguistic notations;

2. *Parsing:* dividing the transcripts into units of discrete behaviours, events or speech acts;

3. *Time stamping:* recording the time boundaries for each unit;

4. *Coding:* determining the nature and meaning of each unit with reference to a coding system, including checks of reliability using Kappa coefficient;

5. *Performing exploratory and inferential analyses* on the codes, such as lag sequential analysis.

However, each of these operations can be time-consuming, and this has held back the widespread use of this type of data.

MacSHAPA: A research and analytical workbench

MacSHAPA (Sanderson *et al.*,1994) is a software workbench that will help researchers perform these operations using a spreadsheet metaphor. It represents individual data as spreadsheet cells and sequential data streams as columns. The user can edit data in a number of ways like in a spreadsheet, for example, direct manipulation, cutting and pasting, and through a query language.

Data can be entered into MacSHAPA in two ways: (i) various format text files can be imported into the MacSHAPA spreadsheet; (ii) the analyst can perform on-line annotation and coding using on screen controls to drive the VCR. Timecodes can be assigned to cells. These timestamps allow the data to be examined in a number of cross referenced formats: computer controlled VCR, graphical timeline presentations, and so on. If these timestamps were captured from the VCR controller the user can select a cell and view its video segment.

The analyst can use MacSHAPA as a tool for exploring data to generate hypotheses that might then be subjected to more rigorous confirmatory tests. It contains useful descriptive and inferential statistics. Descriptive statistics include summaries of counts for different behaviours, differ-

Arnold, M., Kuk, G., & Ritter, F. E. (1995). MacSHAPA review. CTI Psychology Software Review, 6(1), 18-20.

example

action	codings martin	ols codings
111 13:43:38:00 13:43:41:00 bal 110b maintaining flight level 350	112 13:43:38:00 13:43:41:00 pilot info	112 13:43:38:00 13:43:41:00 pilot info
112 13:43:40:00 13:43:41:00 mark strip bal 110b	113 13:43:40:00 13:43:41:00 during manip	113 13:43:40:00 13:43:41:00 during manip
113 13:43:42:00 13:43:50:00 bal 110b roger gm standby break klm 661 descend now to level 260	114 13:43:42:00 13:43:50:00 acknowledge 115 13:43:42:00 13:43:50:00 level 1	114 13:43:42:00 13:43:50:00 acknowledge 115 13:43:42:00 13:43:50:00 level 1
114 13:43:43:00 13:43:44:00 [select track data block bal 110b]	116 13:43:43:00 13:43:44:00 null	116 13:43:43:00 13:43:44:00 null
115 13:43:47:00 13:43:47:50 thankyou	117 13:43:47:00 13:43:47:50 initiate negotiation 6	117 13:43:47:00 13:43:47:50 initiate negotiation 6
116 13:43:48:00 13:43:50:00 [mark strip klm 661]	118 13:43:48:00 13:43:50:00 during manip	118 13:43:48:00 13:43:50:00 during manip
117 13:43:50:00 13:43:51:00 [cock strip bal 110b]	119 13:43:50:00 13:43:51:00 during manip	119 13:43:50:00 13:43:51:00 during manip
118 13:43:51:00 13:43:54:00 descending flight level 260 bal 110b (blip driver mistake)	120 13:43:51:00 13:43:54:00 level 3	120 13:43:51:00 13:43:54:00 level 3
119 13:43:52:00 13:43:54:00 [write strip klm 661]	121 13:43:52:00 13:43:54:00 during manip	121 13:43:52:00 13:43:54:00 during manip

Figure 1. Coding using MacShapa

ent orders of transition matrices and common cycles of behaviour. Inferential statistics mainly include lag sequential data analysis. The results of the descriptive and inferential statistics can be used to support more advanced modelling, for instance, first order transition matrices for building pathfinder nets. One can move between quantitative and qualitative analyses quite easily, and both types are supported.

As with any statistical package, care must be taken when performing analyses and drawing inferences. MacSHAPA allows unwary users to apply statistics in situations where they may be invalid. For example, the Kappa statistic may be obtained after automatically aligning two streams of data to maximise the number of matches between streams. In this case Kappa is not valid, as the data streams are not aligned by position; however, no warning is given in either the manual or the Kappa report.

Documentation and Instructions

MacSHAPA comes with a ring-bound 800 page manual that takes the user through all of its functions in a clear, step-by-step manner. The manuals otherwise excessive length is explained by its modularity and extensive use of white space and screen dumps for clarity. User support is provided through a set of Email lists.

User Interface and Presentation

The on-screen presentation is generally uniform and well designed. All the report windows can be printed and most can be pasted into other applications. MacSHAPA's user interface can be a little quirky and inconsistent. For example, only the names of some types of spreadsheet col-

umns can be changed directly, others cannot. Fortunately, the user manual is comprehensive enough to allow the user to work though these inconsistencies.

Projects at the University of Nottingham

MacSHAPA is being used within the Psychology Department by research staff to analyse social data, developmental data, and cognitive data. But it is an easy piece of software to use - last year we had two 3rd-year student projects using MacSHAPA.

One project analysed conversation turn-taking during mock interviews. The other project analysed data from videos of a high fidelity en-route air traffic control (ATC) simulation. Transcribed data were easily imported into the MacSHAPA spreadsheet (see examples in Figures 1 & 2). A coding scheme was developed iteratively, based upon a hierarchical task analysis of ATC. This preliminary coding scheme consisted of low level, observable actions, such as the air traffic controllers writing on a paper flight strip. The low level actions were grouped into functional tasks, such as ACCEPT AIRCRAFT INTO SECTOR. Finally, trigger events were coded, such as, an aircraft pilot contacting the controller. Hence, the MacSHAPA spreadsheet contained four columns of data: transcriptions, observed actions, functional tasks, and trigger events. The comparisons report was used to show that another coder could use this scheme with 99% agreement. The student examined how air traffic controllers cope with increased task demands. He found that as task demands increase (a) controllers will postpone low priority actions, (b) communication between controllers has an increased importance in decision making, and (c) communication between controllers becomes more direct.
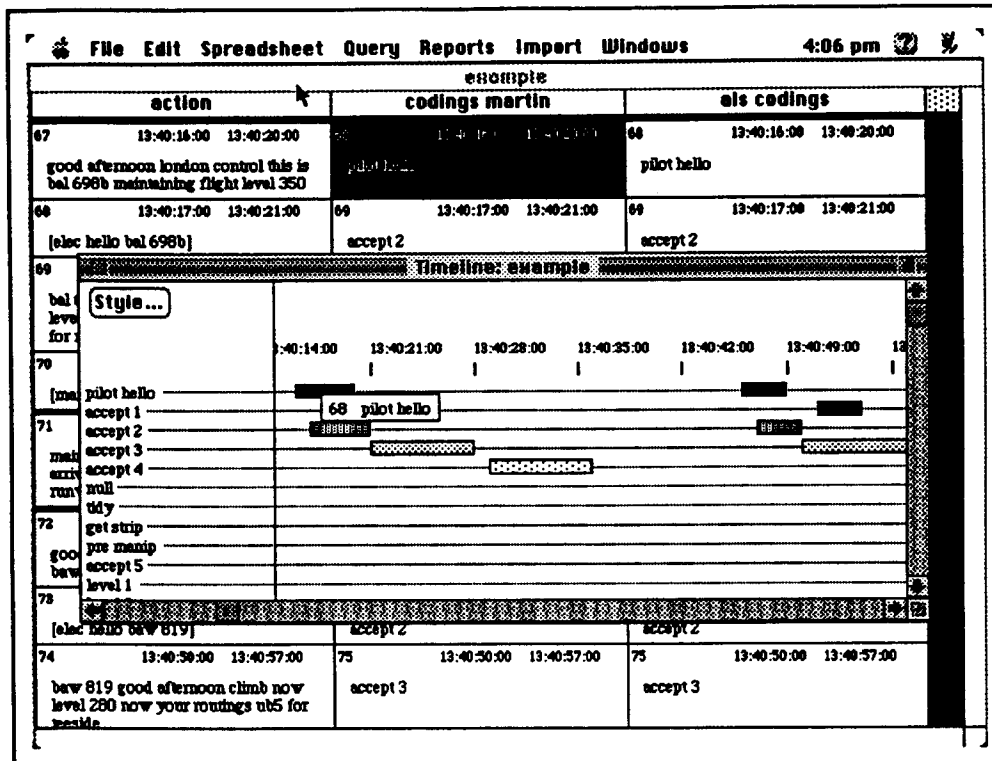
Figure 2. Example of timeline within MacShapa

Conclusions

The main aim of the MacSHAPA developers in their research was to provide an environment that allows the user to develop a richer understanding of their data by allowing the analyst to examine their data in a number of complementary formats. We can unreservedly conclude that MacSHAPA fulfils that goal - MacSHAPA has supported all the analyses we have wished to perform on our sequential data.

The statistical analysis tools within the software are aimed towards providing support for exploratory analysis of data. It would, however, be nice if some more thorough and robust inferential statistics were available. For example, in modelling Markovian processes, it would be useful to include statistical tests for violations of Markovity assumptions: stationarity, homogeneity and order.

We have encountered a problem with MacSHAPA computing a relatively complicated descriptive statistic using the sampling filter, which joins codes to make new codes. At best it does not fit our assumptions and some of the documentation, at worst it simply doesn't do what it should. However, when contacted, the developers have been quick to respond.

The major downside to MacSHAPA is the hardware expense for complete functionality. MacSHAPA's VCR control does not interface well with the Abbate VTK remote. If the user goes for this option, then it is very important to test out the hardware before purchase. The alternative is to use MacSHAPA with the Panasonic AG-7750 or AG-DS850 video recorder. The performance with these machines is good, however, they are also very expensive. A less expensive alternative, until cheaper VCRs work well with MacSHAPA, is to use CVideo.

If you have an interest in sequential behaviour and have access to the appropriate hardware, MacSHAPA is an excellent buy. Even if you do not have access to the appropriate VCR, out of the numerous systems we know about, have used, or have built (Ritter & Larkin, 1994) it still offers the best general platform for sequential data analysis. It is simple enough to be used by undergraduates and powerful enough to be used as a research tool.

References

Ritter, F.E. and Larkin, J.H. (1994). Using process models to summarize sequences of human actions. *Human-Computer Interaction, 9*(3&4), 345-383.

Sanderson, P.M., Scott, J.J.P., Johnston, T., Mainzer, J., Watanabe, L. M. & James, J.M. (1994). MacSHAPA and the enterprise of Exploratory Sequential Data Analysis (ESDA). International Journal of Human-Computer Studies, 41 (5), 633-681.

This is an entry-level authoring tool for users of Authorware Professional who don't have design aspirations of their own and are happy to use preexisting tutorial structures. The toolkit consists of a collection of Authorware models which may be modified by more experienced Authorware developers.

Currently the ATT is available for Windows, but a Macintosh version is planned when Authorware Professional 3.0 is available.
A PC with 80386 processor (486 strongly recommended) 4 Mb RAM (8 Mb strongly recommended) VGA graphics (SVGA recommended) 4.5 Mb free disk space. MS Windows 3.1x

Available from the following FTP site:

FTP: bbs.nott.ac.uk in /pub/ATT

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CVIDEO

CVideo is a video annotation tool that lets you analyse, annotate and locate specific scenes on videotapes and laserdiscs. CVideo integrates a special word processor with a video controller. The video controller provides direct control of the video player with single keystrokes and mouse clicks.

The word processor lets you take notes and stamp start and end times that link each note to a video scene. Once the video is annotated, CVideo can fast forward or rewind automatically to a specific video scene or text note.

CVideo's word processor format supports a variety of representations including content logs, transcripts, and keyword coding schemes. Moreover, users can mix and match a variety of annotation strategies within a single document: keywords, transcript, and analytic comments can be intermingled freely. The *Find* command enables users to search their text for a keyword or phrase, and the *Collect All* command gathers the resulting set of annotations into a list.

CVideo links a Mac to a video player via a simple cable. It runs on any Apple Macintosh computer, with no need for special video cards or a lot of computer memory. CVideo can be used with any television monitor and works with popular makes of VCRs and camcorders, including Sony LANC and Visca devices.

CVideo gives flexibility in recording and viewing video notes. Using the custom AppleEvents supported within CVideo 1.5, video can be annotated within any Macintosh application, including FileMaker Pro, Microsoft Word, or your electronic mail editor. For example, if you need a database format with multiple fields including QuickTime movies, numbers, buttons, and checkbox, you can type your video notes in FileMaker Pro 2.0. Via AppleEvents, all CVideo's features become available for your use. For example: press a key to start or stop the video; click a button to stamp a video time into a FileMaker Pro field; click another button and CVideo will locate the corresponding video scene for you. CVideo uses only a few controls and commands to quickly timestamp, annotate and locate recorded video material.

Technical specifications: Any Macintosh with System 6 or System 7. Minimum 2 Mb RAM. Hard Disk not required, but recommended. CVideo exports to text, Nudist, Digital F/X, and CMX formats. It imports text and Nudist formats.

Using the included cable, CVideo can control video equipment with a LANC (Control-L) remote port and an hour-minutes-seconds counter ("00:00:00"). These include the following Sony models: Hi8 VCR: EVC100 Handheld HiVCR: GVS50 SVHS VCR: SLVR-1000 Visca VCR: VDeck CDV-1000 Camcorder: Any Sony camcorder, and most 8mm recorders.

Using an additional cable, CVideo can control a Pioneer 4200 Laserdisc player, the NEC PC-VCR, and the Panasonic AG-1950 and AG-1960. If your VCR is computer-controllable and not listed below, the distributors may be able to provide a custom driver.

Suggested retail price $150, incl: cable, software & documentation.

CVideo is available from:

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