

AUTOMATED DATA COLLECTION

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ABSTRACT

Human factors organizations frequently are requested to provide recommendations about design choices to a product design team. These recommendations should be based on operator performance data. However, in many cases the required information may not be present in the current literature and time and personnel resources may be limited. This paper describes how this problem has been solved by the Human Factors group in IBM at Boca Raton. We are using the IBM Personal Computer as a process controller for studies in our lab. This low cost tool facilitates the automation of studies which require the recording of data for subsequent analysis. The Personal Computer has also been used to analyze the data.

INTRODUCTION

Human factors recommendations should be based on operator performance data. This data may be obtained from the current human factors literature or from studies conducted by the human factors group. Undoubtedly, the most economical source of recommendations is the human factors literature. However,

- o The required type of information may not be addressed in the current literature.
- o The information in the literature may be too general for the specific question being asked.
- o The information in the literature may be too specific for the specific question being asked.

If this is the case, then an alternative is for the human factors group to conduct a study to answer the question. If time and personnel resources are limited, this may not be a feasible alternative without computer assistance.

Data collection can be facilitated by means of automatic equipment. When data is collected by such machinery, it is usually stored in a form which permits immediate analysis. Another advantage is the higher level of fidelity of the data collected as compared with manually recorded data.

Until recently, the price of automatic data collection restricted its use to well funded projects. Furthermore, these machines required a substantial investment in programming and preparation time thus further restricting their use.

The availability of low cost computers makes them much more attractive as process controllers for experimentation in the field of human factors. High level computer languages are available which reduce the program development effort formerly required. These two factors combine to present a solution to the time/personnel resource problem.

For example, assume that the human factors group knows the acceptable Type I and Type II errors and required discrimination for the experiment. If they also have some idea of the variability associated with the performance variable being investigated, then they can estimate the required sample size (Diamond, 1981, p. 28). If the required sample size is 120, and the duration of the experiment is 1 hour, then it will take 20 working days (1 subject at a time, 6 subjects per day) to complete the experiment. On the other hand, if the experiment were automated and two computers were used to collect the data, then the experiment would take 10 days. If eight computers were used to collect the data, then the experiment would take 2.5 days. Once the software for the experiment is developed, it can be used on any number of computers at no additional software cost.

DEMONSTRATION

An IBM Personal Computer (IBM PC) has been set up (at least for the duration of this interactive session) to illustrate how a small computer can be used to automate a typical study. Attendees to the session are being asked to participate in the study. As

each additional person does the task, the data base is automatically updated with the new data collected on the latest test subject.

The null hypothesis for this study is that operator performance during a tracking task using a joystick having spring centering is not different from operator performance in this task using a joystick without spring centering (i.e., with free positioning.)

The hardware implementation of this study is with two hand-held joystick controls, identical except that one has spring return and the other is free positioning. These are connected to an IBM PC.

In addition to presenting the stimuli to the test subjects and keeping their score, a computer program was written to also do the following:

- o control the order of presentation
- o count the number of subjects
- o instruct the subjects with screen prompts
- o do statistical computations
- o display intermediate results
- o save results on diskette

CONCLUSION

An industrial or research human factors organization frequently may be asked to provide design recommendations. Sometimes there is insufficient information available in the human factors literature upon which to make the requested recommendations, and a study to gain the information is indicated. With limited resources, these studies may not be possible without computer assistance. The advent of small, inexpensive, easy-to-program computers should open a doorway for many such studies.

REFERENCES

- Diamond, William J. Practical Experiment Designs for Engineers and Scientists. Lifetime Learning Publications: Belmont, CA, 1981.