A DATA ACQUISITION AND RETRIEVAL SYSTEM FOR STUDIES OF ANIMAL SOCIAL BEHAVIOUR

by

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(With 2 Figures)

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In studies of mammalian social behaviour it is becoming increasingly important to recognise and record a large number of distinct behaviour patterns. As many as fifty different social acts and postures have been described in the rat, mouse, guinea pig and hamster (Grant & Mackintosh, 1963) while over one hundred and twenty have been identified for the rhesus monkey (Altmann, 1965). The size of the behavioural catalogue and the rapidity with which the acts occur is such that traditional methods of acquiring data, such as the notebook or multichannel event recorder, are no longer appropriate for many areas of investigation.

An early attempt to meet the difficulty of recording sufficient information was based on commentaries, tape recorded during periods of observation and employing one observer per animal (Grant & Mackintosh, loc. cit.). The problem of retrieving the data remained. Methods have since been developed in which the data is encoded on magnetic tape in a form which can be deciphered automatically by computer. In addition to speeding its retrieval, these methods produce information in a form which lends itself immediately to further analysis by computer software. Thus Dawkins (1971) has described a method in which behavioural acts are encoded on magnetic tape as different tones initiated from a keyboard; on playback the computer recognises the identity and timing of each tone. White (1971) also employed a keyboard-operated system, capable of timing a repertoire of forty different events with great precision. The information was recorded digitally on magnetic tape in a code which was inherently resistant to cumulative errors. However the instrumentation was undoubtedly complex and relatively expensive to engineer.

A simpler computer compatible system for use in conjunction with tape

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recorded verbal commentaries has been described by Mackintosh (1965) which did not rely on magnetic tape as an intermediary but used a teletypewriter for immediate transcription of the observations to paper tape.

The present report describes a simple method to enable one observer to record an unlimited catalogue of different behavioural acts for more than one animal simultaneously, and to retrieve this information in tabulated form.

The instrumentation is portable, inexpensive (the whole system was assembled for £50) and is extremely simple to operate. Furthermore, the observer is not distracted from his animals by the need to attend to a complex keyboard and the method does not depend upon access to a computer. The technique was developed to obtain records of the social and non-social behaviour of pairs of interacting golden hamsters as part of a study of social communication in this species.

METHOD

Recording system.

Behavioural observations are recorded on a single channel portable cassette recorder as a series of tone bursts each qualified by a verbal subscript. The equipment shown in Fig. 1 enables the observer to record tone bursts of different frequency by pressing different buttons and to qualify each tone burst by dictating a number into the microphone. We use only two different frequencies but the system is capable of handling more. Four hundred and forty Hz is used to signal the onset of a new behavioural act by one animal, and 950 Hz to signal an act by a second. The number dictated by the observer after each tone burst codes the identity of the act to which the tone refers. The behavioural catalogue of different acts is exclusive so that the duration of each act is indicated by the intervals between homologous tones (the intertone interval).

Since the recorded information is well within the audio frequency band the technical requirements of the cassette recorder are not stringent and a portable machine intended for domestic use is adequate.

The use of different frequencies to distinguish the behaviour of different animals allows all the observations to be recorded on a single channel. Figure 1a shows the method of connecting tone generators and microphone to the same input of the recorder. The potentiometers are used to adjust the tone signals to a level compatible with the output from the microphone. Standard phase shift oscillators of the type shown in Fig. 1b are an inexpensive source of sinewaves. These are allowed to run continuously and their outputs are admitted to the recorder whenever the corresponding button is pressed. The oscillators draw 5 mA at 9 V and can therefore be battery operated.

Data retrieval system.

The data retrieval system enables the frequency, identity and sequence of observed patterns of each animal to be tabulated from the cassette recordings. The tabulation preserves information about the time course of each animal's behaviour so that their interaction can be studied.

In principle the system behaves like an automatic stopwatch which can be set to 'listen' for the occurrence of tones of a particular frequency. As each new toneburst occurs the time elapsed since the previous one is displayed on a numerical readout. This readout remains visible until the next tone is detected. In effect, the stopwatch