Low-cost Activity Trackers for Domestic Cats and Their Use in Comparing Play with Free-range Behavior

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Introduction

Automated data collection on location, and activities of animals has a long history, but the hardware, particularly the batteries, have been so large and heavy as to make them unsuitable for smaller mammals such as domestic cats. Activity and spatial data are of interest for domestic cats for a number of reasons. One is to gather good quality data on their hunting behavior with respect to threats to populations of small animals. Another is to understand the spatial distributions and movements of individual cats over time to explain how domestic cats can often exist at very high densities in urban areas. We can also try to ask more fundamental questions about the relationship between exertion during play behavior and when free-ranging. For example, we could ask whether acceleration during play chases of a toy tends to be higher or lower than when free-ranging. This would provide a further insight into the role of play as physiological 'training' for hunting.

The Arduino platform is an open-source and relatively inexpensive microprocessor platform. Because it is open source, a wide range of sensors, communication add-ons and software 'sketches' are being actively developed for a wide range of applications. Our group has been building and testing a variety of wearable sensors and this poster describes how we build and deploy GPS and accelerometer devices.

Methods

For this work we are using Tinyduino which is a modular, small form-factor and lightweight modification of the Arduino platform. We create a stack with an accelerometer, a GPS module, and a microSD card slot for data logging. In addition a good capacity 3v Lipo battery is needed as power is drained quickly by the GPS module and writing to the SD card. Power consumption can be managed in the software by how often the GPS is activated and how often data are read to the SD card. The accelerometer is very low-power but the sampling rate of that too can be managed. The unit is housed in a sturdy, small plastic box and attached to a cat collar or a harness, depending on what the cat is used to wearing. Two cats have been used for prototyping, both of which are of the large breed Maine Coon, which means the kit is particularly small and light compared to body size.

Results

The prototyping indoors for short periods of time has shown that the kit does not interfere with normal activities and is well tolerated. This holds true when actively playing and chasing a toy. Short outdoor trials have confirmed that all the data from GPS and accelerometer are being reliably collected, although there is an issue with calibrating the two signals in time. Early prototyping has allowed us to optimize the power consumption. It has also shown that the range of g required to be monitored is higher than at first thought. Activity and inactivity are clearly visible in the accelerometer data and the algorithm for peak acceleration is still being developed.

Conclusion

This small form-factor data logging kit shows definite promise as an activity recording solution for answering questions about domestic cat behaviour. This equipment makes play as training for hunting a tractable question which we are gathering data for at present.

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Ethical Statement

The equipment is well tolerated with no distress caused to the cats and it does not interfere with feeding or other activities. The equipment is attached to the collar with a safety release clip. The cats are family pets which are constantly monitored for any signs of discomfort or distress. A repeated-measures design will be used which allows for the smallest number of cats (six) to be used to be able to test for differences in acceleration at $p<0.05$.