Animal monitoring with Gemvid
Non-invasive measure of rats physical global activity

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How to measure rats physical activity? Running wheel?

What should you do when your mouse or rat is out of the running wheel?
How to measure rats physical activity? Radar?

Do you really want such a complicated hardware?
How to measure rats physical activity? Video tracking?

Good idea but costly and impractical (center of gravity only)
How to measure rats physical activity? Markers?

Rats don’t like it ...
Quantification of overall free movements of rodents without any markers, using a commercially available CCTV and modular, free software.
Frame difference analysis, roughly

Each \( \frac{1}{25} \) s, a photo of the animal is taken and compared to the previous one. We compute the number of pixels that are different.
Gemvid

A

B

C

Dark blue poster
Observed rat in its cage
Exit to computer
Camera
Tripod

Field of observation (1 rat)
Camera on tripod
Other rats in the same rack

Animal monitoring with Gemvid
Hardware & Software

- any camera (IR if needed) (Lianyida-806C, 60 EUR)
- any video4linux-enabled framegrabber (ATI Rage 128 AIW, 5 EUR)
- any computer running Linux (PII 350MHz, 35 EUR)

E-bay is your friend!
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- GNU/Linux (RedHat v7.3)
- video4linux API (direct ioctl)
- no other dependencies
- ASCII output (need a pipe anyone?)
- data visualisation with GD, MatlabScilab, PIL, ...
“Theoretical” validation
“Theoretical” validation

Precision
Sensitivity
Reproducibility
Actiwatch
Stability
Rodents
over time

WARD 2018: Animal monitoring with Gemvid

Jean-Etienne & Laurent Poirrier
Research

**Gemvid, an open source, modular, automated activity recording system for rats using digital video**

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Abstract

**Background:** Measurement of locomotor activity is a valuable tool for analysing factors influencing behaviour and for investigating brain function. Several methods have been described in the literature for measuring the amount of animal movement but most are flawed or expensive. Here, we describe an open source, modular, low-cost, user-friendly, high resolution activity monitoring system for small animals.

http://dx.doi.org/10.1186/1740-3391-4-10
Comparison with an Actiwatch

A. Mobile going at 23.8 cm$\text{s}^{-1}$, moving surface = 128 cm$^2$

B. Correlation between the moving surface and Gemvid observations

- $23.81$ cm$^2 \text{s}^{-1}$
- $46.45$ cm$^2 \text{s}^{-1}$
Working with rats (finally)
Rat during the day
Rat during the night
Rats circadian rhythm
Conclusions

1. Sensitive
2. Reproducible
3. Stable over time
4. More accurate than actiwatch
5. Proven with rodents
6. Non-invasive
And more importantly ...

Use commodity hardware
And more importantly ...

Use commodity hardware

Free as in “Free beer”
Activity measurement
Our solution
Validation
Conclusions

And more importantly ...

Use commodity hardware

Free as in “Free beer”

Free as in “Free speech”
Many thanks to

- Professors G. Moonen & A. Luxen
- Drs. P. Leprince & P. Maquet
- F.R.I.A.
- Fonds Leon Fredericq
- B.A.S.S. & C.E.T.E.S.

As well as all the rats that calmly participated in all my experiments

And thanks to you for your attention!

http://www.bioinformatics.org/gemvid
http://dx.doi.org/10.1186/1740-3391-4-10
1. Sensitivity & Reproducibility
Comparison with a fixed oscillator

A: Gemvid observations at 200 opm

B: Observed frequencies mean power at 200 opm

C: Spectrogram at 200 opm

D: Correlation between theoretical and observed frequencies
2. Stability over time
Stability over time

Spectrogram of data obtained at 9:00

Spectrogram of data obtained at 18:00
3. Comparison with an existing device
Comparison with an Actiwatch

(A) Mobile going at 23.8 cm·s\(^{-1}\), moving surface = 128 cm\(^2\)

(B) Correlation between the moving surface and Gemvid observations

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Our solution

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