APP4CAM

RUNNING ON INNOVATIVE CAMERA TRAPS IN THE FIELD

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LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY
LIST

OPPORTUNITIES IN BIODIVERSITY MONITORING

- **Traditional biodiversity monitoring methods**
  - Ethical issues
    - Trapping newts for hours before identifying them
    - Killing insects for species identification
  - Labor-intensity

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- **What if we applied the newest technologies including affordable high-resolution cameras and AI classification models to these species?**

NEWTCAM DEVICE

Photo by NHBS of a NEWTCAM device

Photo by NEWTCAM device of a great crested newt and a predaceous diving beetle

DIMON DEVICE

Photo by LIST of a DiMON device connected to a Vane Trap

Photo by a DiMON device of a Scaeva hoverfly

HARDWARE USED

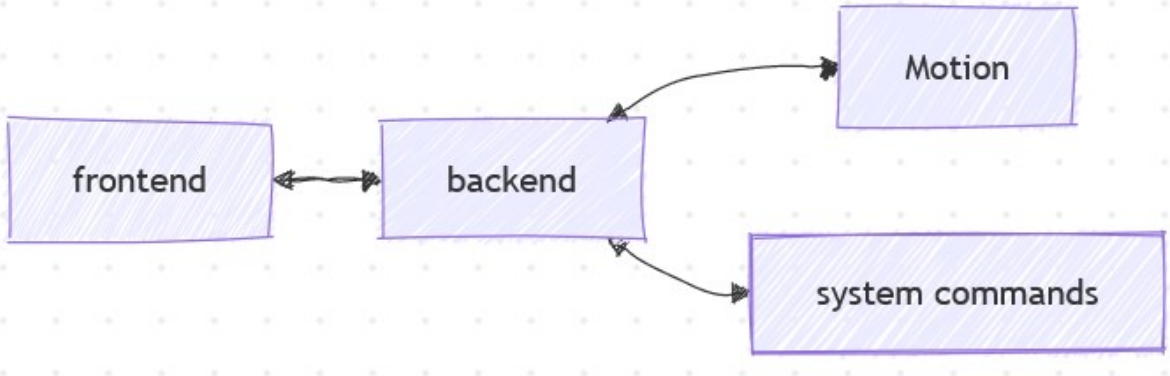
- **Boards**
  - NEWTCAM device: customised Variscite board
  - DiMON device: Raspberry Pi + Witty Pi
  - Both allowing to run Debian-based operating systems
- **Additional hardware**
  - Wi-Fi module for access point feature
  - SD card for fast data retrieval
  - Strips with infrared and visible LEDs on NEWTCAM device

APP4CAM

Adriano Gama

Daniel Waxweiler

Enabling researchers to configure their camera traps efficiently and easily in the field as well as accessing the data collected while maintaining a low energy consumption



LIST

APP4CAM

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DASHBOARD | MEDIA | SETTINGS

Raspberry-Pi-B106

Disk storage

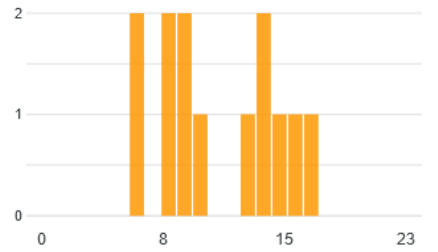
Total capacity: 29 GB

16% | 84%

4.72 GB used | 24.18 GB available

The path /media/USB_32 is accessible and writable.

Total observations over the day



DASHBOARD | MEDIA | SETTINGS

The filenames include the local time of the trap while the time below shows their creation UTC time.

Filter by type: Videos

20250130T131811.mp4
2025-01-30T12:18:22.000Z

20250130T082300.mp4
2025-01-30T07:23:18.000Z

20250130T081823.mp4
2025-01-30T07:18:40.000Z

20250130T065329.mp4
2025-01-30T05:53:46.000Z

20250130T065008.mp4
2025-01-30T05:50:24.000Z

20250129T172654.mp4
2025-01-29T16:27:10.000Z

20250129T163744.mp4
2025-01-29T15:38:00.000Z

20250121T093932.mp4
2025-01-21T08:39:46.000Z

20250121T093734.mp4
2025-01-21T08:37:50.000Z

20241212T154128.mp4
2024-12-12T14:41:48.000Z

20241212T142550.mp4

SELECT ALL | UNSELECT ALL

DOWNLOAD | DELETE

DASHBOARD | MEDIA | SETTINGS

General settings

Camera settings

Trigger settings

Working time

Turn on during the following interval

06:00 – 21:00

Turn on between sunrise and sunset

Next sunrise at 08:09 tomorrow and next sunset at 17:27 today

Threshold: 1500

This is the number of pixels that need to change for the device to trigger. It can range from 1 to 14745600.

Temperature threshold: 23

Shots will only be taken when the temperature is equal to or above this temperature in degree Celsius. Leave empty if you do not want to use this threshold.

SAVE

Tools

Export & import settings

TECHNOLOGY STACK & REPOSITORIES

- **Backend**
  - TypeScript
  - NestJS
  - Some C programs
  - Some shell scripts

- **Frontend**
  - TypeScript
  - Quasar
  - Vue.js

https://github.com/LIST-LUXEMBOURG/App4Cam-Backend

https://github.com/LIST-LUXEMBOURG/App4Cam-Frontend

FUNDING

- **Development funded by several projects**
  - 2021 – 2023: AURINION: Ministry of Environment, Climate and Biodiversity of Luxembourg
  - 2021 – 2022: POLLICAM: self-funded
  - 2022 – 2025: CAMPHIBIAN: Luxembourg National Research Fund (FNR)
  - 2023 – 2024: DiMON 2023: self-funded
  - 2024 – 2025: DiMON: Luxembourg National Research Fund (FNR)
- **App4Cam development was always only a small part.**

LIST

PUBLICATION PROCESS

- **Open-source publication process started as part of software disclosure for transferring technology in January 2024**
  - Main justification: Researchers need to be able to verify code functionality to fully understand the data collection methodology.
- **Validations required**
  - Business and valorisation department
  - Legal department
  - Security team
  - Several reminders needed over the course of the months
- **Published in November 2024 under a GNU General Public License v3.0 license**

FUTURE

- **Challenges**
  - Funding: Research funding usually limited to specific project. What about external requests?
  - Increasing long-term usage and compatibility
- **Wishes**
  - Migration of backend to Rust
  - Containerisation of frontend and backend and other code parts
  - Integration of object detection and image classification models (edge computing)
  - Transfer of heartbeat and data via 4G

LIST

thank you

contact

Daniel Waxweiler
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- https://github.com/LIST-LUXEMBOURG/App4Cam-Frontend
- https://github.com/LIST-LUXEMBOURG/App4Cam-Backend

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