HIBER\_N (V1.0)

# **SETUP the FLIR C-5 camera for HIBER**

As the camera cannot be controlled by the software, it needs to be setup before recording ! NOTA : It would appear convenient to constantly keep the camera ON but it is STRONGLY DISCOURAGED. Thermal camera sensors efficiency is highly dependent on the their running temperature. Keeping the camera ON continuously might decrease the camera sensitivity and life time.

Steps to setup the camera :

* Place the camera in "temperature" mode : The C5 as a mode called "Thermal MSX" which combines visible and thermal image. This modes gives pictures visually easier to interpret but makes it harder to access a clear temperature information from the video stream. It is then recommended to use the pure "Thermal" mode.
  + Press the 3 dots buttons at the bottom of the screen
    - Select the image mode and select "Thermal"
    - Select the color mode and select "White Hot"
    - Press the temperature scale button and set it to Manual
      * Adjust the scale bar on the left so the darkest point is ~15 and the brightest ~40
      * **Don't forget to lock your range once set by pressing the temperature value!**

# **Quick Start.**

## Camera Manager

1. **Start the program**

Double click on HIBER\_N and wait for the program to load. It will automatically connect to the available USB cameras in the PC. Note that some internal cameras are also considered as USB devices and will appear in the list.

1. **Check the temperature range**

The software automatically tries to read the onscreen digits. Always confirm the temperature range reported on the GUI for EACH CAMERA is correct before starting the acquisition.

1. **View Now**

This will let you visualize the camera preview with its “usable” working region and discarded borders. Set your arenas accordingly.

1. **Enable / Disable cameras**

If a camera is enabled, its stream will be stored to disk at the time of recording. If a camera is non usable or does not contain any animal, disable it.

1. **Set the number of Areas and FPS**

HIBER\_N lets you record 1 to 3 animals within the field of view of a single camera. Set Areas as the number of recording arenas you want to use. You can also set the acquisition rate of each cameras from 1 to 8 fps.

## Main View

1. **Start Live Stream / Stop Live Stream**

This will let you preview the images and computations without storing anything on disk. Use it to adjust your behavior arena position, to confirm your mouse can be detected, and that no "mysterious" hot object is present in the field of view. Press the button again to stop live stream.

1. **Select the recording folder**

Press the "Select Recording Folder" and set a "NEW FOLDER NAME" where to store the data.

1. **Start Recording / Stop Recording**

The live stream and computations will be displayed and data will be stored on disk. At the end of your experiment press the button again to stop the recording and save the Experimental notes.

# **Technical notes**

The software is compatible with streamable USB cameras. It uses direct show and will capture the data stream coming from devices recognized as web camera by your system. It is compatible with any FLIR cameras with core limitations:

As it does not use any SDK, the camera hardware cannot be controlled by 3rd party software. In other words, the camera settings shall be done manually before each recording. Also, the **camera sensor data cannot be accessed directly. The temperature estimation is then done from the onscreen information** (temperature range <-> Pixel value correspondence). **Note: If the hardware adds up any onscreen information (watermark, settings ...) it will be grabbed by the video stream** and interfere with the temperature estimation process.

# **GUI Description.**

## Camera Manager

A screenshot of a computer

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This widget contains the current settings of the available cameras. (From left to right)

* Camera Name (hardware name implemented by the manufacturer ) + Camera\_X name set by user. You can arrange the cameras names up to your liking with the limit of having a single name per camera.
* View Now button: Displays a preview of the camera stream. The green region represents the “discarded” part of the video. Watermarks and additional info displayed by the camera shall be removed not to interfere with the temperature estimation. **The greyish region represents the “usable region”. Be sure that your behavior arena is contained within that region**
* Tmin and Tmax correspond to the temperature range measured by the camera. This is automatically estimated by reading the onscreen digits. The algorithm is designed to be functional for temperature with 3 digits. Which means from 10.0 to 99.9. Any other values will most likely be faulty. **Always check the validity of these temperature before starting the recording**. Modify it here in case the estimation is incorrect.
* Acquisition Status : Set if the camera shall be ENABLED or DISABLED. Disabled camera won’t store any data to disk
* Areas : number of behavior arenas supervised by this camera. Can be set from 1 to 3.
* FPS : The acquisition rate ranging from 1 to 8 (based on FLIR C5 cameras)
* Rebin factor : Down sampling the original image resolution. **It is recommended to keep the value to 1** and keep the original resolution (especially with several areas).

### **NOTA :**

Accept button will validate the values and bring you to the Main GUI. Reset and the close window [X] button will reset the value to their original ones.

### **TROUBLESHOOTING :**

If your camera is not listed.

Fix 1 : Camera was not detected by windows properly

* + - * + Close the software.
        + Un-plug and Re-plug each camera, wait for a couple of seconds (windows detecting the camera)
        + Start the software

Fix 2 : USB port is faulty or USB controller is overloaded

* + - * + Close the software.
        + Plug the “not detected” camera to another USB port, wait for a couple of seconds (windows detecting the camera)
        + Start the software

## Dashboard

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**Options :**

Call back the task manager “Camera Settings” or show / hide some cameras.

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**HDW / active cameras :**

Number of connected cameras / enable cameras

**Start / Stop Live Stream :**

Start / Stop Live streaming of the video with computations. Nothing is stored on disk!

**Select Recording Folder :**

Set the recording destination folder

**Experimental – notes**Keep a tag file in your recording folder  
Suggested minimal fields are written in bold.  
Add up any additional information favorite Game/TV program. **Entries can be entered throughout the course of experiment.** **The box will be saved ONLY when you stopped the recording.  
日本語でも入力できます。**

**Start / Stop Recording:**

Start and stop the acquisition storing frames and temperature data to disk.

**Statistics and behavior estimation:**

Set a bin size in minute, select the camera, Compute and show the behavior VS temperature estimation for the duration of the current recording.

## Image Preview

**Selected Camera:**

Display the name of the camera currently streaming and its temperature range.

**Middle panel:**

Visualization of 3 regions of interest (camera settings set to area 3) tracking 1 hot object per region.

Red cross: indicates hottest spot in the region, blue: coldest spot in the region, colored contour and triangles indicate the object identified as a mouse and its maximum temperature.

**Bottom panel:**

Temperature trace over the last minutes of the recording. Each mouse is color coded. Red being the hottest temperature among the 3 ROIs, blue the coldest among the 3.

A screen shot of a hand

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## Beahvior / statistics information

A graph of a graph

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First patnel, will display the displacement for each temperature bin.

Second panel will display the temperature population over time following the BIN defined in the DASHBOARD statistics box.

## Additional information

Graphical user interface, text, application

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**IMPORTANT: Don’t forget to create a new directory to start a new recording. If any data is found in the current Recording folder, an error message will show up.**

**You can choose to :**

**-Backup:**Will create a backup directory called: “current\_name\_bkup” with no data loss.

**-Overwrite:**Will destroy any data located in that directory and sub directories. Use it with cautious

**- Cancel:**

Abort current operation. Recording won’t start. Select another destination folder and try again.