Phase Visual Meter and algorithmic estimation (PVMae) for LISA

Lab Manual: Setup and Linux PC
Romi Gilat, Joshua Marmor, Carlos Arias
Laboratory of Space Systems and Optomechanics

PHYSICAL SETUP

Turn on the following instruments on the laboratory table:
   1. Laser   - *small gray button on the side, set to 190 mA*
   2. Oscilloscope   - *power button on bottom left*
   3. Moku   - *logo is the power button*
   4. Power Supply   - *set to 15 V = 0.01 A*
   5. Photodetector - *small black switch on the side*
(The CCD Camera should be initially connected to the computer through the USB)

Opening vivado
   1. In terminal, type
      source /home/Xilinx/Vivado/2022.1/settings64.sh
   2. Type "vivado"

OPEN GUI

(1): Connect to the Red Pitaya
On the linux terminal, type the following command:

ssh root@<ip address of RP>

In our case, the ip address of the RedPitaya in use (**rp-f084ec**) is: **169.254.2.239**
When asked for a password, use 'root'

Now you are connected to the terminal on the linux OS inside the RedPitaya.

NOTE: If you are unable to connect to the RedPitaya, you may need to reboot the computer using dzdo reboot. Sometimes, when the system has been left alone for a while, the connection between the two times out.

(2): Navigate to the folder with the bitstream file
Now that you are on the RedPitaya's terminal, run the following command:

cd PVMAE/

Inside this folder, there are the executable files.
Any .bit —- > compiles FPGA
Any .bpf —- > communications between the RP and the Linux PC

(3): Compile the FPGA bitstream
Still in the RedPitaya's terminal, type the following command:

```
cat pvmae_Test_100us.bit > /dev/xdevcfg
```
{compile} {   what   } {   where   }

(4): Initialize communication between the RedPitaya and the Linux PC
In the RedPitaya terminal, run the following command:

```
./bpf_server.out
```

This will activate the communication protocol between the PC and the RedPitaya

(5): Open a new terminal window in the folder with the Linux Code
Navigate to the following folder address:

```
LASSO-DAQ/PVMae/Alberto
```

It makes things easier if you just access the folder, right click, and open a terminal from the menu.

(6): Ensure all codes are compiled correctly
In the terminal window opened in step **(5)**, run this command:

```
make
```

If any changes have been made, this command will compile those new changes to make sure all files are up to date.

(7): Connect the camera and FPGA and open the GUI
In the same window, run the following command:

```
dzdo ./PVMae
```

Now the PC is connected to the RedPitaya and the CCD camera. The PC is the *master* and both the RP and the camera are *slaves*. This command will ask for a user password first, then the GUI will open.

GUI COMMANDS

To use these callbacks at least one window of the displays made by the program has to be active.

➔ **'q'** : *closes the camera, clears the memory, and closes the program.*

- ➔ **'s'** : *calls the function save_data() to save the current displayed information.*
- ➔ **'+'** : *changes the color palette for the phase front by increasing the contribution (range) of white color to scale and display the data.*
- ➔ **'-'** : *changes the color palette for the phase front by decreasing the contribution (range) of white color to scale and display the data.*
- ➔ **'/'** : *increases the brightness on the phase front display.*
- ➔ **'*'** : *decreases the brightness on the phase front display.*
- ➔ **'b'** : *calls the function back_gnd() to take pictures of the background, averages it, and saves it in the matrix background[i][j].*
- ➔ **'u'** : *Increases the scale's upper limit for the phase front*
- ➔ **'i'** : *Decreases the scale's upper limit for the phase front*
- ➔ **'l'** : *Increases the scale's lower limit for the phase front*
- ➔ **'k'** : *Decreases the scale's lower limit for the phase front*
- ➔ **'h'** : *Increases scale's range for the phase front*
- ➔ **'j'** : *Decreases scale's range for the phase front*
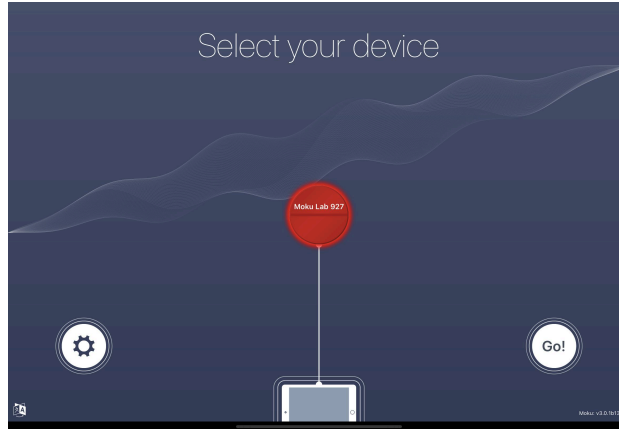
CONNECTING TO THE MOKU

(1): Power on the Moku
Press the logo in the middle to power on

(2): Connect on the iPad:
Password: 111111
Wifi: Moku-000927

(3): Open Oscilloscope App

LINUX PC INFO

ID: **aero-5w8bmh3**

REDPITAYA INFORMATION

Primary RP
ID: **rp-f084ec**
IP: **169.254.2.239**

Secondary RP
ID: **rp-f0949f**
IP: **169.254.8.101**

FLYCAPTURE

Software: *FlyCap2*
Camera Serial Number: *Chameleon CMLN-13S2M*

NOTE: *To open the software, use run the following command:*

dzdo flycap

Running the command without dzdo will not detect the camera.