Probando la Orange Pi

Un proyecto de BricoLabs

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Probando la Orange Pi y aprendiendo a usarla.
TRABAJO EN CURSO NO TERMINADO

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1 Empezar rápido desde linux

Para usar la Orange Pi Zero tendremos que crear imágenes arrancables en tarjetas micro SD.

1.1 Crear una SD arrancable

Dependiendo de donde conectemos la tarjeta tendremos que usar diferentes rutas. En el procedimiento descrito a continuación `${card}` será la ruta al dispositivo de la tarjeta y ${p} la partición (si la hay).

Si la tarjeta se conecta via adaptador USB, linux la va a asociar a un dispositivo /dev/sdx, por ejemplo en mi portátil el disco duro es `/dev/sda` las distintas particiones serán `/dev/sda1`, `/devb/sda2`, etc.

Si conectamos una memoria con un adaptador USB linux la podría mapear en `/dev/sdb` por ejemplo.

Si la memoria se conecta mediante una ranura SD, linux la asociará a un dispositivo `/dev/mmcblk0` o `/dev/mmcblk1`, etc. etc. Dependerá de la ranura usada. Las particiones en este tipo de dispositivos tienen rutas como por ejemplo `/dev/mmcblk0p1`.

Los datos se pueden almacenar directamente en la memoria SD o en una partición creada en la memoria.

Resumiendo:

- `${card}` será `/dev/sdb` o `/dev/mmcblk0`
- $card${p} será `/dev/sdb1` o `/dev/mmcblk0p1`

Antes de seguir adelante hay que estar completamente seguro del dispositivo asociado a nuestra memoria SD para no armar ningún estropicio.

Hay varias comprobaciones que se pueden hacer:

`dmesg |tail` nos permitirá echar un ojo a los últimos mensajes en el log del sistema. Si acabamos de insertar la memoria veremos el dispositivo usado.

`sudo fdisk -l` nos permite ver las particiones montadas en nuestro linux, por ejemplo con mi SD en la ranura SD de mi portatil la salida es (entre otras cosas, he obviado las particiones de los discos duros):

```
Disk /dev/mmcblk0: 7.4 GiB, 7948206080 bytes, 15523840 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x00000000
```

`cat /proc/partitions` también nos dará una lista de particiones, en mi portátil las que interesan son:

```
 179        0    7761920 mmcblk0
 179        1    7757824 mmcblk0p1
```

Descargamos la imagen de Jessie adaptada a la *Orange Pi Zero* desde la página https://www.armbian.com/download/

Descomprimimos la imagen y la grabamos en la tarjeta SD con el comando:

```
sudo dd if=./Armbian_5.24_Orangepizero_Debian_jessie_3.4.113.img of=/dev/mmcblk0
```

Insertamos la tarjeta en la *Orange Pi* y le damos alimentación. El primer arranque llevará alrededor de tres minutos, y tras ese tiempo aun hará falta un minuto más para poder hacer login. Este retardo es debido a que el sistema intentará actualizar la lista de paquetes y creará un area de swap de emergencia en la SD, y además cambiará el tamaño de la partición que hemos creado para ocupar todo el espacio libre en la SD.

De momento solo la he arrancado y efectivamente las particiones han cambiado tras el arranque así que tiene buena pinta.

Volvemos a insertar la SD en la *Orange Pi* y la conectamos con un cable ethernet al router de casa. El Armbian viene configurado por defecto para obtener su IP desde un servidor DHCP.

Como mi cutre-router no me da información de las IP asignadas usamos *nmap*:

```
nmap -sP 192.168.0.0/24
```

Con eso averiguamos la IP asignada a la *Orange Pi Zero* y ya podemos hacer login con el siguiente comando [1]:

```
ssh root@192.168.0.109
```

¡Y ya estamos!

Figura 1: Primer login en *Orange Pi*

Lo primero es poner al dia el sistema:

```
apt-get update
apt-get upgrade
```

Si quieres puedes reconfigurar el *time zone*:

```
dpkg-reconfigure tzdata
```

[1] La password por defecto de Armbian es **1234**, nos pedirá cambiarla en el primer login.

1.2 Conexión WIFI

Vamos a comprobar que todo va bien:

```
root@orangepizero:~# iwconfig
lo        no wireless extensions.

tunl0     no wireless extensions.

wlan0     IEEE 802.11bgn  ESSID:off/any
          Mode:Managed  Access Point: Not-Associated   Tx-Power=20 dBm
          Retry  long limit:7   RTS thr:off   Fragment thr:off
          Encryption key:off
          Power Management:on

eth0      no wireless extensions.
```

Todo tiene buena pinta, vamos a ver si detecta WIFIs:

```
root@orangepizero:~# iwlist wlan0  scan |grep ESSID
                    ESSID:"wificlientesR"
                    ESSID:"casa_de_verano"
                    ESSID:"MOVISTAR_BEEF"
                    ESSID:"wificlientesR"
                    ESSID:"R-wlan90"
                    ESSID:"MOVISTAR_BAAF"
                    ESSID:"abababb"
                    ESSID:"WLAN 77"
                    ESSID:"castillo"
                    ESSID:"unaWifi"
                    ESSID:""
                    ESSID:"mikasa"
```

Para configurar el wifi echamos un ojo al fichero `/etc/network/interfaces` pero en ese mismo fichero encontramos el aviso:

```
# Armbian ships with network-manager installed by default. To save you time
# and hassles consider using 'sudo nmtui' instead of configuring Wi-Fi settings
# manually.
```

Así que basta con ejecutar `sudo nmtui` y ya podemos dar de alta nuestra wifi (yo la prefiero con IP estática).

Ejecutamos `ifconfig` y ya vemos nuestro nuevo interface configurado:

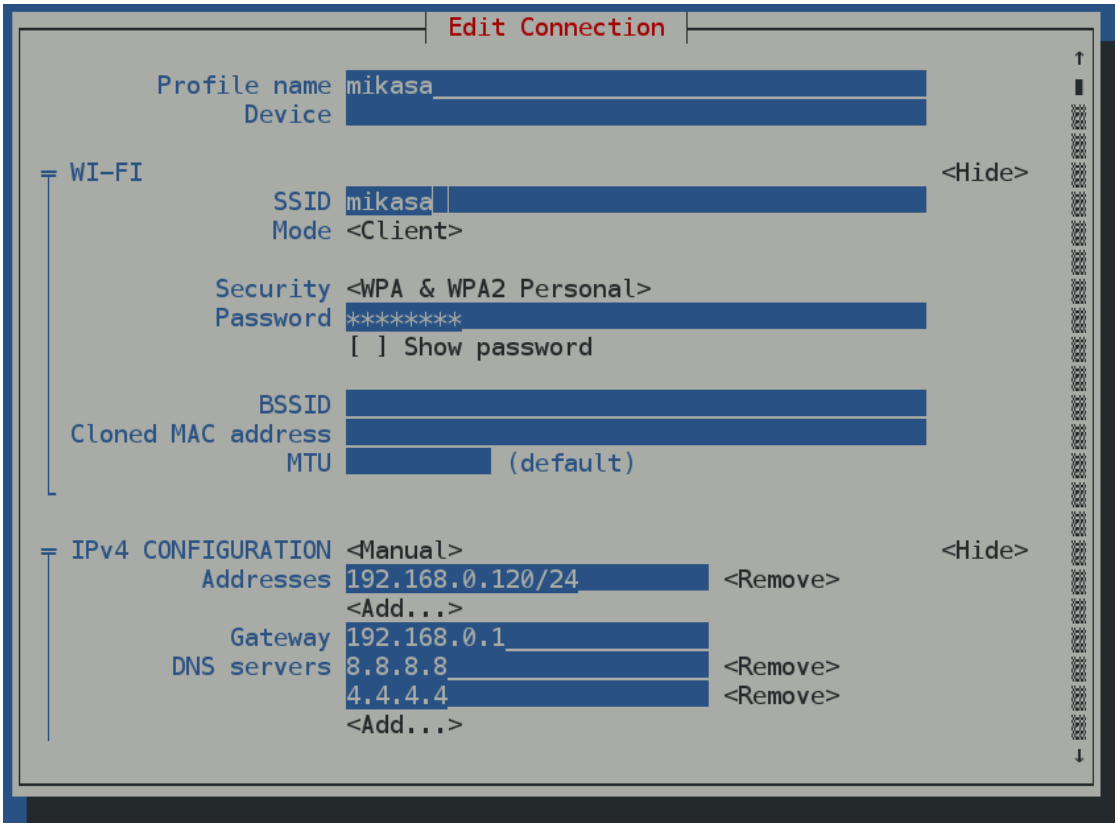

Figura 2: Configuración WIFI

```
ifconfig

wlan0     Link encap:Ethernet  HWaddr a4:7c:f2:9a:97:7c
          inet addr:192.168.0.120  Bcast:192.168.0.255  Mask:255.255.255.0
          inet6 addr: fe80::a67c:f2ff:fe9a:977c/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:2 errors:0 dropped:0 overruns:0 frame:0
          TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:328 (328.0 B)  TX bytes:852 (852.0 B)
```

2 Orange Pi Zero, características técnicas

La tarjeta de desarrollo Orange Pi Zero viene equipada con un procesador Cortex A7 Allwinner H2+ quad core, con 256 o 512MB RAM, Ethernet, y puertos USB. Disponible en Aliexpress (tienda oficial) por 6.99 dolares, mas 3.39 dolares como gastos de envío.

2.1 Especificaciones

- SoC – Allwinner H2(+) quad core Cortex A7 processor @ 1.2 GHz with Mali-400MP2 GPU @ 600 MHz
- System Memory – 256 to 512 MB DDR3-1866 SDRAM
- Storage – micro SD card slot
- Connectivity – 10/100M Ethernet + 802.11 b/g/n WiFi (Allwinner XR819 WiFi module) with u.FL antenna connector and external antenna
- USB – 1x USB 2.0 host ports, 1x micro USB OTG port
- Expansion headers – Unpopulated 26-pin "Raspberry Pi B+" header + 13-pin header with headphone, 2x USB 2.0, TV out, microphone and IR receiver signals
- Debugging – Unpopulated 3-pin header for serial console
- Misc – 2x LEDs
- Power Supply – 5V via micro USB port or optional PoE
- Dimensions – 52 x 46 mm
- Weight – 26 grams

2.2 Esquema de pines

Un excelente esquema de pines puede conseguirse en OSHLab

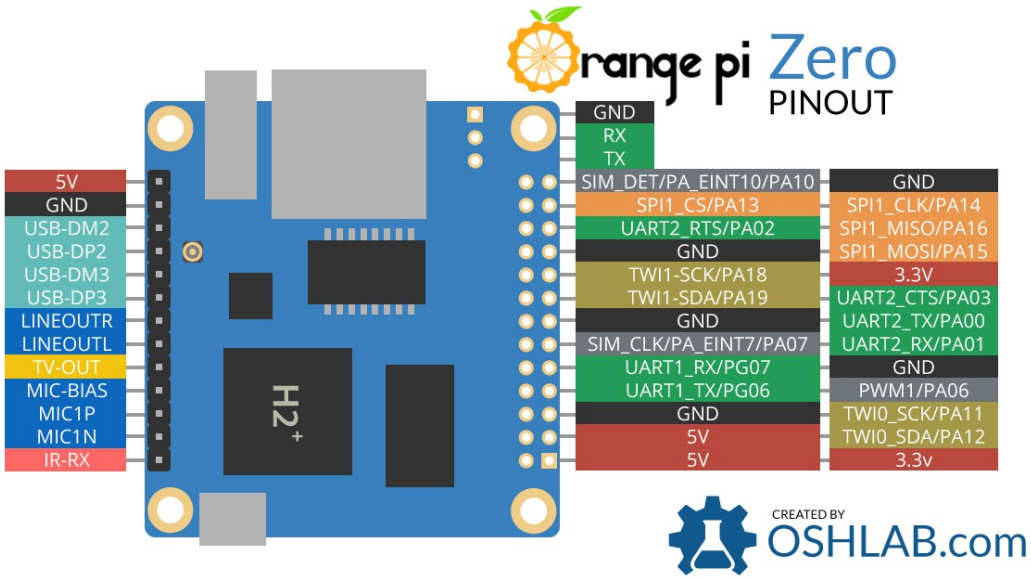

Figura 3: Pineado Orange Pi

El mapeado de los pines de la Orange (de los micros Allwinner en realidad) en el kernel de Linux viene dado por la formula:

```
(Position of letter in alphabet - 1) * 32 + Pin number
```

Para todos los pines PA de nuestra Orange Pi Zero, el número del kernel coincide con el del pin. Pero para los pines *PG06* y *PG07* se corresponden con los códigos *198* y *199*.

2.3 Esquemas eléctricos

Pueden bajarse de aquí

3 Accediendo al hardware desde linea de comandos

La memoria es más que suficiente para correr programas. El Armbian consume únicamente 40Mb en funcionamiento.

```
root@orangepizero:~# free
             total       used       free     shared    buffers     cached
Mem:        247068     122300     124768       4620       7908      69548
-/+ buffers/cache:      44844     202224
```

```
Swap:       131068          0     131068
```

Vamos a hacer algunas pruebas con el hardware. En Armbian, como todo Unix que se precie, todo es un fichero.

En el directorio `/sys/class` encontraremos cosas interesantes:

```
root@orangepizero:~# ls /sys/class
backlight cuse    graphics    i2c-dev   mdio_bus power_supply script  spidev    thermal    video4linux
bdi   devfreq hdmi    ieee80211 mem     ppp     scsi_device spi_master tty      vtconsole
block     disp    hidraw   input     misc     rc       scsi_disk   sunxi_cma_test udc
bsg   dma     hwmon   leds     mmc_host rfkill      scsi_host   sunxi_dump usb_device
cedar_dev gpio    i2c-adapter  lirc      net       rtc       sound    sunxi_info  vc
```

3.1 LEDs

Si miramos dentro del directorio `leds` veremos que hay un directorio que representa cada uno de los leds de la placa:

```
root@orangepizero:~# cd /sys/class/leds/
root@orangepizero:/sys/class/leds# ls
green_led  red_led
```

Podemos ver, por ejemplo, a que evento está asociado cada led ejecutando `cat green_led/trigger` (tiene el valor `default_on`) o `cat red_led/trigger` (tiene el valor `none`).

```
root@orangepizero:/sys/class/leds# cat green_led/trigger
none mmc0 mmc1 timer heartbeat backlight [default-on] rfkill0 phy1rx phy1tx phy1assoc phy1radio
root@orangepizero:/sys/class/leds# cat red_led/trigger
[none] mmc0 mmc1 timer heartbeat backlight default-on rfkill0 phy1rx phy1tx phy1assoc phy1radio
```

O podemos encender el led rojo ejecutando `echo 1 > red_led/brightness`, y para apagarlo ya os podéis imaginar que es `echo 0 > red_led/brightness`.

3.2 GPIO

Podemos ver los GPIO disponibles ejecutando:

```
root@orangepizero:~# cat /sys/kernel/debug/gpio
GPIOs 0-383, platform/sunxi-pinctrl, sunxi-pinctrl:
 gpio-10  (?                   ) out hi
 gpio-17  (red_led             ) out lo
 gpio-202 (xradio_irq          ) in  lo
```

```
 gpio-354 (?                    ) out hi
 gpio-362 (green_led            ) out hi
```

Podemos activar un nuevo puerto GPIO, digamos el 15:

```
root@orangepizero:~# echo 15 >/sys/class/gpio/export
```

Ahora veremos el puerto activo:

```
root@orangepizero:~# cat /sys/kernel/debug/gpio
GPIOs 0-383, platform/sunxi-pinctrl, sunxi-pinctrl:
 gpio-10  (?                    ) out hi
 gpio-15  (sysfs                ) in  lo
 gpio-17  (red_led              ) out lo
 gpio-202 (xradio_irq           ) in  lo
 gpio-354 (?                    ) out hi
 gpio-362 (green_led            ) out hi
```

En el directorio `/sys/class/gpio/gpio15/` tendremos los interfaces usuales para puertos gpio definidos en el kernel de linux.

4 Bibliotecas útiles

4.1 Python

4.1.1 Instalación de virtualenv

Para probar bibliotecas de Python instalamos:

```
sudo aptitude install python-pip
sudo aptitude install python-virtualenv
sudo aptitude install python-dev
```

El caso es que el *virtualenv* no me funciona después de ejecutar estos pasos. Finalmente he tenido que ejecutar, como *root*, los siguientes comandos:

```
pip install --upgrade pip
pip install --upgrade virtualenv
```

Despues de eso ya he podido usar *virtualenv* sin problemas.

4.1.2 orangepi_PC_gpio_pyH3

Tenemos dos repos disponibles:

El repositorio original con las librerías *gpio* para H3:

```
git clone https://github.com/duxingkei33/orangepi_PC_gpio_pyH3
```

Y un fork del repositorio original **ya adaptado** a la Orange Pi Zero (que es el que usaremos):

```
git clone https://github.com/nvl1109/orangepi_PC_gpio_pyH3
```

IMPORTANTE: Si usamos el repositorio original tenemos que revisar el fichero `orangepi_PC_gpio_pyH3/pyA20/gpio/mapping.h`

Por ejemplo: la definicion de *STATUS_LED* debe quedar en el *GPA17* en lugar de *GPA15*:

```
{   "STATUS_LED",  SUNXI_GPA(17),  2   },
```

Nos clonamos el repo. Vamos a hacer todas las pruebas desde la cuenta de **root**.

Creamos un entorno para pruebas y lo activamos:

```
virtualenv test_pyH3_zero
source test_pyH3_zero/bin/activate
```

Compilamos la biblioteca:

```
cd orangepi_PC_gpio_pyH3
python setup.py install
```

Y ya podemos probar los ficheros de ejemplo:

```
examples/blink_led.py
examples/blink_POWER_STATUS_PL10.py
```

El resto de ejemplos no van a funcionar, están escritos para la *A20-OLinuXino-MICRO*

4.2 Acceso desde C

4.2.1 pyA20

La biblioteca de Python *orangepi_PC_gpio_pyH3*, en realidad se basa en bibliotecas escritas en C que tenemos disponibles dentro del repo en el directorio *pyA20*

```
cd pyA20
ls
gpio/  i2c/  __init__.py  spi/  utilities/
```

Nos interesa probar las bibliotecas en los directorios *gpio* e *i2c*, al menos de momento. Serían *gpio_lib* e *i2c_lib* respectivamente.

Probamos el acceso al *gpio* desde C con un programa sencillo que nos haga encender y apagar el led de la OPI.

```
#include <gpio_lib.h>
sunxi_gpio_init();
sunxi_gpio_set_cfgpin(SUNXI_GPA(17), SUNXI_GPIO_OUTPUT);
while(1) {
    sunxi_gpio_output(SUNXI_GPA(17), 1);
    sleep(1);
    sunxi_gpio_output(SUNXI_GPA(17), 0);
    sleep(1);
}
```

4.2.2 WiringOP-Zero

Esta biblioteca imita a la *WiringPI* que se usa con *Raspberry Pi*.

Tenemos un fork que viene preparado para la Orange Pi Zero disponible aquí:

`https://github.com/xpertsavenue/WiringOP-Zero`

GPIO funciona completamente y al parecer aun no han testeado el i2c (tiene mala pinta)

Para compilarla seguimos las instrucciones:

```
git clone https://github.com/xpertsavenue/WiringOP-Zero
cd WiringOP-Zero
chmod +x ./build
sudo ./build
```

Podemos comprobar que todo se ha instalado correctamente:

```
gpio readall
 +-----+-----+----------+------+--Orange Pi Zero--+---+------+---------+-----+--+
 | H2+ | wPi |   Name   | Mode | V | Physical | V | Mode | Name     | wPi | H2+ |
 +-----+-----+----------+------+---+----++----+---+------+----------+-----+-----+
 |     |     |     3.3v |      |   |  1 || 2  |   |      | 5v       |     |     |
 |  12 |   8 |    SDA.0 | ALT5 | 0 |  3 || 4  |   |      | 5V       |     |     |
 |  11 |   9 |    SCL.0 | ALT5 | 0 |  5 || 6  |   |      | 0v       |     |     |
 |   6 |   7 |   GPIO.7 | ALT3 | 0 |  7 || 8  | 1 | OUT  | TxD3     | 15  | 198 |
 |     |     |       0v |      |   |  9 || 10 | 0 | ALT5 | RxD3     | 16  | 199 |
```

```
|   1 |   0 |     RxD2 | ALT5 | 0 | 11 || 12 | 0 | ALT3 | GPIO.1   | 1   | 7   |
|   0 |   2 |     TxD2 | ALT5 | 0 | 13 || 14 |   |      | 0v       |     |     |
|   3 |   3 |     CTS2 | ALT3 | 0 | 15 || 16 | 0 | ALT4 | GPIO.4   | 4   | 19  |
|     |     |     3.3v |      |   | 17 || 18 | 0 | ALT4 | GPIO.5   | 5   | 18  |
|  15 |  12 |     MOSI | ALT5 | 0 | 19 || 20 |   |      | 0v       |     |     |
|  16 |  13 |     MISO | ALT5 | 0 | 21 || 22 | 0 | ALT3 | RTS2     | 6   | 2   |
|  14 |  14 |     SCLK | ALT5 | 0 | 23 || 24 | 0 | ALT5 | CE0      | 10  | 13  |
|     |     |       0v |      |   | 25 || 26 | 0 | ALT3 | GPIO.11  | 11  | 10  |
+-----+-----+----------+------+---+---LEDs---+---+------+----------+-----+-----+
|  17 |  30 | STAT-LED |  OUT | 1 | 27 || 28 |   |      | PWR-LED  |     |     |
+-----+-----+----------+------+---+-----+----+---+------+----------+-----+-----+
| H2+ | wPi |   Name   | Mode | V | Physical | V | Mode | Name     | wPi | H2+ |
+-----+-----+----------+------+--Orange Pi Zero--+---+------+----------+-----+--+
```

Instalamos las i2c-tools `aptitude install i2c-tools`, después de eso ya funciona el comando `gpio i2cd`.

4.2.3 WiringPI-Python-OP

Una receta para compilar WiringPI-Python-OP

Edited by nopnop2002 at 2017-3-18 22:51

diyer replied at 2017-3-6 06:03 can someone explain how to map wiringPO on zero plaese?

You can update WiringPi-Python-OP to WiringPi-Python-OP-ZERO.

1.Download [WiringOP libary for the Orange Pi Zero] from here.

https://github.com/xpertsavenue/WiringOP-Zero

2.Download WiringPi-Python-OP from here.(But not Install)

https://github.com/lanefu/WiringPi-Python-OP

3.Replace base library

cd WiringPi-Python-OP rm -R WiringPi cp -R $HOME/WiringOP-Zero ./ mv WiringOP-Zero WiringPi

4.Build WiringPi-Python-OP-ZERO library

sudo apt-get install python-dev python-setuptools swig swig2.0 -python wiringpi.i sudo python setup.py install cd tests sudo python test.py

WiringPi-Python-OP-ZERO have there pin. PysPin PinInLib 1(3.3V) 2(5V) 3 8 4(5V) 5 9 6(GND) 7 7 8 15 9(GND) 10 16 11 0 12 1 13 2 14(GND) 15 3 16 4 17(3.3V) 18 5 19 12 20(GND) 21 13 22 6 23 14 24 10 25(GND) 26 11

This is same as RPI TYPE A or B

4.3 Referencias

- Probando la Orange Pi Zero
- GPIO from commandline
- mas de lo mismo
- hilo GPIO en foro
- WiringPi_OrangePi explicación lanefu
- El repo donde pretende unificar WiringPI
- Otro Repo mas
- Otro mas, este tio no para
- Hilo en el foro hablando de unificiación de bibliotecas
- Otro hilo
- Otro hilo más con I2C SPI

5 Distribuciones disponibles para Orange Pi Zero

5.1 Armbian oficial

En la página oficial de Armbian tenemos dos opciones:

5.1.1 Ubuntu Server (legacy kernel)

Es la versión estable

5.1.2 Ubuntu Server (mainline kernel)

Es la versión de desarrollo.

5.2 Orange Pi oficial

Tiene varias distribuciones, parece que no esta puesta al dia o bien las fechas no son consistentes.

5.3 Diet Pi

En esta página parece que hay una versión ultraligera.

6 Monitorizar temperatura

Podemos ver estadísticas de nuestra OPI con:

```
sudo armbianmonitor -m

Stop monitoring using [ctrl]-[c]
Time        CPU    load %cpu %sys %usr %nice %io %irq   CPU
21:04:18: 1152MHz  0.08   0%   0%   0%   0%   0%   0%   40°C
21:04:23:  240MHz  0.07   0%   0%   0%   0%   0%   0%   39°C
21:04:28:  240MHz  0.15   6%   1%   0%   0%   4%   0%   40°C
21:04:33:  240MHz  0.12   6%   1%   0%   0%   4%   0%   38°C
21:04:38:  240MHz  0.11   2%   1%   0%   0%   0%   0%   39°C
21:04:43:  240MHz  0.11   1%   0%   0%   0%   0%   0%   39°C
21:04:49:  240MHz  0.10   1%   0%   0%   0%   0%   0%   38°C
21:04:54:  240MHz  0.09   1%   0%   0%   0%   0%   0%   39°C
21:04:59:  240MHz  0.08   2%   1%   0%   0%   0%   0%   38°C
21:05:04:  240MHz  0.08   2%   1%   0%   0%   0%   0%   38°C
21:05:10:  240MHz  0.07   2%   1%   0%   0%   0%   0%   40°C
21:05:15:  240MHz  0.06   2%   1%   0%   0%   0%   0%   37°C
21:05:20:  240MHz  0.06   2%   1%   0%   0%   0%   0%   39°C
21:05:25:  240MHz  0.05   2%   1%   0%   0%   0%   0%   37°C
21:05:30:  240MHz  0.05   2%   1%   0%   0%   0%   0%   39°C
```

También podemos instalar RPi-Monitor con el comando:

```
sudo armbianmonitor -r
```

Una vez instalado podemos visitar desde nuestro navegador la dirección ip de nuestra OPI Zero *http://opi-adress:8888* para ver las estadísticas.

¡Ojo! Las gráficas no se refrescan automáticamente hay que recargar la página.

Figura 4: Estadísticas en RPi-Monitor

Para desinstalar el RPi-Monitor basta con:

```
sudo aptitude uninstall rpimonitor
```

7 Referencias

- Página oficial
- Recursos oficiales aquí hay imágenes y los esquemáticos
- Tienda en Aliexpress
- http://linux-sunxi.org/Bootable_SD_card
- https://www.armbian.com/orange-pi-zero/
- https://docs.armbian.com/User-Guide_Getting-Started/
- https://docs.armbian.com/Hardware_Allwinner/
- GPIO Una explicación de como acceder al gpio desde terminal
- Info variada Aquí tenemos el esquema de pines
- GPIO desde el espacio de usuario
- sunxi-gpio
- orange pi español
- ArchLinux ARM on Orange Pi
- Lakka Nightly Builds Lakka is the official Linux distribution of RetroArch and the libretro

ecosystem. Each game system is implemented as a libretro core, while the frontend RetroArch takes care of inputs and display. This clear separation ensures modularity and centralized configuration. Also nightly build for H3 is supported

8 META

Este documento está escrito en Markdown-Pandoc. Pandoc es un sistema muy sencillo de documentación que permite generar múltiples formatos de salida.

Las fuentes del documento están en el directorio **doc/src** dentro del árbol de directorios del proyecto.

Los formatos de salida son el fichero **README.md** en formato *Markdown-Github* y los documentos que puedes encontrar en el directorio **doc/out** incluyendo un fichero en formato *pdf*.

Los documentos en los distintos formatos de salida se generan automáticamente sin mas que ejecutar:

```
$ cd doc
$ make
```

Otras opciones que soporta el **makefile** serían:

reset para regenerar todos los documentos de salida.

clean para borrar todos los fichero de salida

pdf, latex, mediawiki, epub, odt, docx genera el fichero de salida en el formato especificado: pdf, latex, etc. etc.

Ejemplos:

```
$ make reset
$ make odt
```

8.1 Requisitos

Necesitas tener instalaco **Pandoc**, hay una pequeña introducción en el el github de BricoLabs.

9 Licencia

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