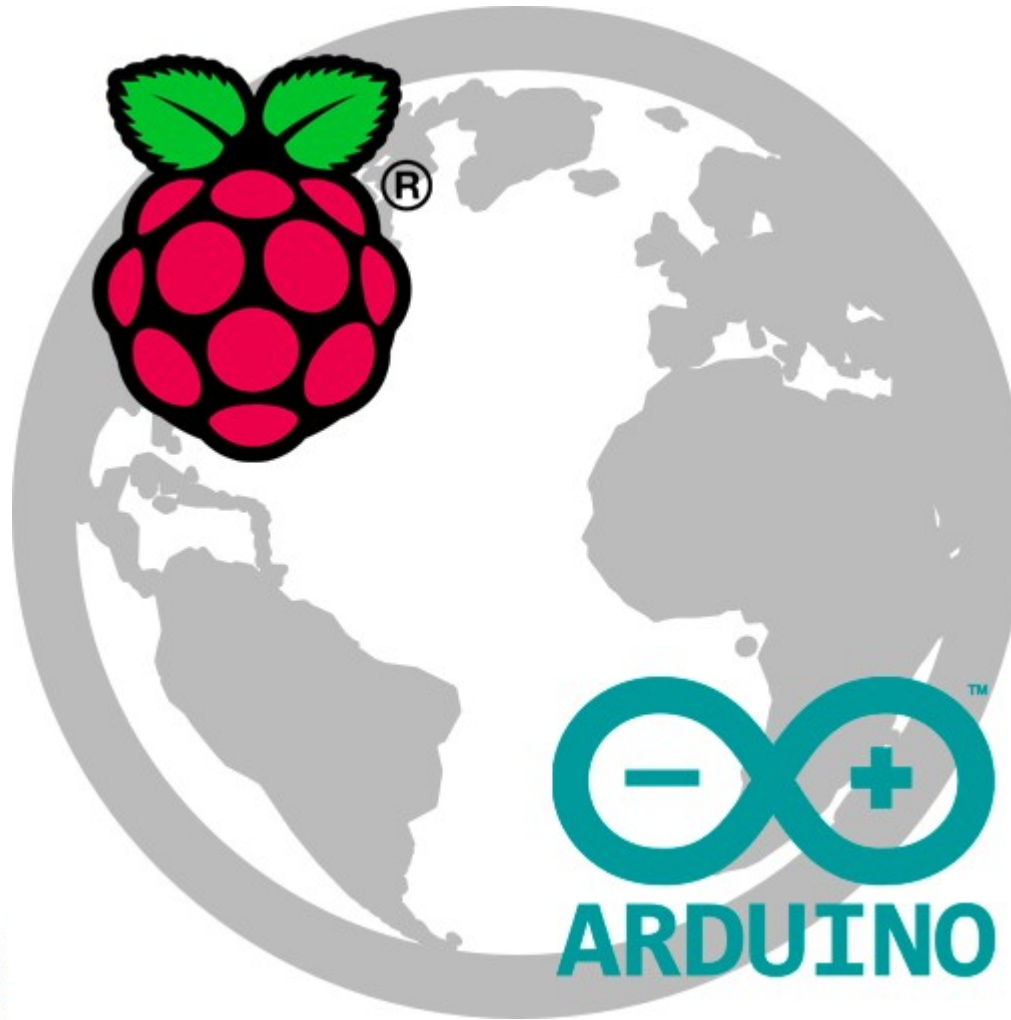


Arduino i Raspberry Pi



Telecos.cat
enginyers de telecomunicació,
electrònica i multimèdia-audiovisual

**22, 24, 29 de novembre
i 1 de desembre 2016**



Arduino i Raspberry Pi

- * Maneres de programar un Arduino (per blocs i des de l'IDE d'Arduino)
- * Connexió de perifèrics a l'Arduino (entrades i sortides digitals, SPI, I2C, UART)
- * Comunicació entre l'Arduino i l'ordinador
- * Bluetooth i RS485
- * Maneres de programar una Raspberry Pi (Python, BASH, C++, Qt)
- * Connexió de perifèrics a la Raspberry Pi
- * Automatització de processos amb la Raspberry Pi (sense entorn gràfic i amb entorn gràfic. Mode quiosc)
- * Comunicació entre la Raspberry Pi i l'Arduino
- * Comunicació entre la Raspberry Pi i l'ordinador
- * Comunicació entre la Raspberry Pi i el núvol (Introducció a Internet de les coses i seguretat en les comunicacions)

Arduino i Raspberry Pi

Interacció amb el món físic

Sensors



Lectura
d'informació

Actuadors

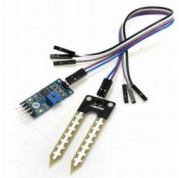


Escriptura
d'informació

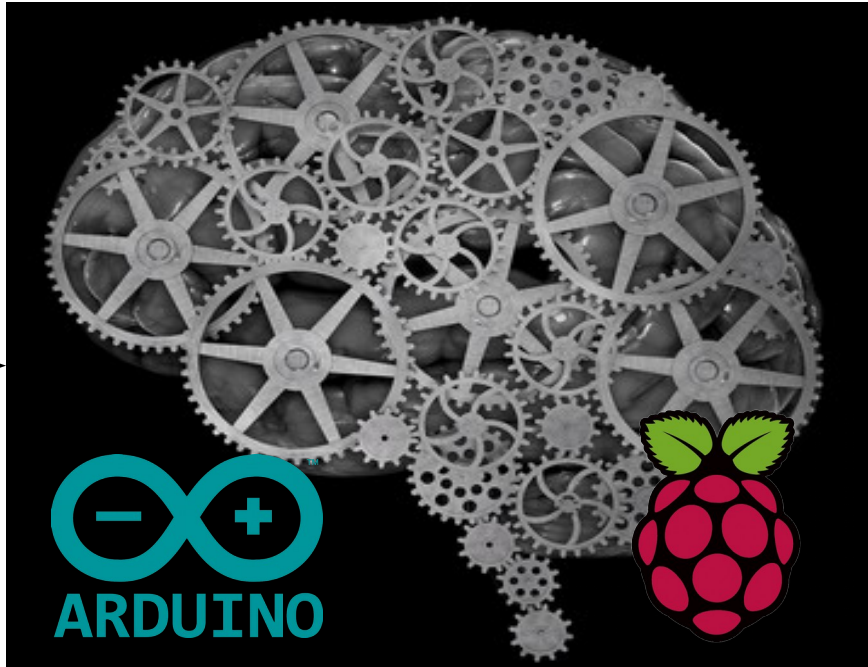


Arduino i Raspberry Pi

Automatització del món físic



Sensors



Actuadors



Sortida
de sensors
Escriptura -->

Entrada
d'informació
--> Lectura

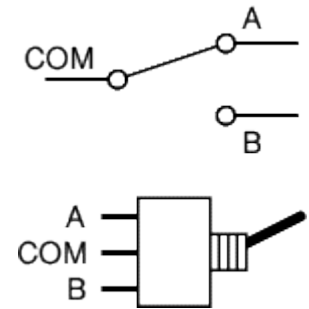
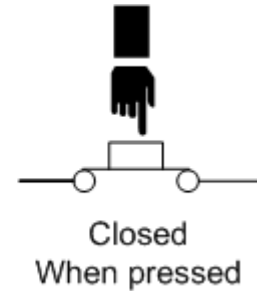
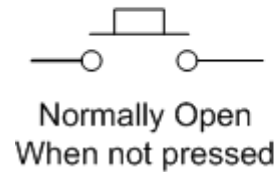
Sortida
d'informació
Escriptura -->

Entrada
d'actuadors
--> Lectura



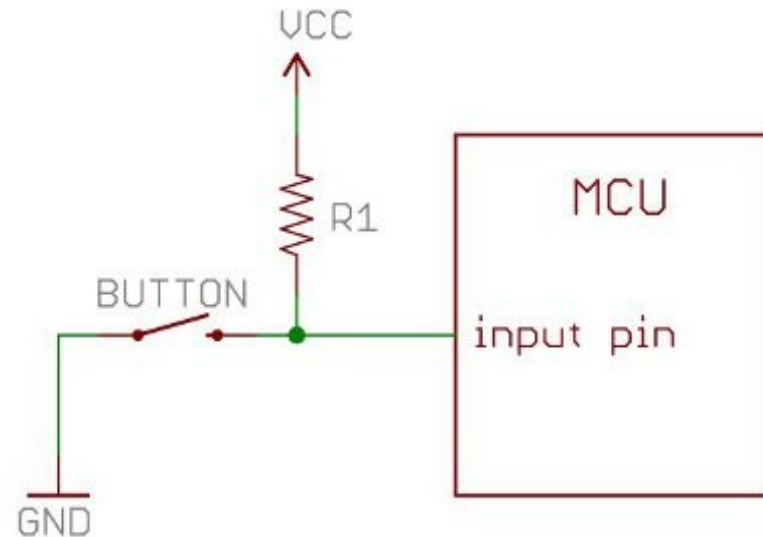
Arduino i Raspberry Pi

Lectura de l'estat d'un sensor digital



**Cert : 1.8v, 3.3V,
5V**
Fals : 0v

True / False
High / Low

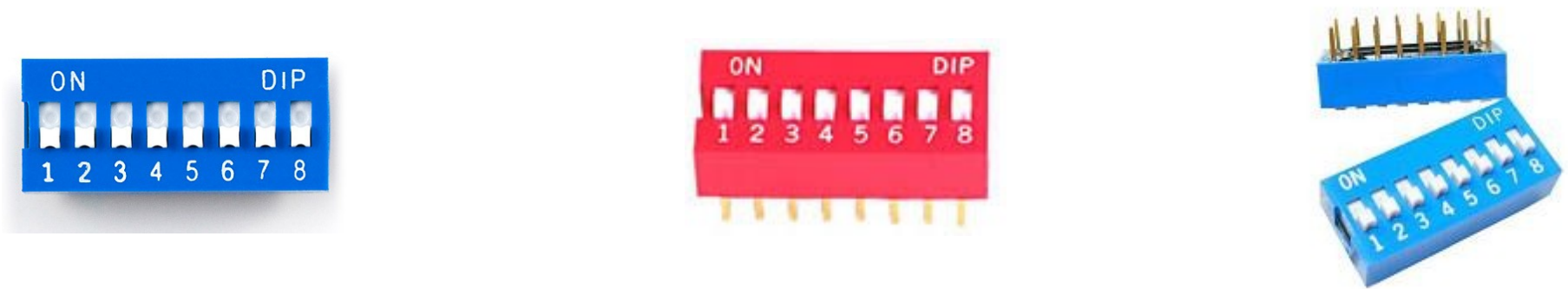




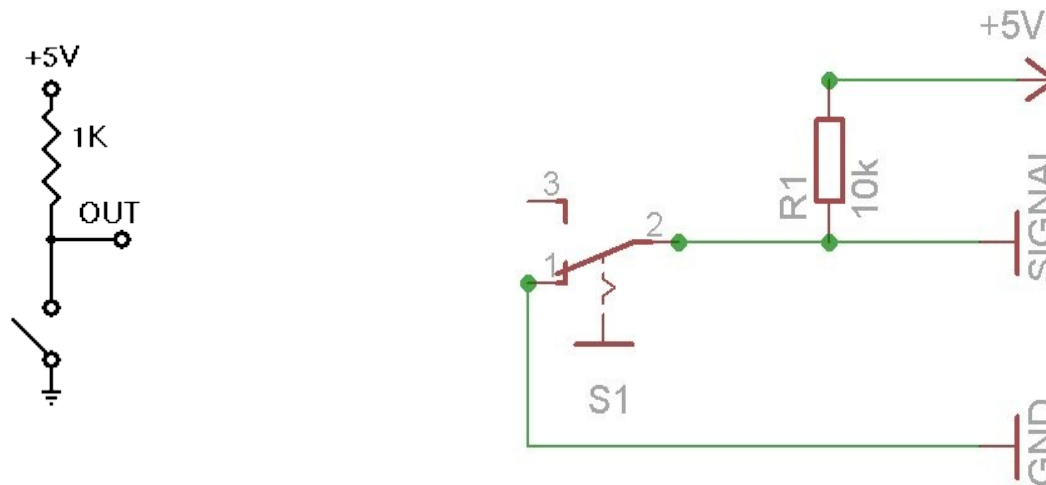
Arduino i Raspberry Pi

Lectura de l'estat d'un sensor digital

uSW : Microrruptor (dip-switch, microswitch)

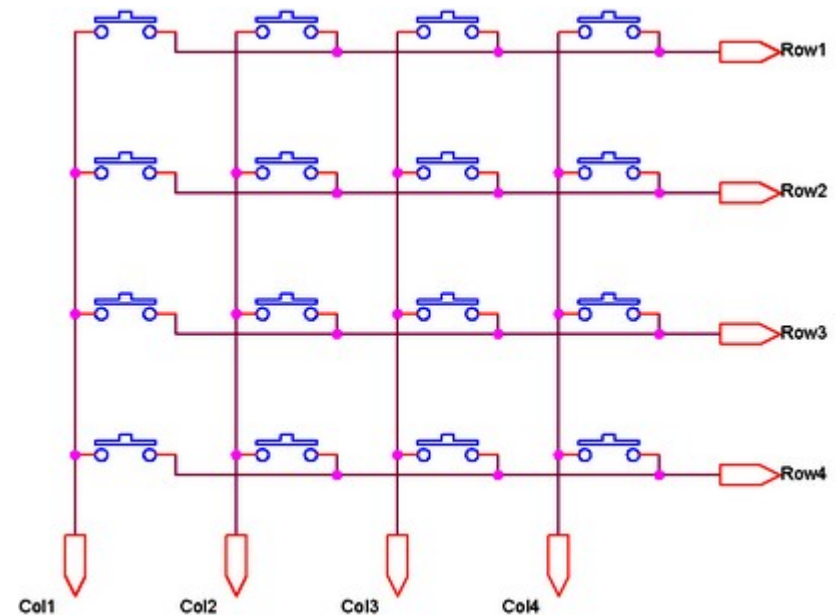


Pull-up : Connexió d'un resistor a alimentació per assegurar un nivell lògic a una entrada digital



Arduino i Raspberry Pi

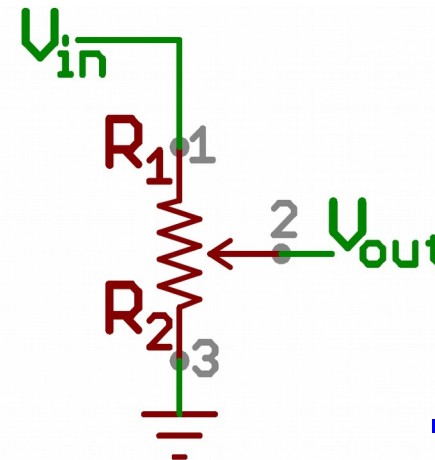
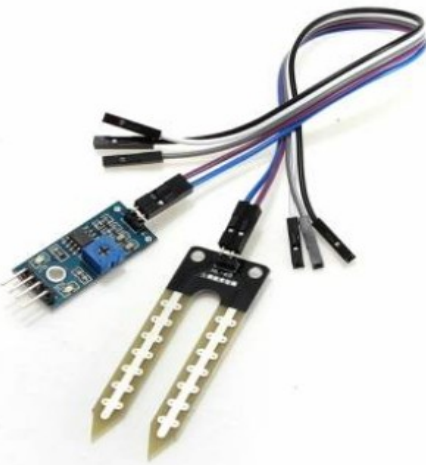
Lectura de la informació d'un teclat





Arduino i Raspberry Pi

Lectura d'informació analògica



0..3,3V

0..5V

0..10V

-10..10V



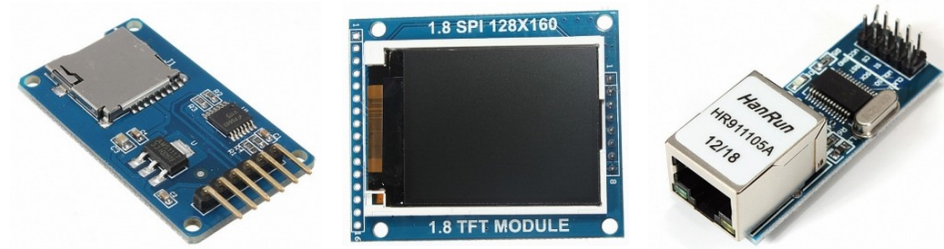
Arduino i Raspberry Pi

Protocols I2C (TWI), SPI i 1-Wire

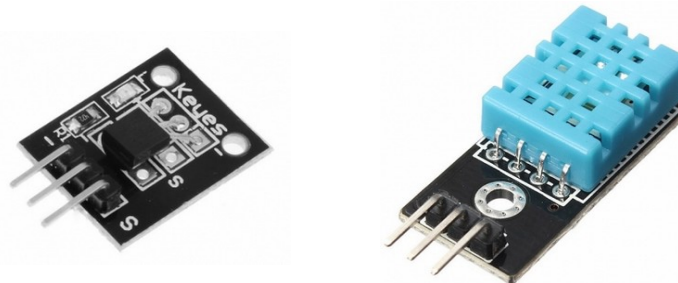
I2C : Inter-Integrated Circuit



SPI : Serial Peripheral Interface Bus



1-Wire

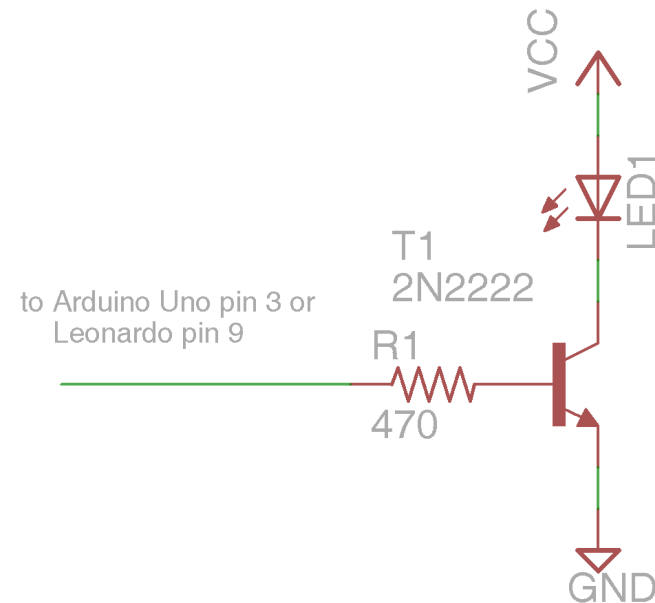
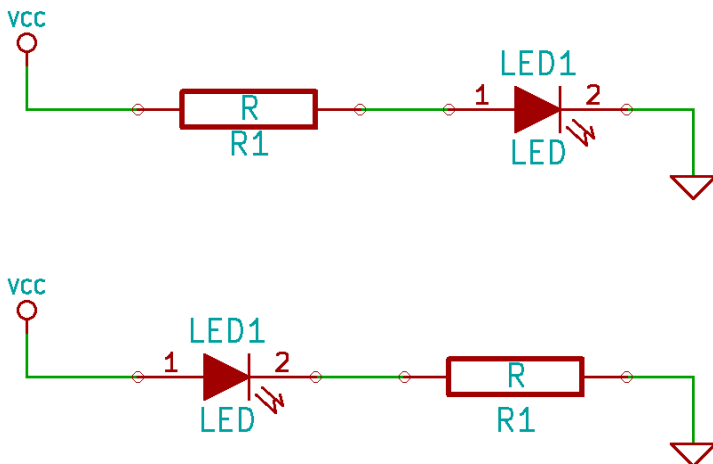
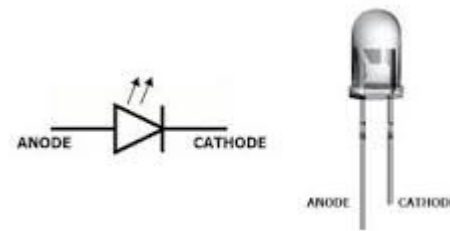
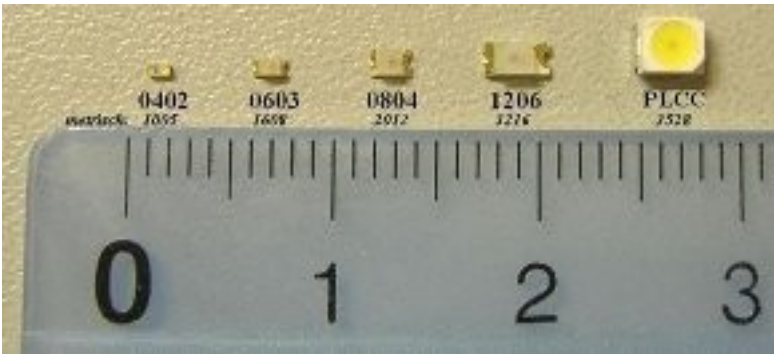




Arduino i Raspberry Pi

Espectura d'estat a un actuator digital

LED : Díode emissor de llum

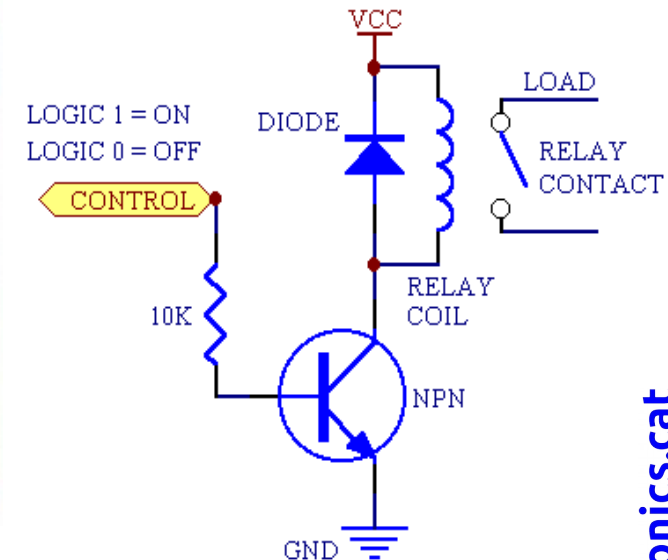
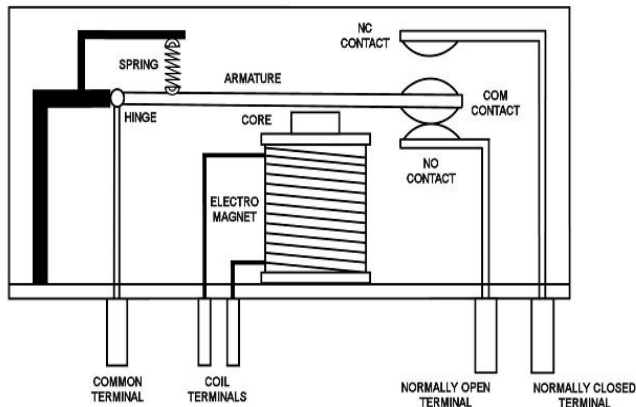
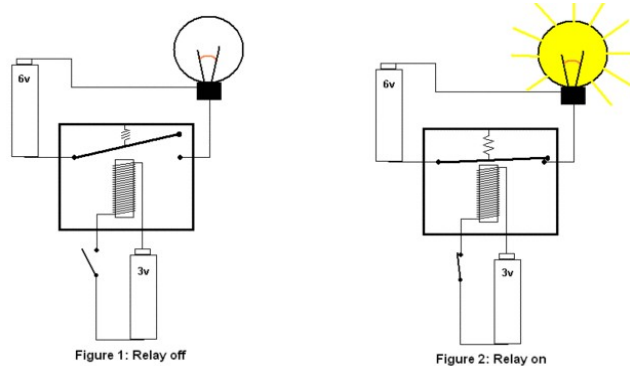




Arduino i Raspberry Pi

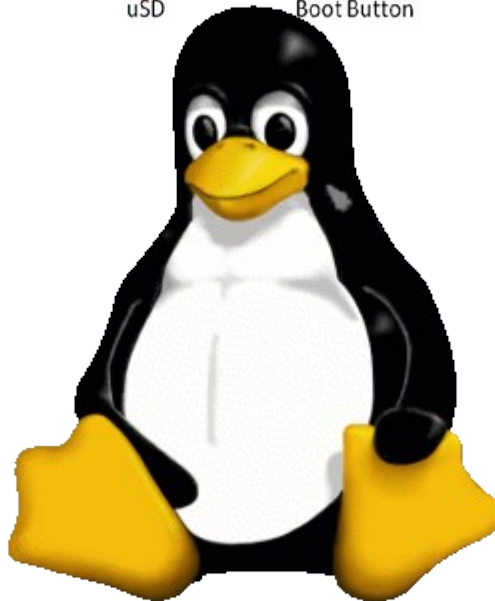
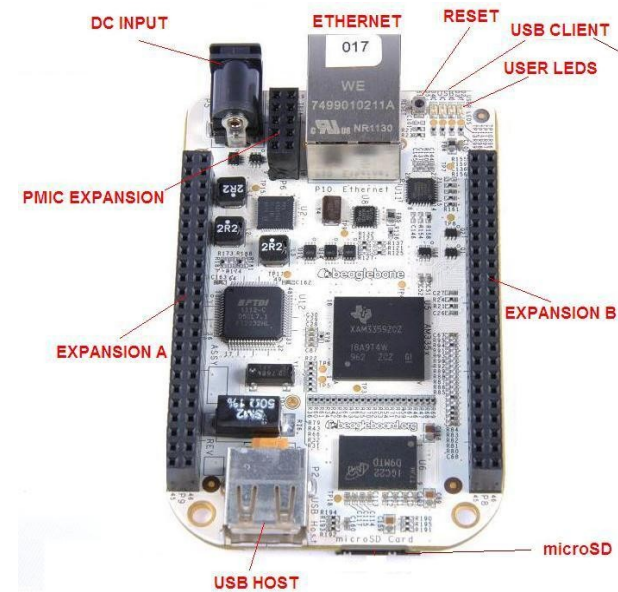
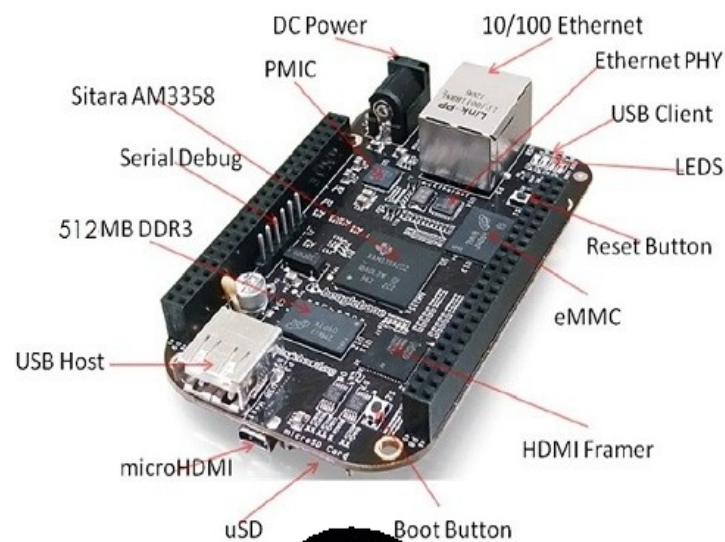
Esriptura d'estat a un actuador digital

Relé : Sistema electromecànic que modifica l'estat d'un commutador. Amb una tensió de control petita s'activa un electroimant podent controlar tensions molt superiors.



Arduino i Raspberry Pi

Processadors de 32 bits





Arduino i Raspberry Pi

Família d'Arduinos i Teensy



Arduino Uno



Arduino Leonardo



Arduino Due



Arduino Yún



Arduino Tre



Arduino Micro



Arduino Robot



Arduino Esplora



Arduino Mega ADK



Arduino Ethernet



Arduino Mega 2560



Arduino Mini



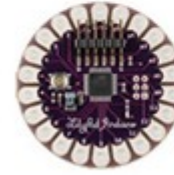
LilyPad Arduino USB



LilyPad Arduino Simple



LilyPad Arduino SimpleSnap



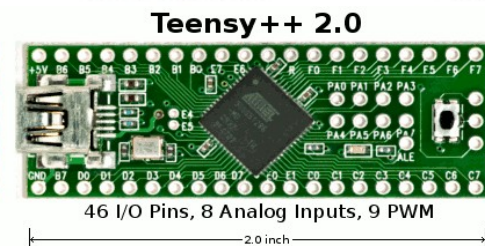
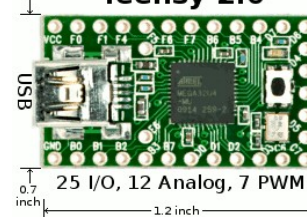
LilyPad Arduino Teensy 2.0



Arduino Nano



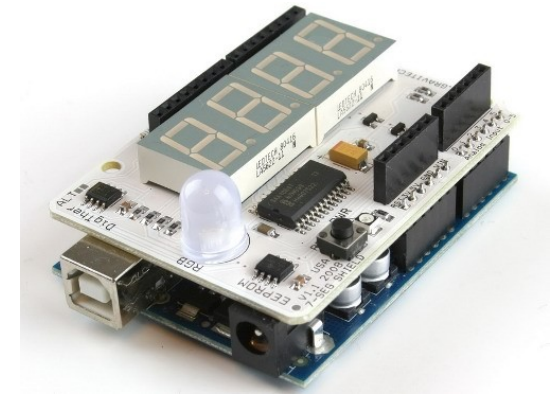
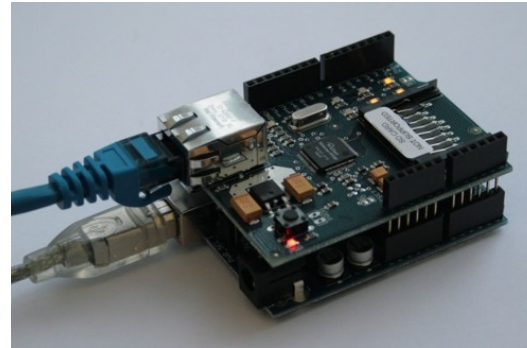
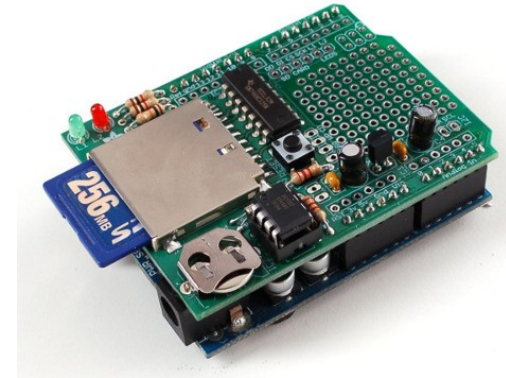
Arduino Pro Mini





Arduino i Raspberry Pi

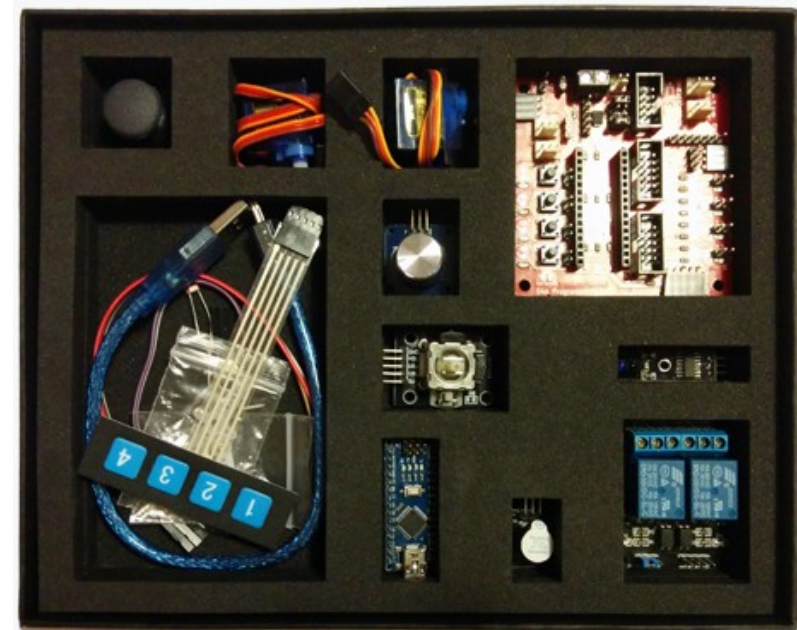
Plaques complementàries (shield / hat)



La majoria de plaques complementàries venen amb biblioteques i arxius de capçalera que acceleren el procés de funcionament.

<http://arduino.cc/en/pmwiki.php?n=Main/ArduinoShields>

electronics.cat



<http://www.makeit.cat>



Arduino i Raspberry Pi

Alguns llenguatges de programació

SCRATCH



```
#include <stdio.h>
int main(void)
{
    printf("Hello World!\n");
    return 0;
}
```

C/C++



ArduBlock

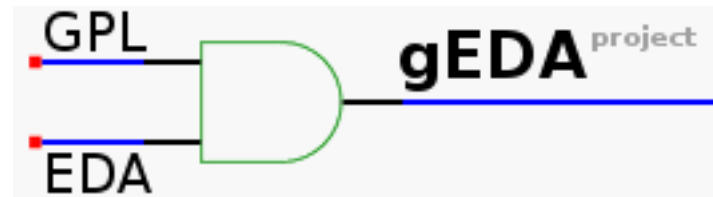




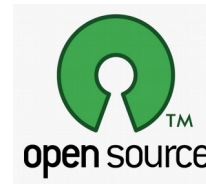
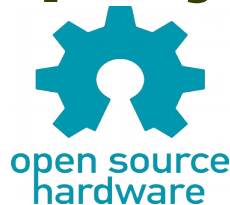
Arduino i Raspberry Pi

El perquè d'emprar el maquinari lliure

- Preus baixos (www.banggood.com)
- Promoció STEM (Science, Technology, Engineering and Maths)
- Disseny accessible
 - KiCad, gEDA



- Circuits impresos (www.pcbway.com)
- Munió de projectes de codi obert








Arduino i Raspberry Pi

Exemple: Trepant / fresadora - qtCnc

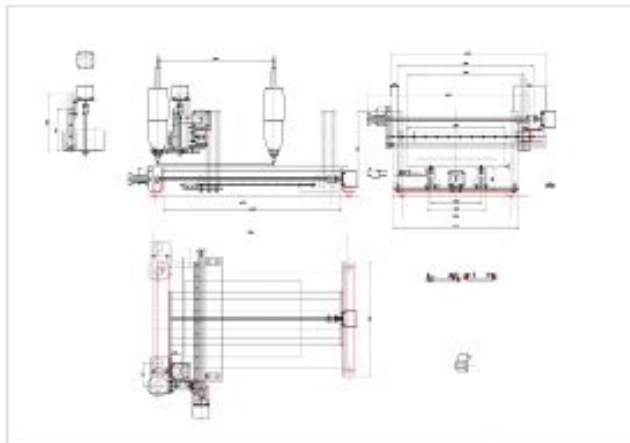
- Programari allotjat a sourceforge.net :
(<http://sourceforge.net/projects/qtCnc/files/>)



Home 

Name ▾	Modified ▾	Size ▾	Downloads ▾
 Desktop Software	2011-12-21		
 FirmwareAtmega	2011-12-21		

Totals: 2 Items





Arduino i Raspberry Pi

Eines per a simular

123D Circuits / Circuits Components Circuit Scribe Shop Search Sign up Sign in

Simulate Arduino online and easily create custom circuit boards

Design and simulate circuit boards with our breadboard, schematic and PCB editor. Share your designs and collaborate as a team.

Get started designing electronics online!

Show me an example!

123D Circuits / Circuits / LED shield

```
const int numLEDs = 10;
const int numButtons = 2;

// the setup routine runs once when you press reset
void setup() {
  // initialize the digital pin as an output.
  pinMode(13, OUTPUT);
  pinMode(12, OUTPUT);
  pinMode(11, OUTPUT);
  pinMode(10, OUTPUT);
  pinMode(9, OUTPUT);
  pinMode(8, OUTPUT);
  pinMode(7, OUTPUT);
  pinMode(6, OUTPUT);
  pinMode(5, OUTPUT);
  pinMode(4, OUTPUT);
  pinMode(3, OUTPUT);
  pinMode(2, OUTPUT);
  pinMode(1, OUTPUT);
  pinMode(0, OUTPUT);
}

// the loop routine runs over and over again forever
void loop() {
  // turn the LED on when you press reset
  digitalWrite(13, HIGH);
  // wait for a second
  delay(1000);
  // turn the LED off when you press reset
  digitalWrite(13, LOW);
  // wait for a second
  delay(1000);
}
```

DRAW CONDUCTIVE TRACES

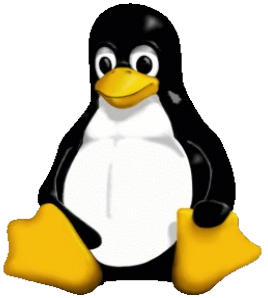
Easily create and simulate Circuit Scribe sketches online.

<http://123d.circuits.io/>



Arduino i Raspberry Pi

Sistemes operatius



Els sistemes basats en GNU/Linux permeten fer metadistribucions



debian



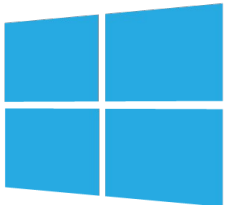
ubuntu



redhat



Puppy Linux



Els sistemes propietaris no permeten fer metadistribucions



Arduino i Raspberry Pi

Metadistribució basada en Debian

- Els alumnes poden tenir una còpia funcional sense cap mena de restricció legal

- Escriptoris :



Gnome3 / Gnome clàssic / LXDE

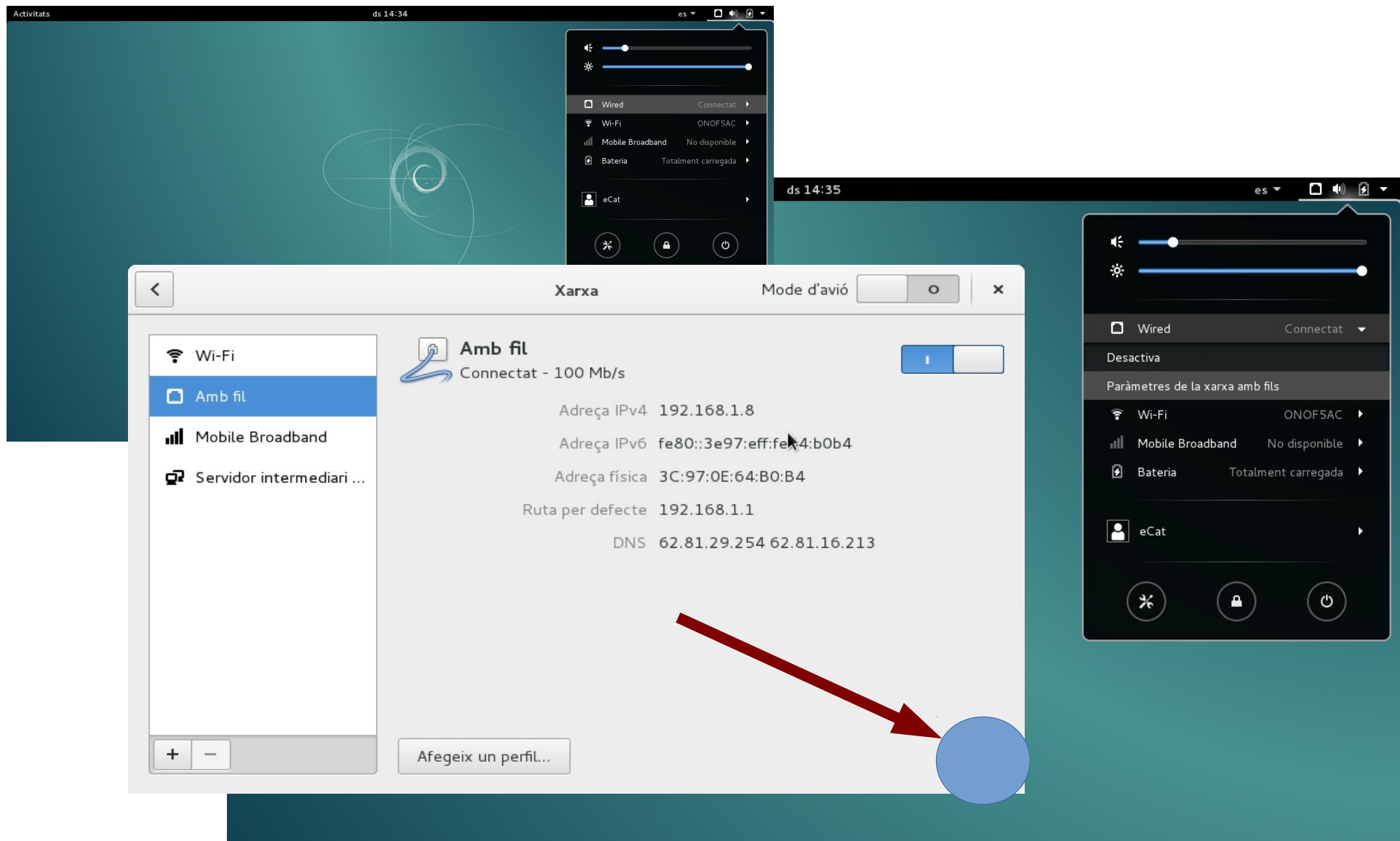
- Uuaris :

- Primari o **root** (**#**). Contrasenya : **clot**

- Usuari **ecat** (**\$**). Contrasenya : **clot**

Arduino i Raspberry Pi

Assignació d'IP





Arduino i Raspberry Pi

Reconeixement de les plaques de comunicació

ecat@ecatian:~\$ lsusb

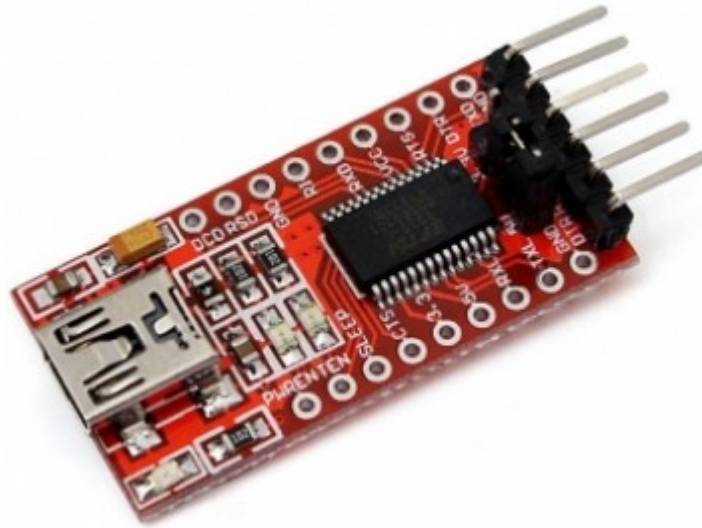
```
ecat@ecatian:~$ lsusb
Bus 004 Device 002: ID 8087:0024 Intel Corp. Integrated Rate Matching Hub
Bus 004 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 003 Device 005: ID 5986:0299 Acer, Inc
Bus 003 Device 004: ID 0461:4d81 Primax Electronics, Ltd Dell N889 Optical Mouse
Bus 003 Device 003: ID 0bdb:1926 Ericsson Business Mobile Networks BV
Bus 003 Device 002: ID 8087:0024 Intel Corp. Integrated Rate Matching Hub
Bus 003 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 002 Device 002: ID 0781:5581 SanDisk Corp.
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
Bus 001 Device 005: ID 0403:6001 Future Technology Devices International, Ltd FT232 USB-Serial (UART) IC
Bus 001 Device 004: ID 0403:6001 Future Technology Devices International, Ltd FT232 USB-Serial (UART) IC
Bus 001 Device 003: ID 1a40:0101 Terminus Technology Inc. 4-Port HUB
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
ecat@ecatian:~$ ls /dev/ttyUSB*
/dev/ttyUSB0 /dev/ttyUSB1
ecat@ecatian:~$ ls /dev/ttyUSB* -ls
0 crw-rw---- 1 root dialout 188, 0 jun 27 14:53 /dev/ttyUSB0
0 crw-rw---- 1 root dialout 188, 1 jun 27 14:53 /dev/ttyUSB1
ecat@ecatian:~$
```

ecat@ecatian:~\$ ls /dev/ttyUSB* -ls



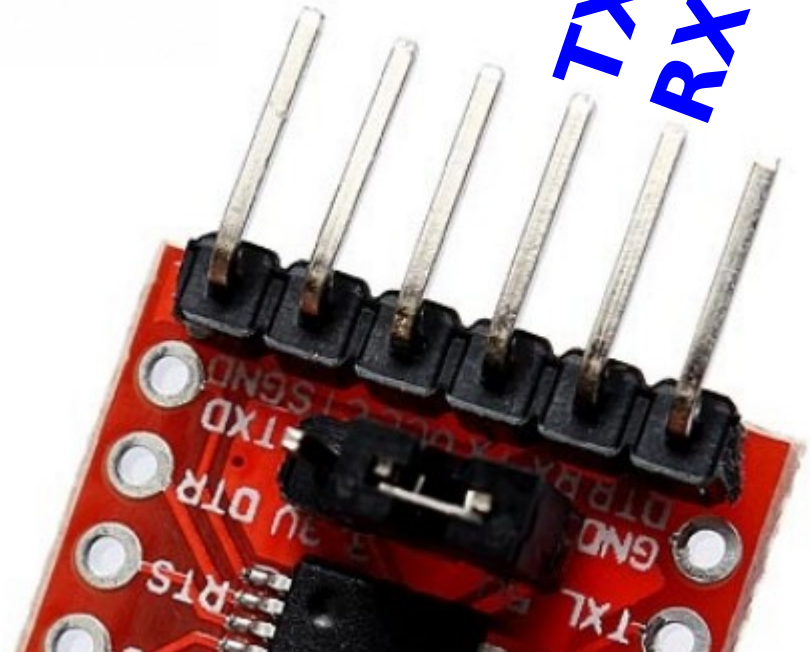
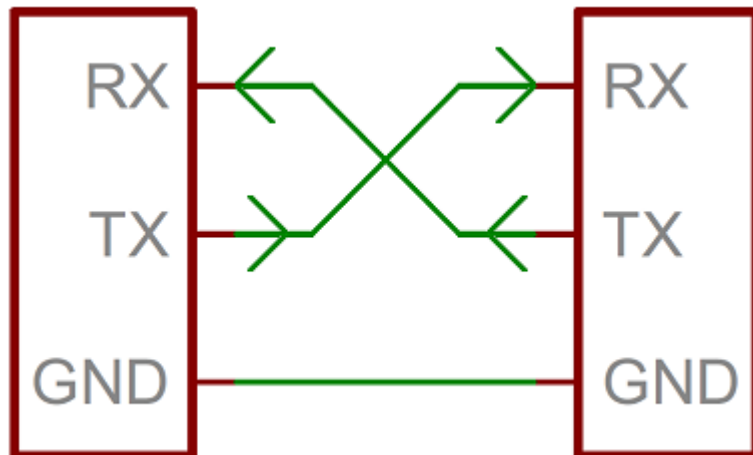
Arduino i Raspberry Pi

Plaques de comunicació



GND

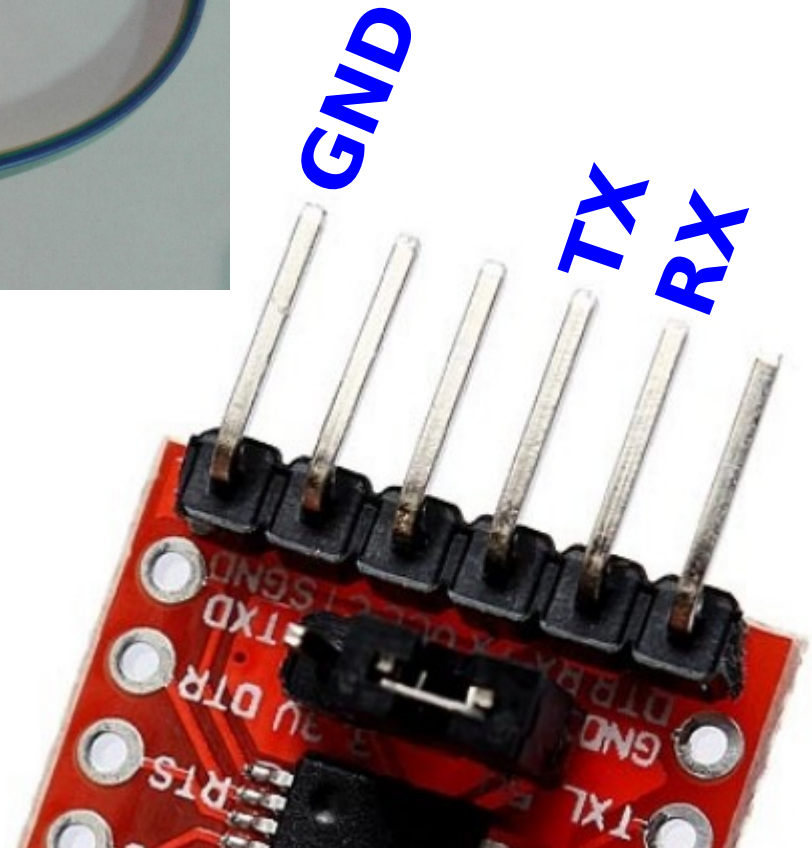
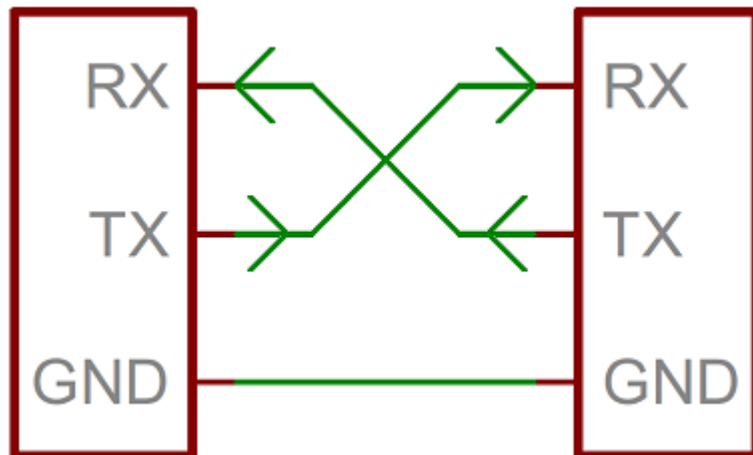
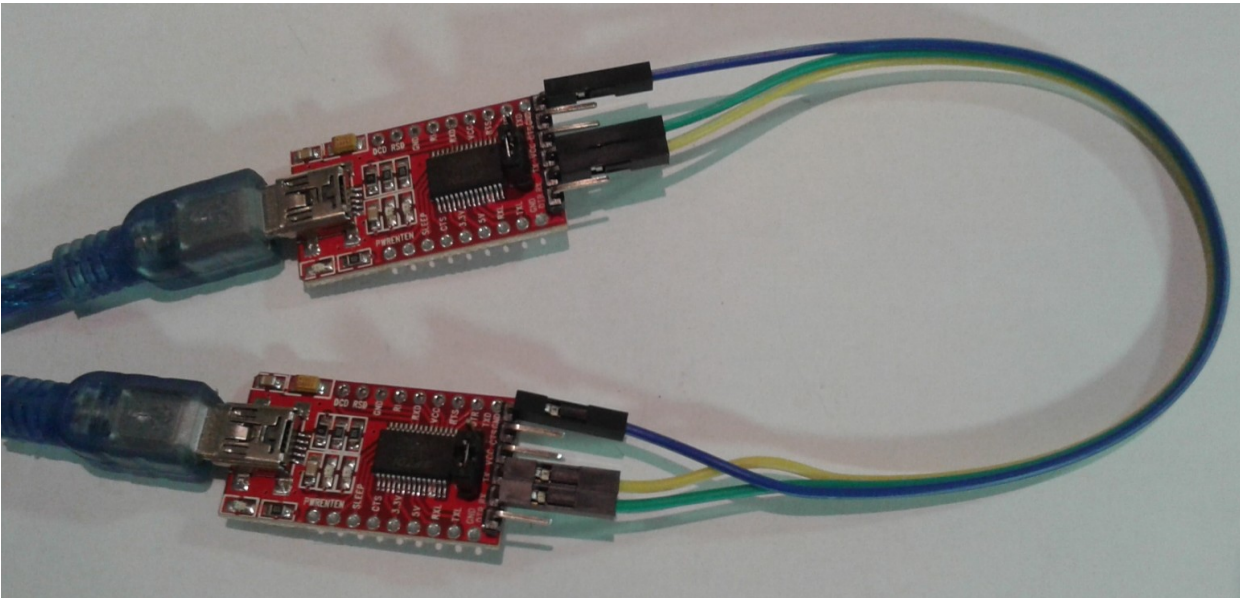
TX
RX





Arduino i Raspberry Pi

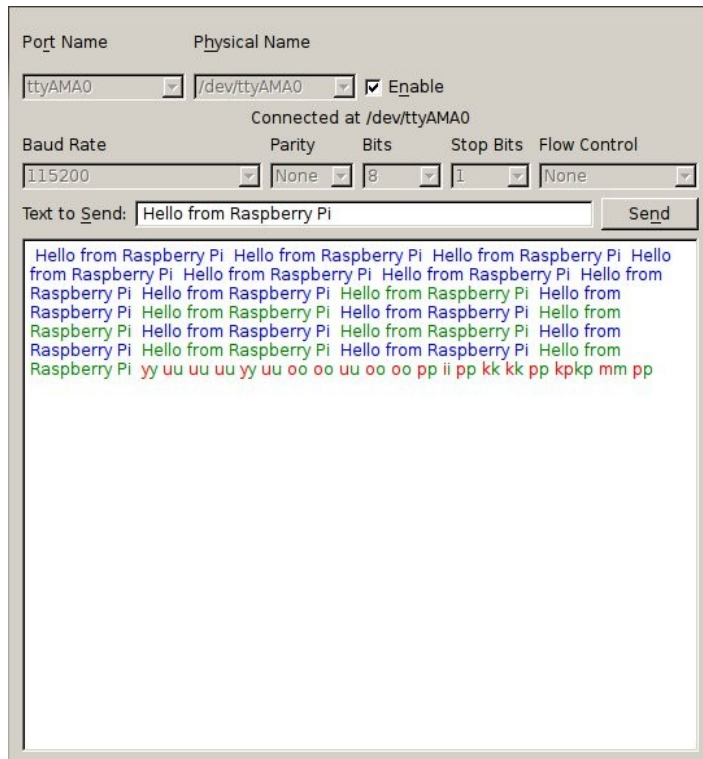
Plaques de comunicació





Arduino i Raspberry Pi

qtTerm

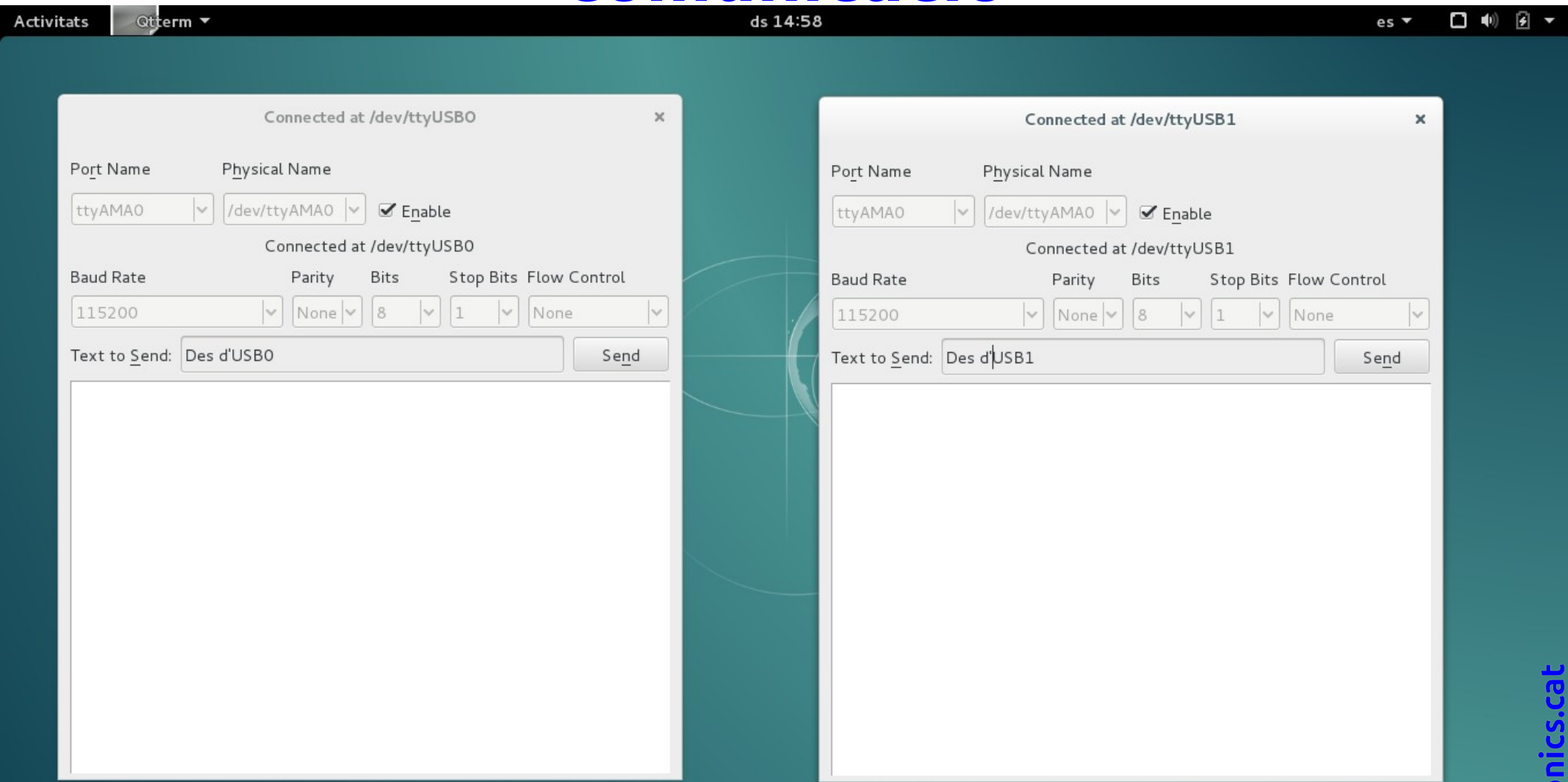


<http://code.google.com/p/qtterm/>



Arduino i Raspberry Pi

Ús del qtTerm amb les plaques de comunicació





Arduino i Raspberry Pi

Ús del qtTerm amb les plaques de comunicació

Activitats Qtterm ds 14:58 es

Connected at /dev/ttyUSB0

Port Name Physical Name
ttyAMA0 /dev/ttyAMA0 ☒ Enable

Connected at /dev/ttyUSB0

Baud Rate Parity Bits Stop Bits Flow Control
115200 None 8 1 None

Text to Send: Des d'USB0

Des d'USB0

Connected at /dev/ttyUSB1

Port Name Physical Name
ttyAMA0 /dev/ttyAMA0 ☒ Enable

Connected at /dev/ttyUSB1

Baud Rate Parity Bits Stop Bits Flow Control
115200 None 8 1 None

Text to Send: Des d'USB1

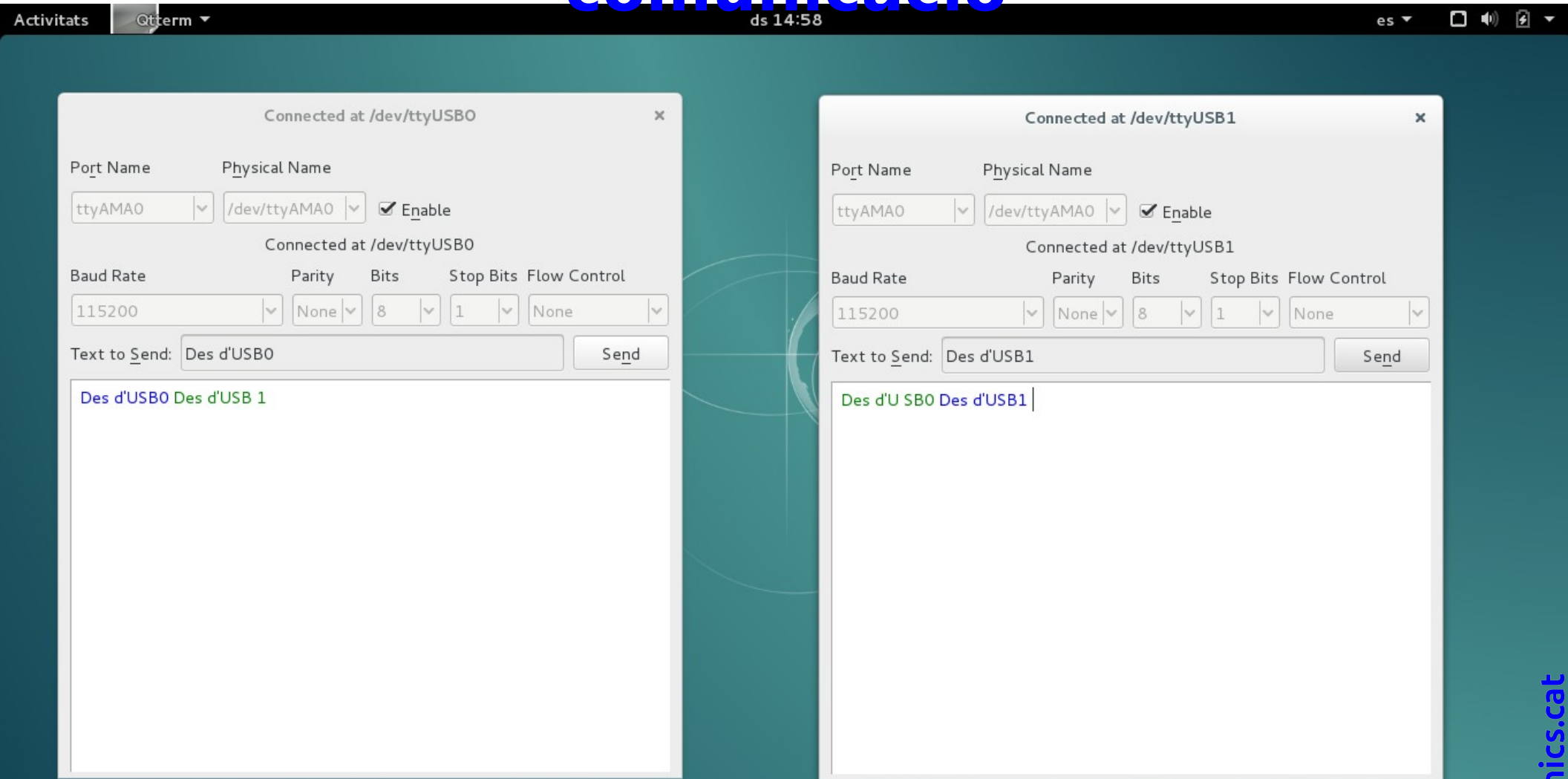
Des d'U SB0

electronics.cat



Arduino i Raspberry Pi

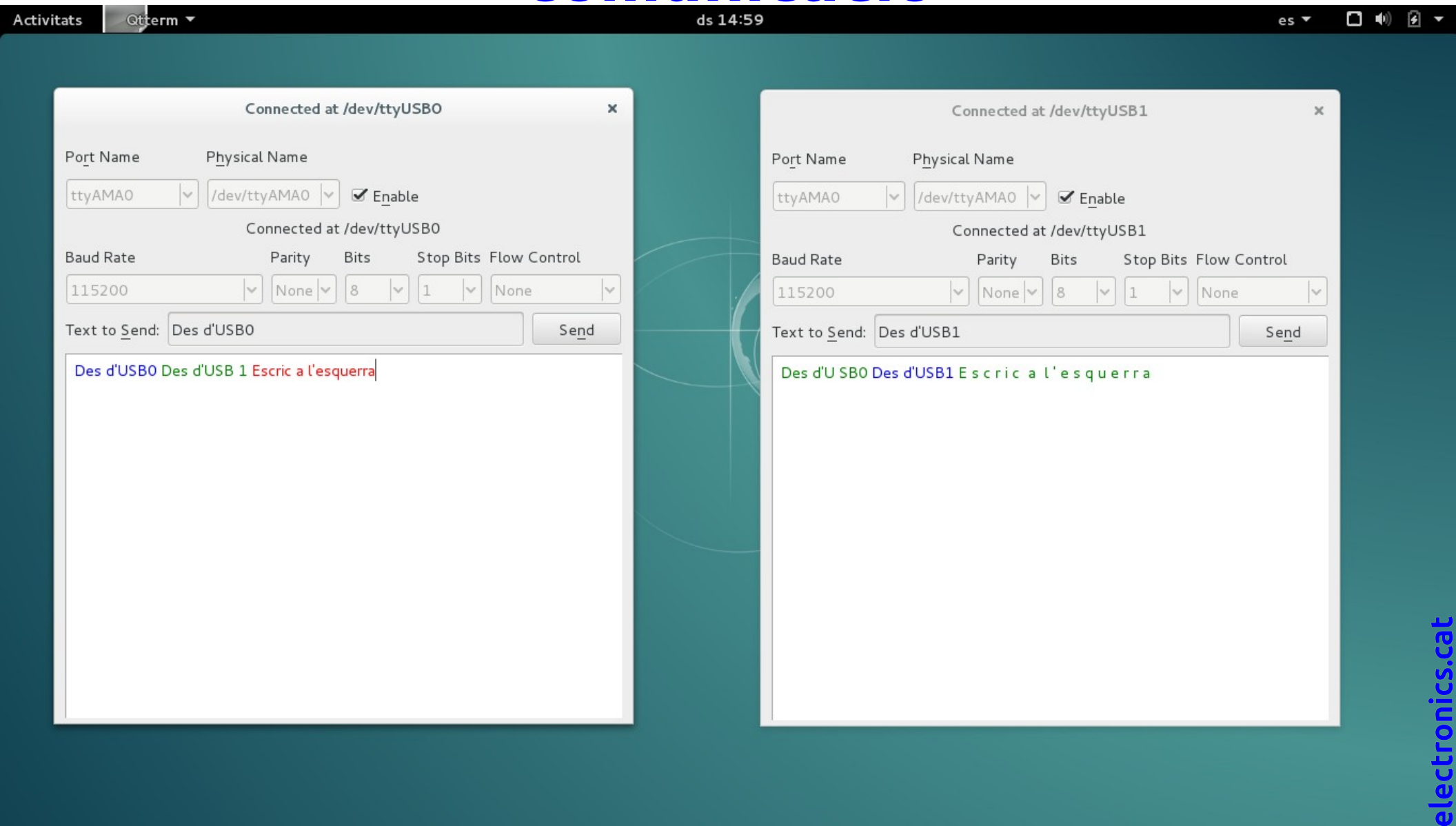
Ús del qtTerm amb les plaques de comunicació





Arduino i Raspberry Pi

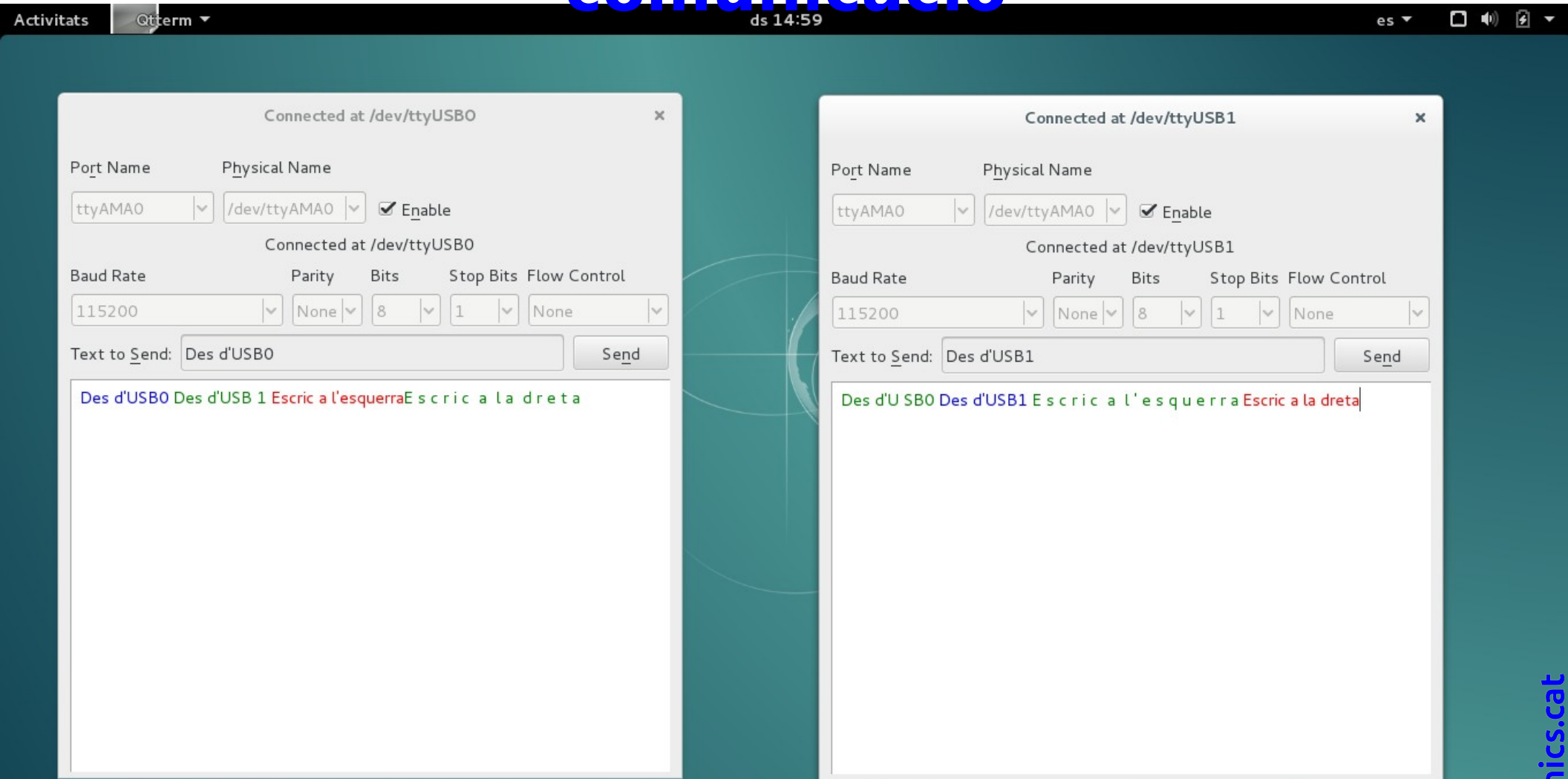
Ús del qtTerm amb les plaques de comunicació





Arduino i Raspberry Pi

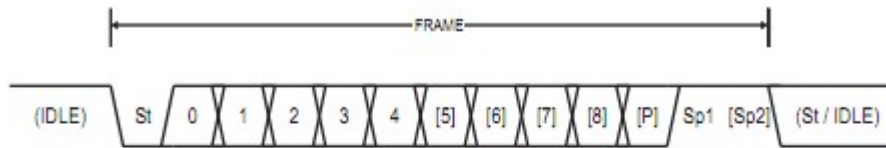
Ús del qtTerm amb les plaques de comunicació





Arduino i Raspberry Pi

Senyal de comunicació sèrie



St Start bit, always low.

(n) Data bits (0 to 8).

P Parity bit. Can be odd or even.

Sp Stop bit, always high.

IDLE No transfers on the communication line (RxDn or TxDn). An IDLE line must be high.

UART Settings

Baudrate	Data Bits	Parity	Stop Bits
<input type="radio"/> 300	<input type="radio"/> 5	<input checked="" type="radio"/> none	<input checked="" type="radio"/> 1
<input type="radio"/> 1200	<input type="radio"/> 6	<input type="radio"/> even	<input type="radio"/> 1.5
<input type="radio"/> 2400	<input checked="" type="radio"/> 7	<input type="radio"/> odd	<input type="radio"/> 2
<input type="radio"/> 4800	<input type="radio"/> 8		
<input checked="" type="radio"/> 9600			
<input type="radio"/> 19200			
<input type="radio"/> 38400			
<input type="radio"/> 57600			
<input type="radio"/> 115200			

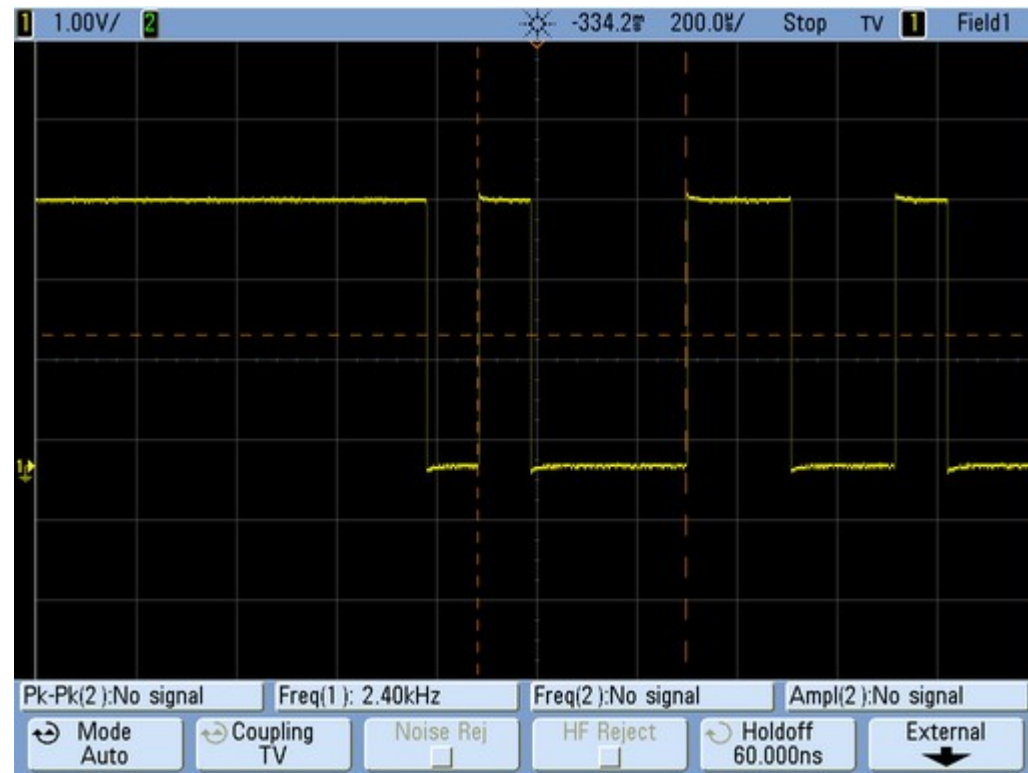
Software Flow Control

☒ on ☐ off

Xon/Xoff karakter

Xon Char (HEX) (0x11)

Xoff Char (HEX) (0x13)



Arduino i Raspberry Pi

Comunicació amb minicom

ecat@ecatian:~\$ minicom -b 9600 -o -D /dev/ttyUSB1

```

ecat@debian8: ~
Fitxer  Edita  Visualitza  Cerca  Terminal  Ajuda

Welco-----
OPTIO|
Compi|
Port |
Press|
-----+-----
|                                     |
|             Minicom Command Summary |
|                                     |
| Commands can be called by CTRL-A <key> |
|                                     |
|             Main Functions           | Other Functions |
|-----+-----|-----+-----|
| Dialing directory..D  run script (Go)....G | Clear Screen.....C |
| Send files.....S    Receive files.....R | cOnfigure Minicom..O |
| comm Parameters...P  Add linefeed.....A | Suspend minicom...J |
| Capture on/off....L  Hangup.....H       | eXit and reset....X |
| send break.....F    initialize Modem...M | Quit with no reset.Q |
| Terminal settings..T  run Kermit.....K   | Cursor key mode...I |
| lineWrap on/off...W  local Echo on/off..E | Help screen.....Z  |
| Paste file.....Y    Timestamp toggle...N | scroll Back.....B   |
| Add Carriage Ret...U |                                     |
|                                     |
| Select function or press Enter for none. |
|-----+-----|-----+-----|
|                                     |
| CTRL-A Z for help | 9600 8N1 | NOR | Minicom 2.7 | VT102 | Offline | ttyUSE

```

```

+-----[configuration]-----+
| Filenames and paths          |
| File transfer protocols      |
| Serial port setup            |
| Modem and dialing            |
| Screen and keyboard          |
| Save setup as dfl            |
| Save setup as..              |
| Exit                          |
+-----+-----+
+-----+-----+
| A - Serial Device           : /dev/ttyUSB0 |
| B - Lockfile Location       : /var/lock    |
| C - Callin Program          :              |
| D - Callout Program         :              |
| E - Bps/Par/Bits            : 9600 8N1     |
| F - Hardware Flow Control   : No           |
| G - Software Flow Control   : No           |
+-----+-----+
+-----[conf.]-+-----+
| Filenames                  |
| File tran:                  |
| Serial port setup          |
| Modem and dialing          |
| Screen and keyboard        |
| Save setup as dfl          |
| Save setup as..            |
| Exit                        |
+-----+-----+

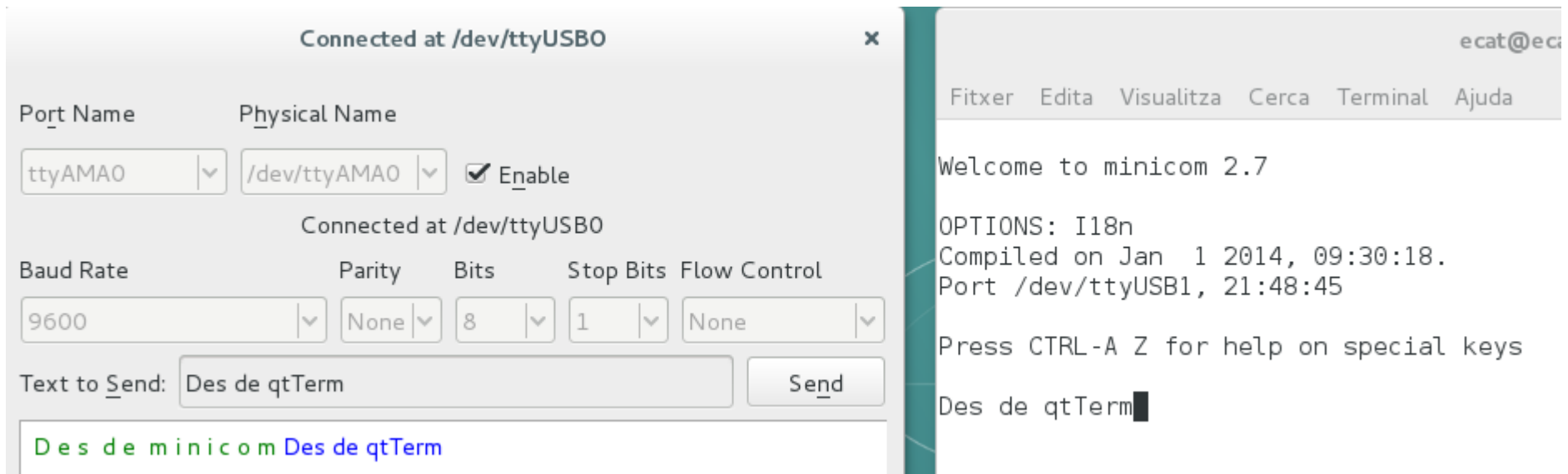
```

Deseu com a «per defecte» al finalitzar la configuració sense «Hardware Flow Control»



Arduino i Raspberry Pi

Comunicació qtTerm amb minicom



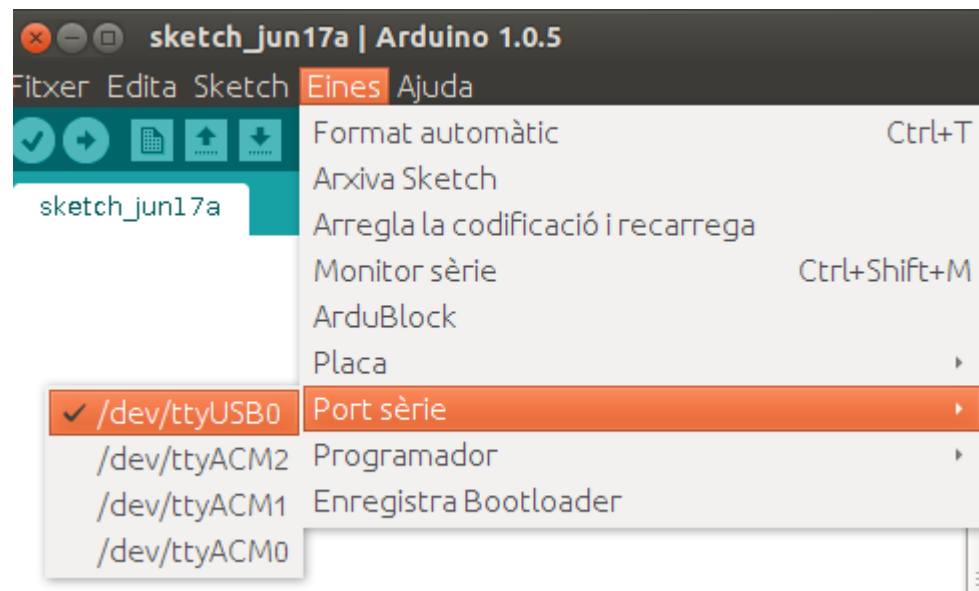
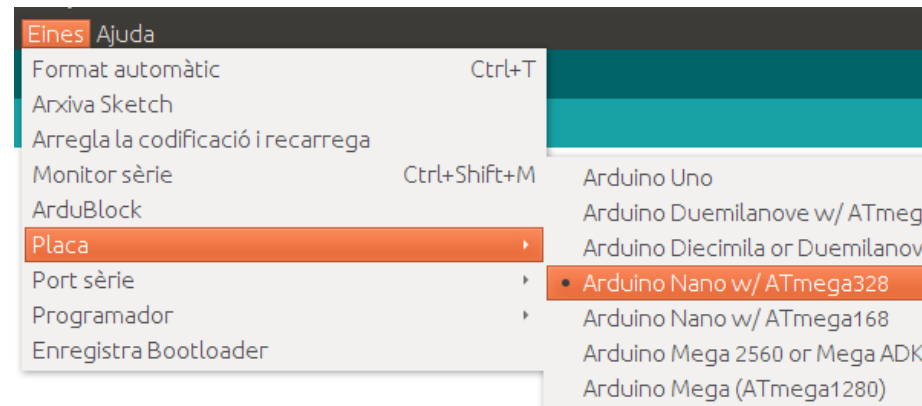
qtTerm està configurat a /dev/ttyUSB0 a 9600-N-8-1

ecat@ecatian:~\$ minicom -b 9600 -o -D /dev/ttyUSB1



Arduino i Raspberry Pi

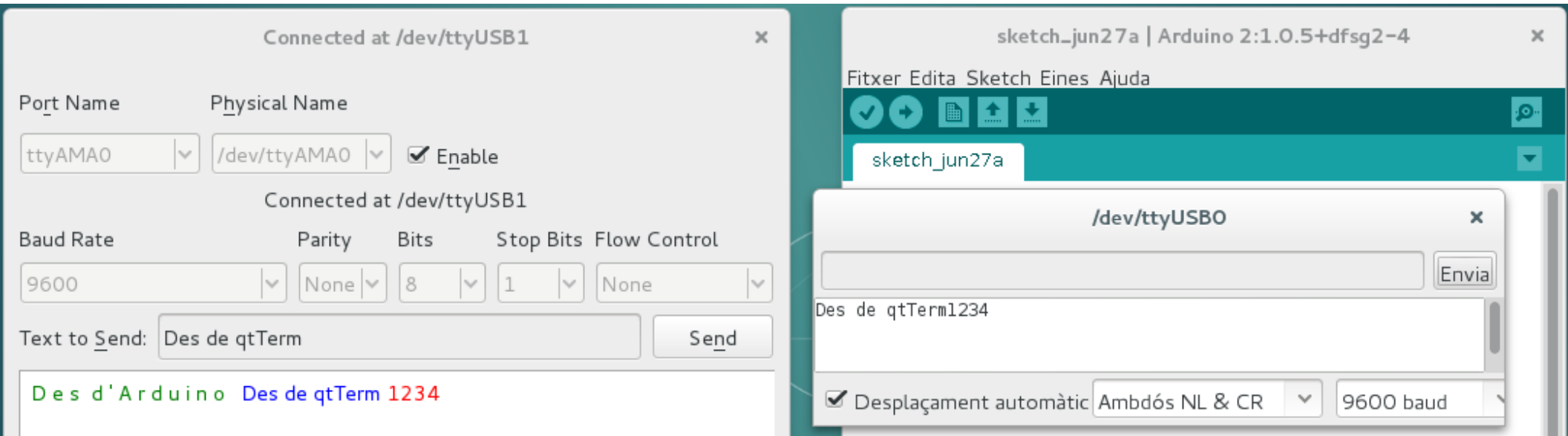
Comunicació qtTerm amb IDE d'Arduino





Arduino i Raspberry Pi

Comunicació qtTerm amb IDE d'Arduino



qtTerm està configurat a /dev/ttyUSB1 a 9600-N-8-1

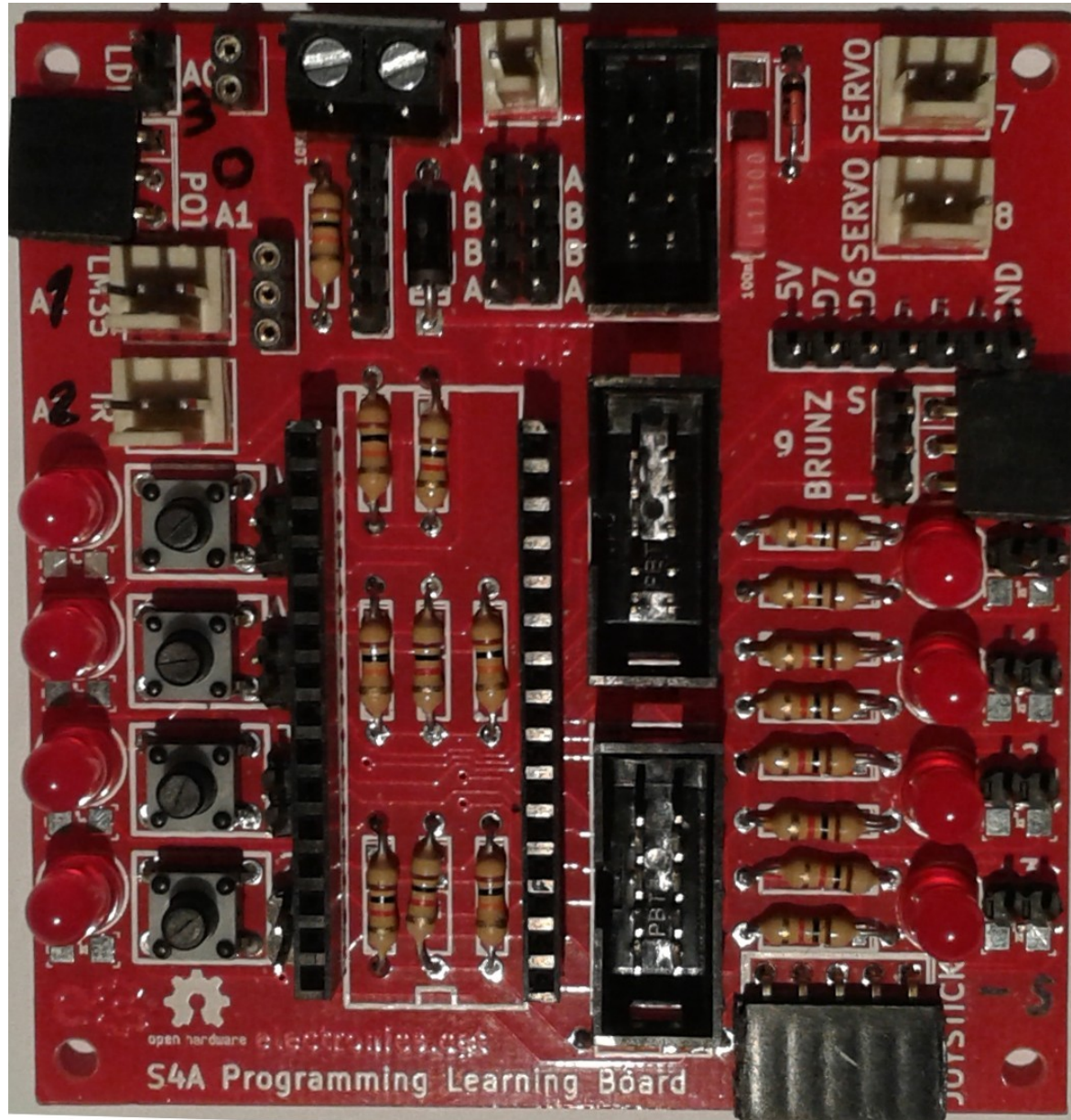
IDE d'Arduino està configurat a /dev/ttyUSB0 a 9600

El monitor sèrie de l'IDE d'Arduino és a Eines/Monitor sèrie



Arduino i Raspberry Pi

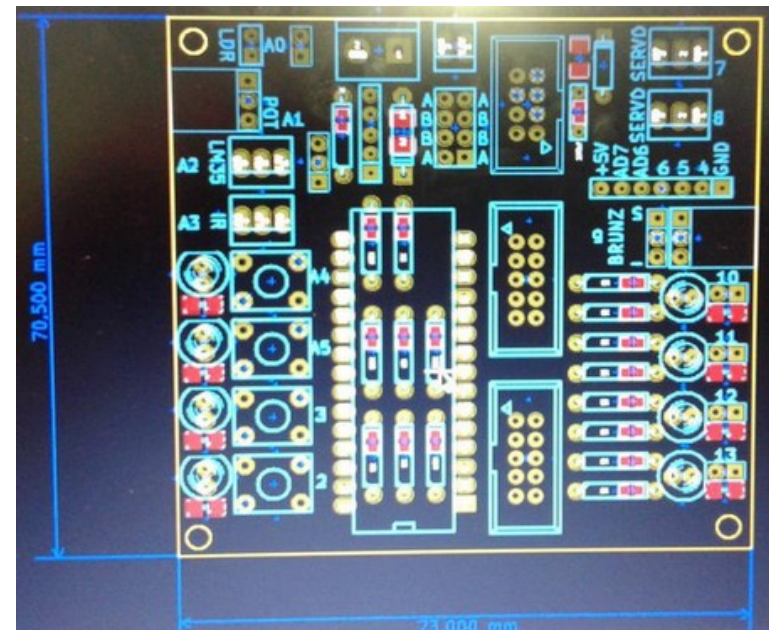
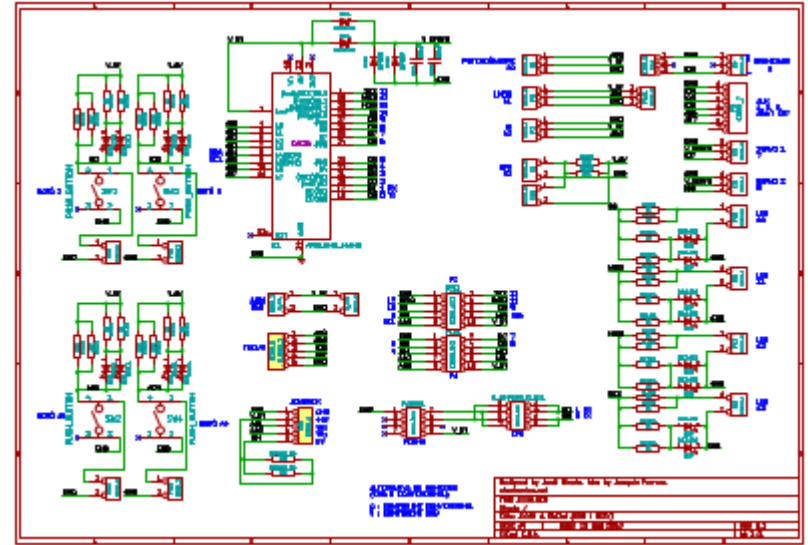
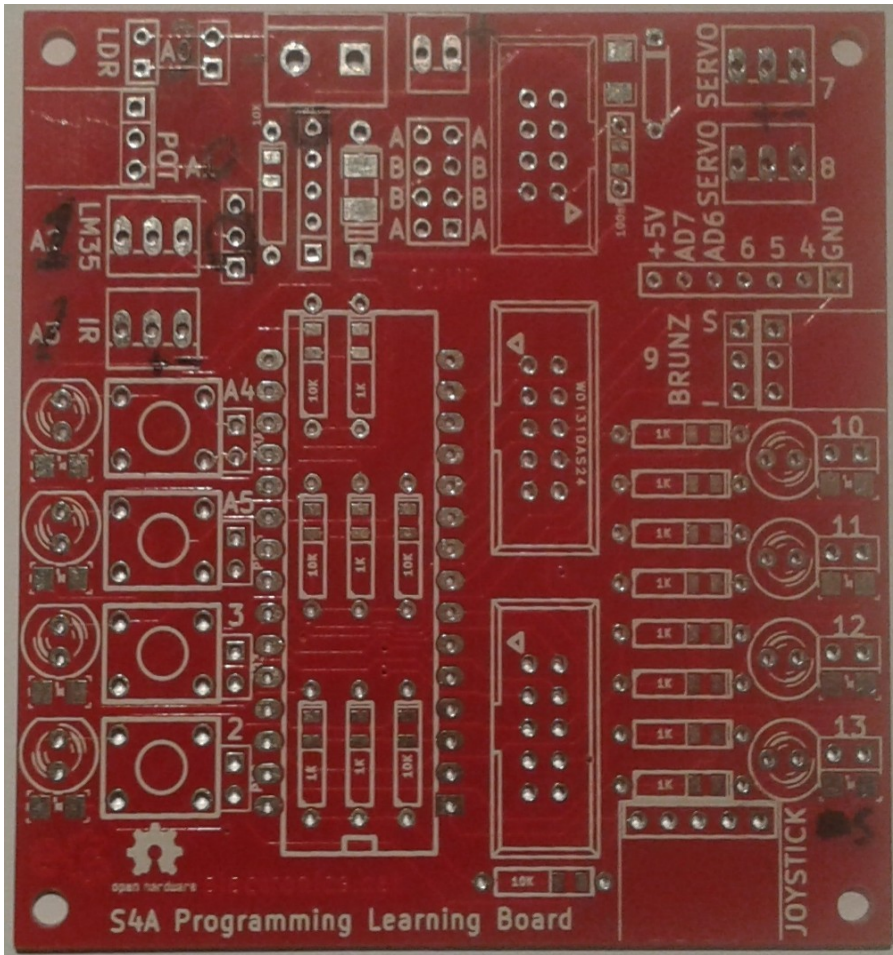
La placa S4A Programming Learning Board





Arduino i Raspberry Pi

La placa S4A Programming Learning Board



Placa desenvolupada amb l'entorn de disseny integrat de programari lliure



Arduino i Raspberry Pi

Ús d'S4A

Based on Scratch from the MIT Media Lab

Fitxer Edita Ajuda

Moviment Control Aspecte Sensors Sons Operadors Lapis Variables

Nova variable Nova llista

Arduino1

x: 0 y: 0 direcció: 90

Programes Vestits Sons

al prémer

per sempre

si ¿sensor Digital2 premut?

digital 13 apagat

si no digital 13 encès

si ¿sensor Digital3 premut?

digital 12 apagat

si no digital 12 encès

si valor del sensor Analog5 < 15

digital 11 encès

si no digital 11 apagat

si valor del sensor Analog4 < 15

digital 10 encès

si no digital 10 apagat

al prémer

per sempre

si no ¿sensor Digital2 premut?

analògic 9 valor 255

si no analògic 9 valor 0

pcbS4A_01

Arduino 1 port: USB0

Analog0 628

Analog1 522

Analog2 519

Analog3 114

Analog4 1023

Analog5 1023

Digital2 true

Digital3 true

MADE IN ITALY

Arduino Duemilanove

www.arduino.cc

POWER ANALOG GND

5V GND 1 2 3 4 5

6 7 8 9 10 11 12 13 14 15 16

17 18 19 20 21 22 23 24 25 26 27 28 29 30

31 32 33 34 35 36 37 38 39 40

41 42 43 44 45 46 47 48 49 50

51 52 53 54 55 56 57 58 59 60

61 62 63 64 65 66 67 68 69 70

71 72 73 74 75 76 77 78 79 80

81 82 83 84 85 86 87 88 89 90

91 92 93 94 95 96 97 98 99 100

101 102 103 104 105 106 107 108 109 110

111 112 113 114 115 116 117 118 119 120

121 122 123 124 125 126 127 128 129 130

131 132 133 134 135 136 137 138 139 140

141 142 143 144 145 146 147 148 149 150

151 152 153 154 155 156 157 158 159 160

161 162 163 164 165 166 167 168 169 170

171 172 173 174 175 176 177 178 179 180

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581 582 583 584 585 586 587 588 589 590

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601 602 603 604 605 606 607 608 609 610

611 612 613 614 615 616 617 618 619 620

621 622 623 624 625 626 627 628 629 630

631 632 633 634 635 636 637 638 639 640

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651 652 653 654 655 656 657 658 659 660

661 662 663 664 665 666 667 668 669 670

671 672 673 674 675 676 677 678 679 680

681 682 683 684 685 686 687 688 689 690

691 692 693 694 695 696 697 698 699 700

701 702 703 704 705 706 707 708 709 710

711 712 713 714 715 716 717 718 719 720

721 722 723 724 725 726 727 728 729 730

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751 752 753 754 755 756 757 758 759 760

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961 962 963 964 965 966 967 968 969 970

971 972 973 974 975 976 977 978 979 980

981 982 983 984 985 986 987 988 989 990

991 992 993 994 995 996 997 998 999 1000

1001 1002 1003 1004 1005 1006 1007 1008 1009 1010

1011 1012 1013 1014 1015 1016 1017 1018 1019 1020

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1091 1092 1093 1094 1095 1096 1097 1098 1099 1100

1101 1102 1103 1104 1105 1106 1107 1108 1109 1110

1111 1112 1113 1114 1115 1116 1117 1118 1119 1120

1121 1122 1123 1124 1125 1126 1127 1128 1129 1130

1131 1132 1133 1134 1135 1136 1137 1138 1139 1140

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1151 1152 1153 1154 1155 1156 1157 1158 1159 1160

1161 1162 1163 1164 1165 1166 1167 1168 1169 1170

1171 1172 1173 1174 1175 1176 1177 1178 1179 1180

1181 1182 1183 1184 1185 1186 1187 1188 1189 1190

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2251 2252 2253 2254 2255 2256 2257 2258 2259 2260

2261 2262 2263 2264 2265 2266 2267 2268 2269 2270

2271 2272 2273 2274 2275 2276 2277 2278 2279 2280

2281 2282 2283 2284 2285 2286 2287 2288 2289 2290

2291 2292 2293 2294 2295 2296 2297 2298 2299 2300

2301 2302 2303 2304 2305 2306 2307 2308 2309 2310

2311 2312 2313 2314 2315 2316 2317 2318 2319 2320

2321 2322 2323 2324 2325 2326 2327 2328 2329 2330

2331 2332 2333 2334 2335 2336 2337 2338 2339 2340



Arduino i Raspberry Pi

Ús d'S4A

El microprogramari és el programari del maquinari

Català

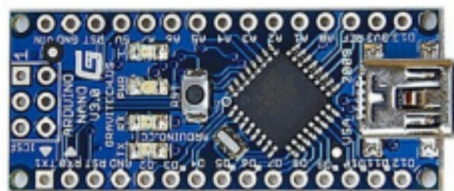
Programari
Maquinari
Microprogramari

Anglès

Software
Hardware
Firmware



Arduino Nano



The screenshot shows the Arduino IDE interface with the 'S4AFirmware16' sketch loaded. The code includes comments about version updates and pin structure changes. The status bar at the bottom indicates '1 Arduino Nano, ATmega328 on /dev/ttyUSB0'.

```

S4AFirmware16

// NEW IN VERSION 1.6c (by Jorge Gomez):
// Fixed variable type in pin structure: pin.state should be uint8_t
// Optimized speed of execution while receiving data from S4A

// NEW IN VERSION 1.6b (by Jorge Gomez):
// Added new structure arduinoPins to hold the pins info
// - This makes the code easier to read and modify (IMH)
// - Allows to change the type of pin more easily to me
// - Eliminates the need of having to deal with different pin types
// - By using an enum to hold all the possible output pins
// Changed all functions using old style pin access: conPin to pin
// Fixed possible overflow every 70 minutes (2e32 us) in digitalWrite
// Some minor coding style fixes
  
```

Microprogramari per l'Arduino per funcionar amb l'S4A :
<http://vps34736.ovh.net/S4A/S4AFirmware16.ino>



Arduino i Raspberry Pi

Ús d'S4A

The screenshot shows the Arduino IDE interface. In the foreground, a dialog box titled "Obre un sketch d'Arduino..." is open. It displays a list of sketches in the "S4AFirmware16" folder. The sketch "S4AFirmware16.ino" is selected, showing a size of 7,1 kB and a modification date of 06/10/15.

The background shows the Arduino IDE window titled "S4AFirmware16 | Arduino 2:1.0.5+dfsg2-4". The menu bar includes "Fitxer", "Edita", "Sketch", "Eines", and "Ajuda". The toolbar shows various icons for file operations and execution. The main text area displays code comments and function definitions:

```

6c (by Jorge Gomez):
type in pin structure: pin.state should be int, no
of execution while receiving data from computer i

6b (by Jorge Gomez):
are arduinoPins to hold the pins information:
e code easier to read and modify (IMHO)
ge the type of pin more easily to meet non stand
e need of having to deal with different kind of i
um to hold all the possible output pin states th
tions using old style pin access: configurePins()
erflow every 70 minutes (2e32 us) in pulse() whi
style fixes

6a (by Jorge Gomez):
ty with Arduino Leonardo by avoiding the use of
optimized:
machine for reading the two bytes of the S4A mes
r() is only called if the state is changed
ization
ts of code
global variables
  
```

At the bottom of the IDE window, the status bar indicates "Arduino Nano w/ ATmega328 on /dev/ttyUSB0".



Arduino i Raspberry Pi

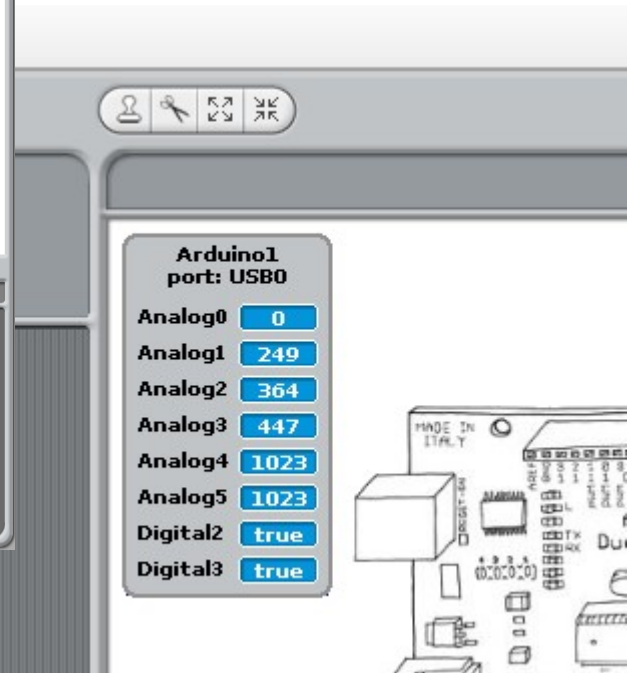
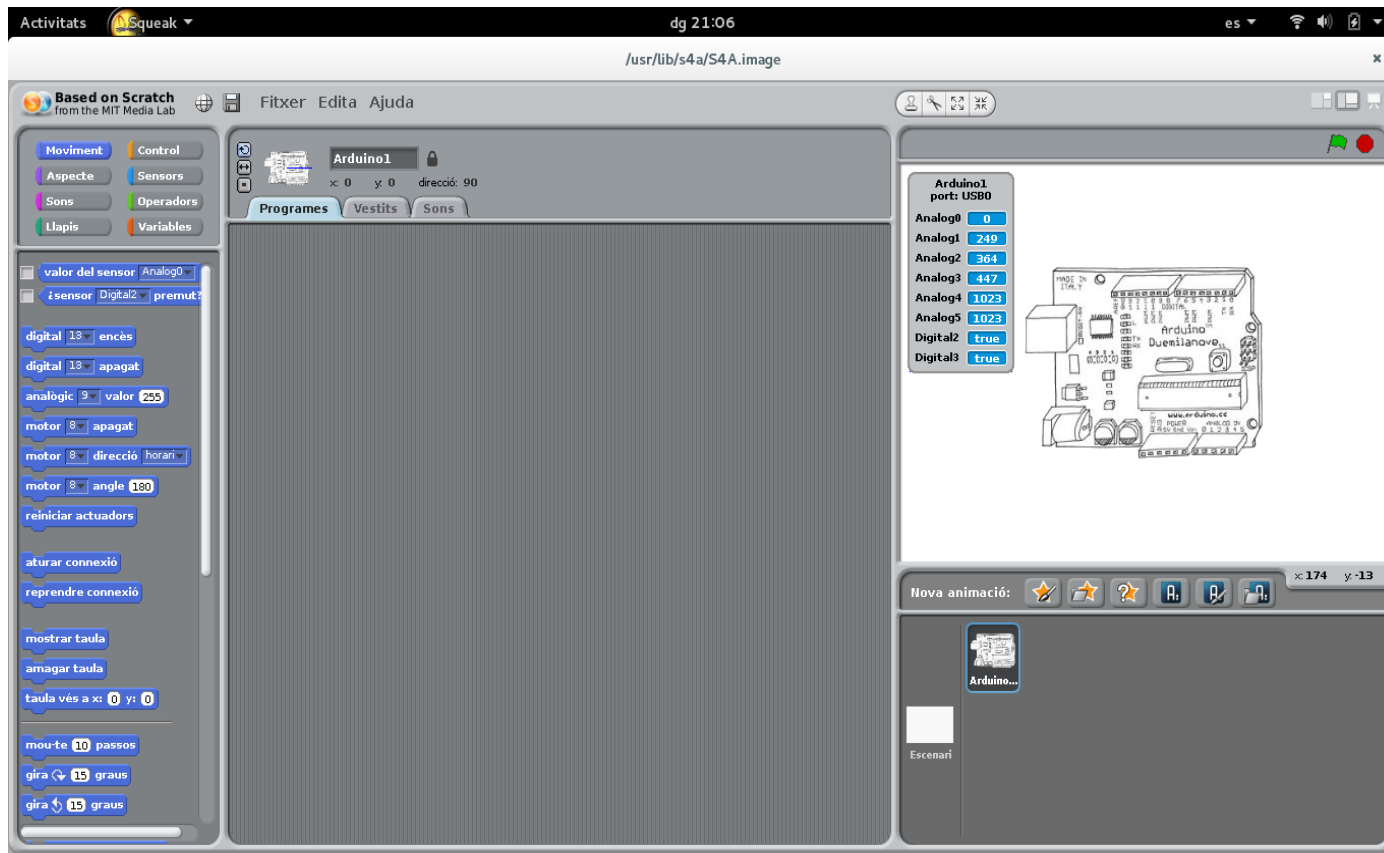
Ús d'S4A



Connecteu la placa S4A PLB al vostre ordinador i premeu la supertecla (botó amb la icona d'una finestra a l'esquerra de la barra espaciadora) i després escriviu S4A i ho seleccioneu amb el ratolí.

Arduino i Raspberry Pi

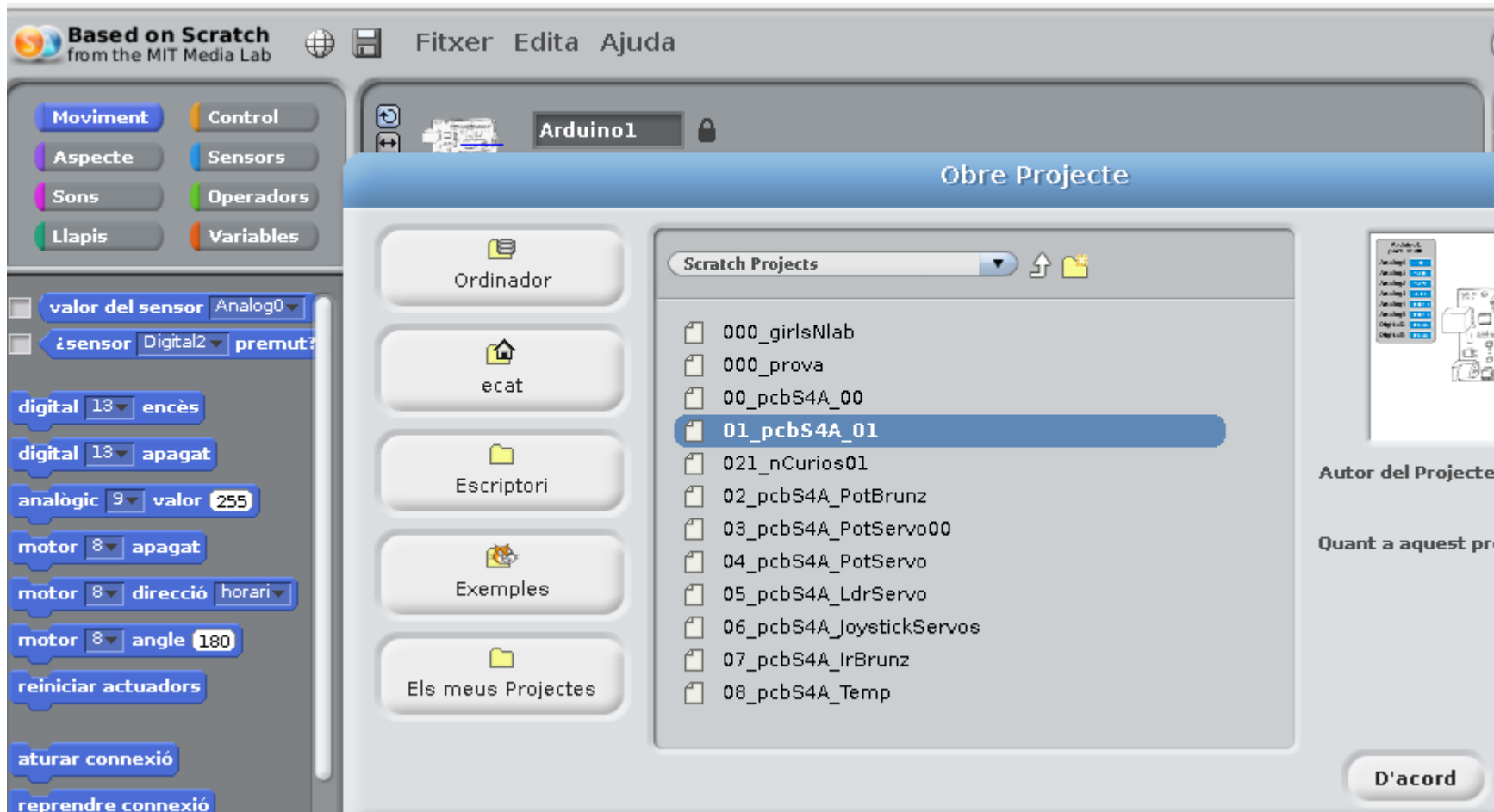
Ús d'S4A



Un cop es detecta la placa, apareixen nombres que es van movent al panell d'entrades analògiques i digitals.

Arduino i Raspberry Pi

Ús d'S4A



Obriu l'arxiu 01_pcbS4A_01

Arduino i Raspberry Pi

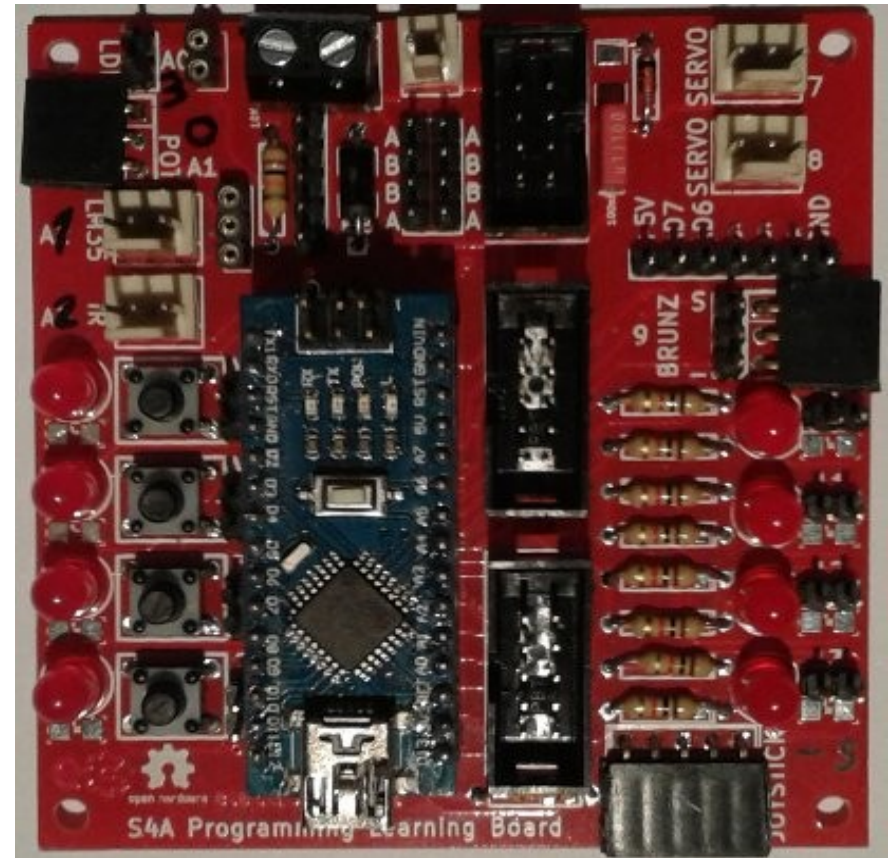
Ús d'S4A



Us apareixerà un programa com aquest

Arduino i Raspberry Pi

Ús d'S4A



A5
A4
3
2

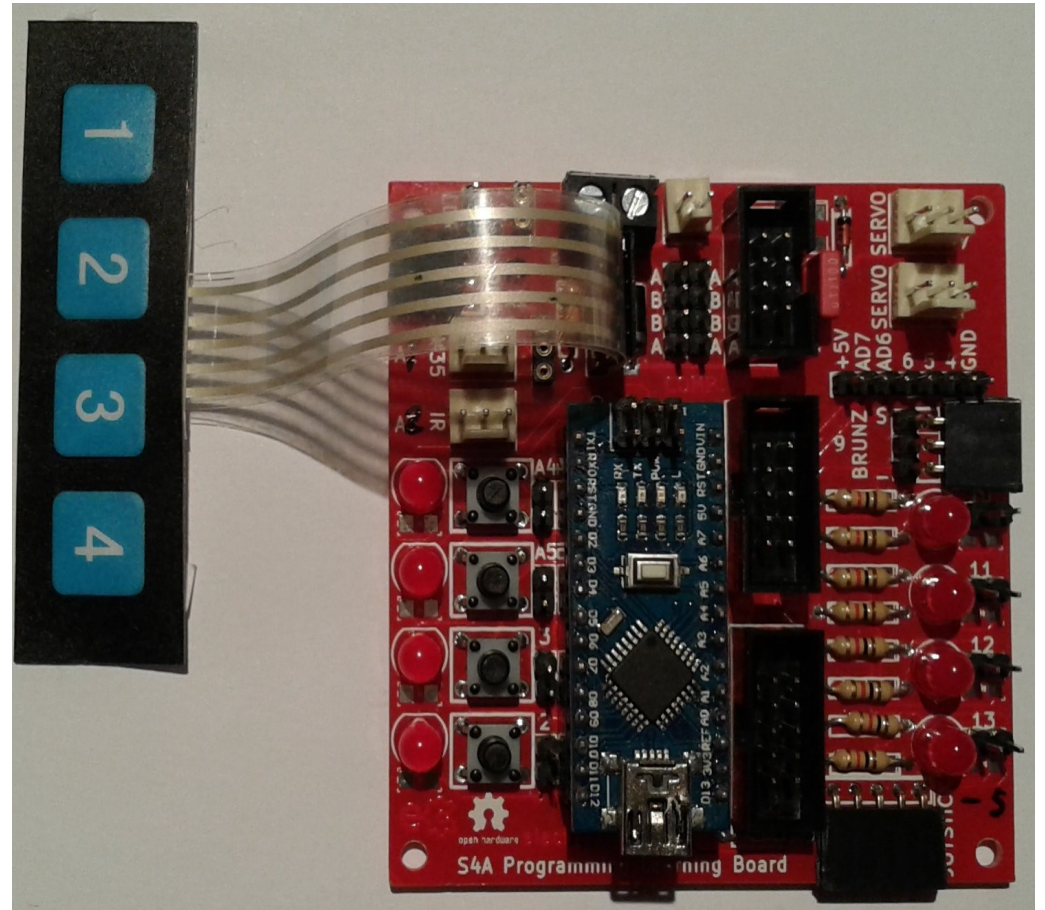
10
11
12
13

Premeu la bandera verda de l'S4A
I després premeu els botons de la placa



Arduino i Raspberry Pi

Ús d'S4A

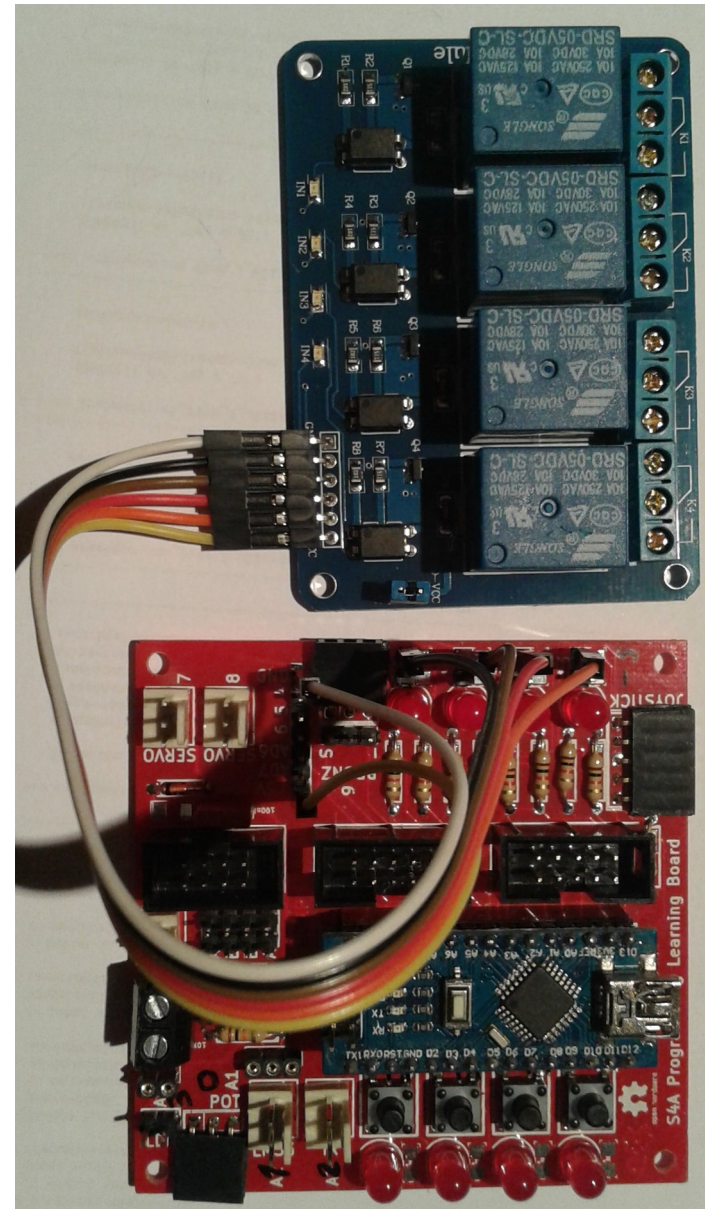
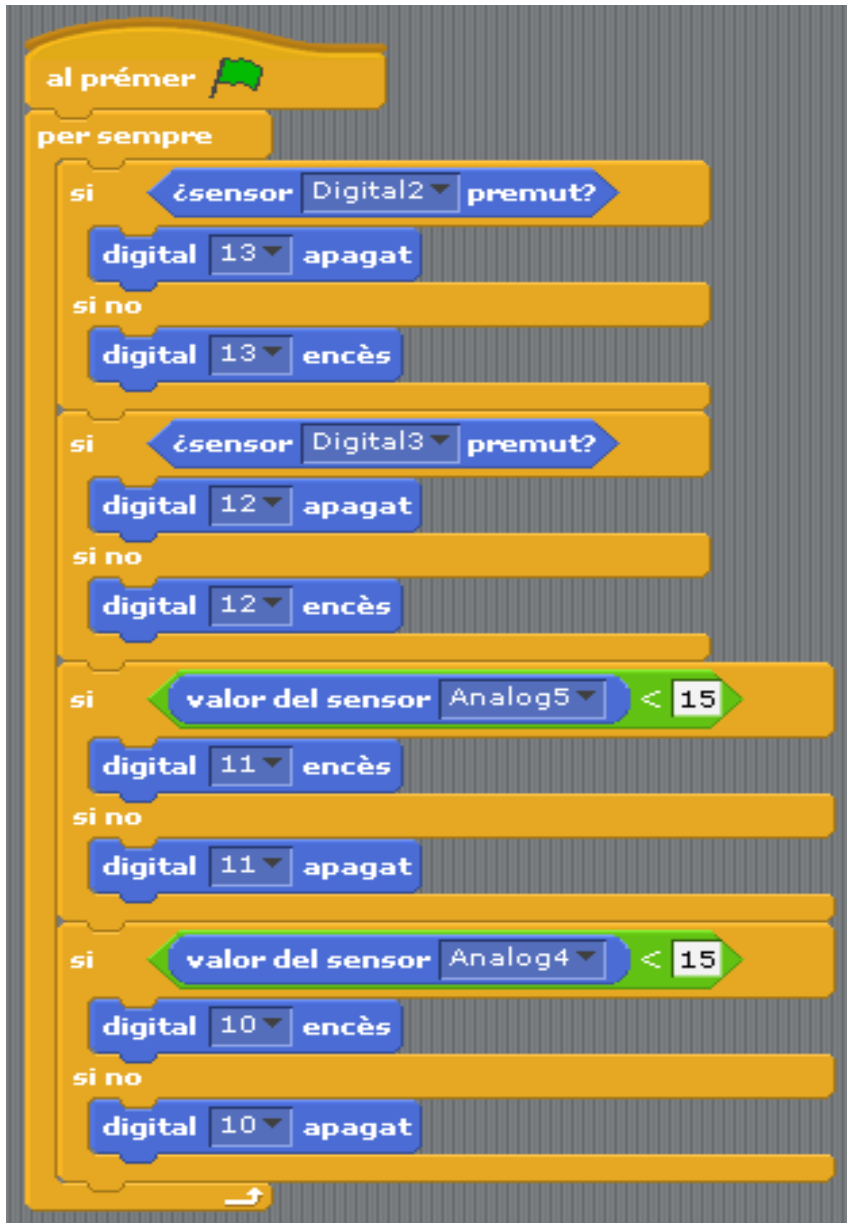


Connecteu el teclat de membrana. Torneu
A prémer la bandera verda de l'S4A
i després premeu els botons del nou teclat.

Potser haureu de canviar el número 15 per un
altre de superior.

Arduino i Raspberry Pi

Ús d'S4A





Arduino i Raspberry Pi

Com funciona un relé

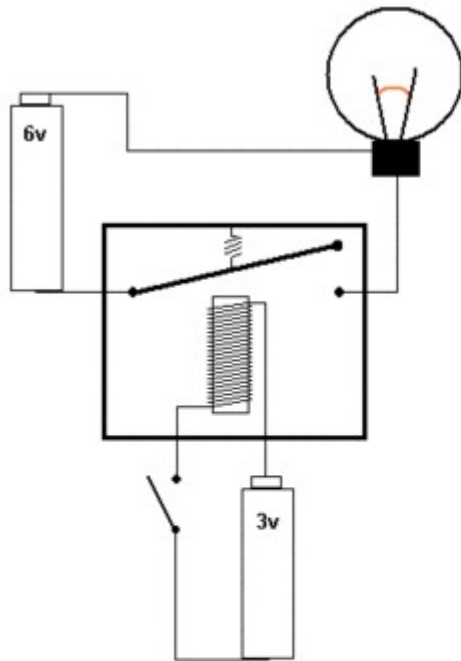


Figure 1: Relay off

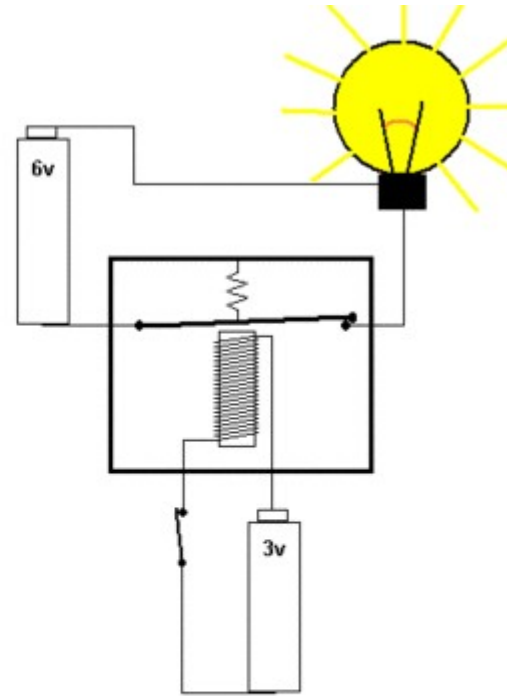
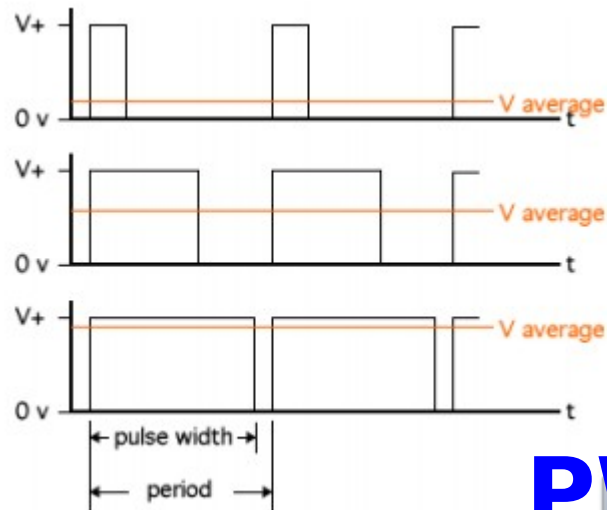


Figure 2: Relay on



Arduino i Raspberry Pi

Ús d'S4A - El brunzidor



A4

A5

3

2

PWM

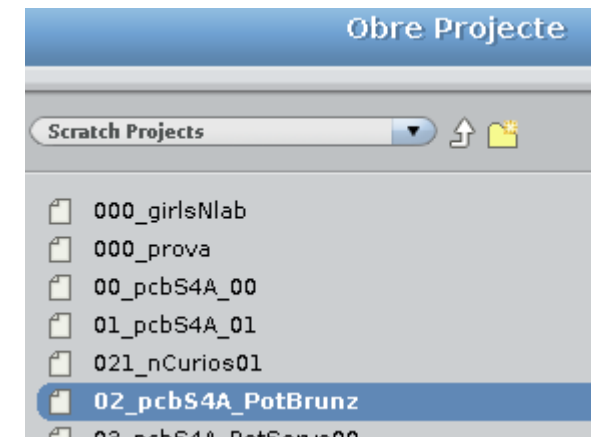
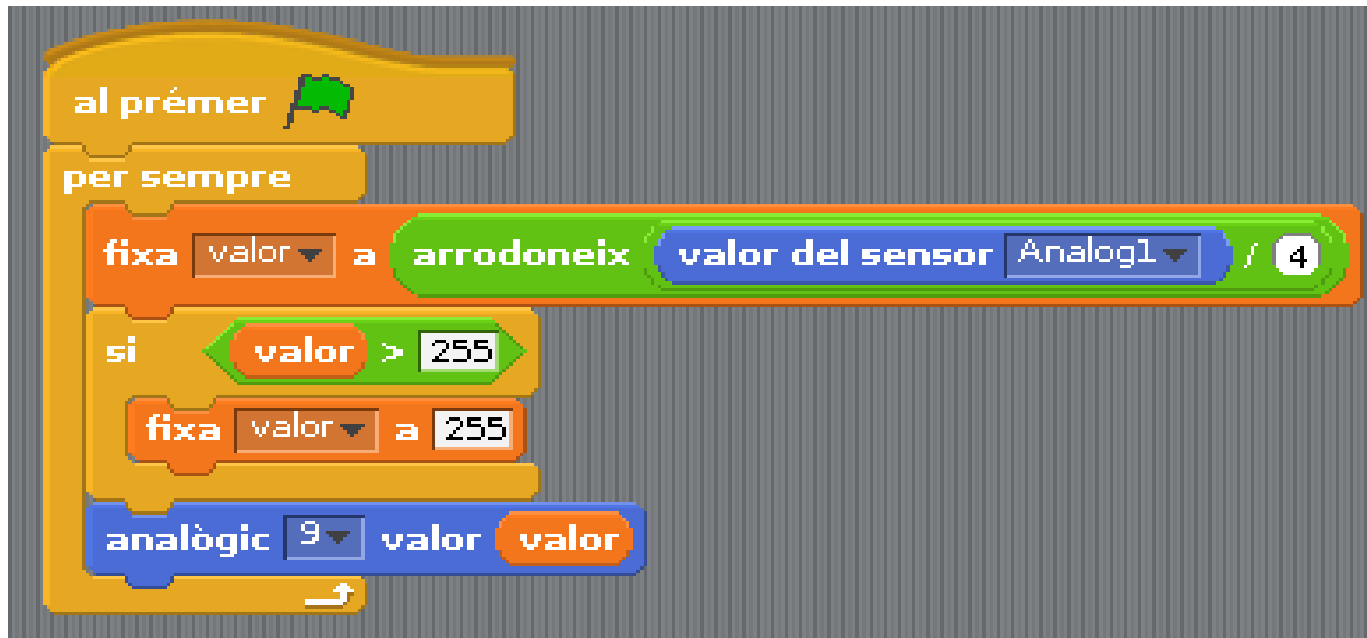


9



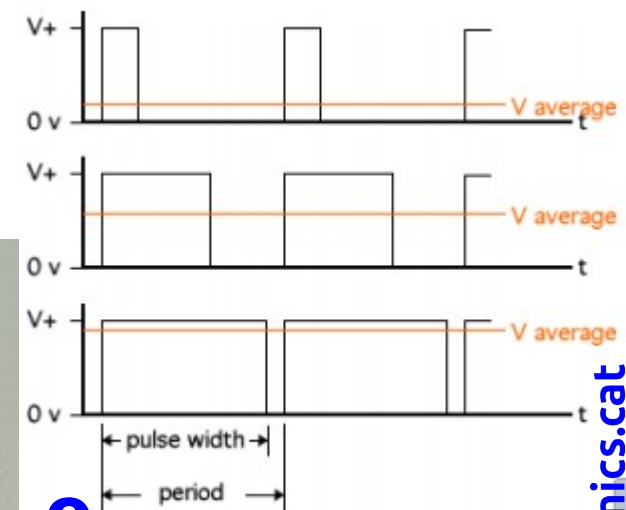
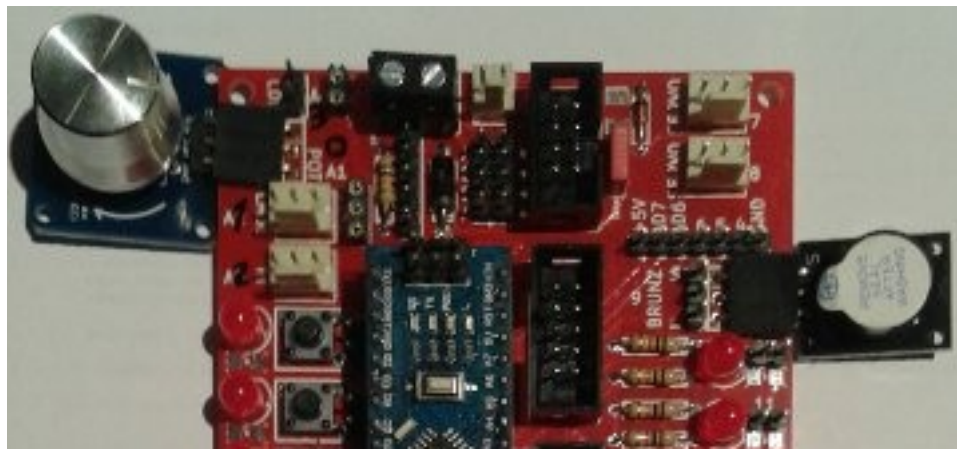
Arduino i Raspberry Pi

Ús d'S4A - Potenciòmetre i brunzidor



Verifiquen que està seleccionat Analog1 i no Analog0

A1



9



Arduino i Raspberry Pi

Ús d'Snap for Arduino

Per a l'Snap for Arduino i l'Scratch 2.0 offline
el microprogramari
és el Firmata estàndar

Català

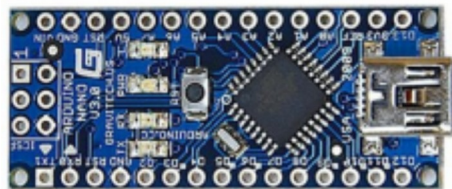
Anglès

Programari
Maquinari
Microprogramari

Software
Hardware
Firmware



Arduino Nano



```
StandardFirmata | Arduino 2:1.0.5+dfsg2-4
Fitxer Edita Sketch Eines Ajuda
StandardFirmata
* any host computer software package.
*
* To download a host software package, please click on the following
* to open the download page in your default browser.
*
* http://firmata.org/wiki/Download
*/

/*
Copyright (C) 2006-2008 Hans-Christoph Steiner. All rights reserved.
Copyright (C) 2010-2011 Paul Stoffregen. All rights reserved.
Copyright (C) 2009 Shigeru Kobayashi. All rights reserved.
Copyright (C) 2009-2011 Jeff Hoefs. All rights reserved.

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modify it under the terms of the GNU Lesser General Public
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version 2.1 of the License, or (at your option) any later version.

See file LICENSE.txt for further informations on licensing terms.

formatted using the GNU C formatting and indenting
Guardat enllestit.
1 Arduino Nano w/ ATmega328 on /dev/ttyUSB0
```

Microprogramari per l'Arduino per funcionar amb l'Snap for Arduino i l'Scratch 2 Offline:
<http://binefa.cat/php/training/s4a/StandardFirmata.tar.gz>



Arduino i Raspberry Pi

Ús d'Snap for Arduino

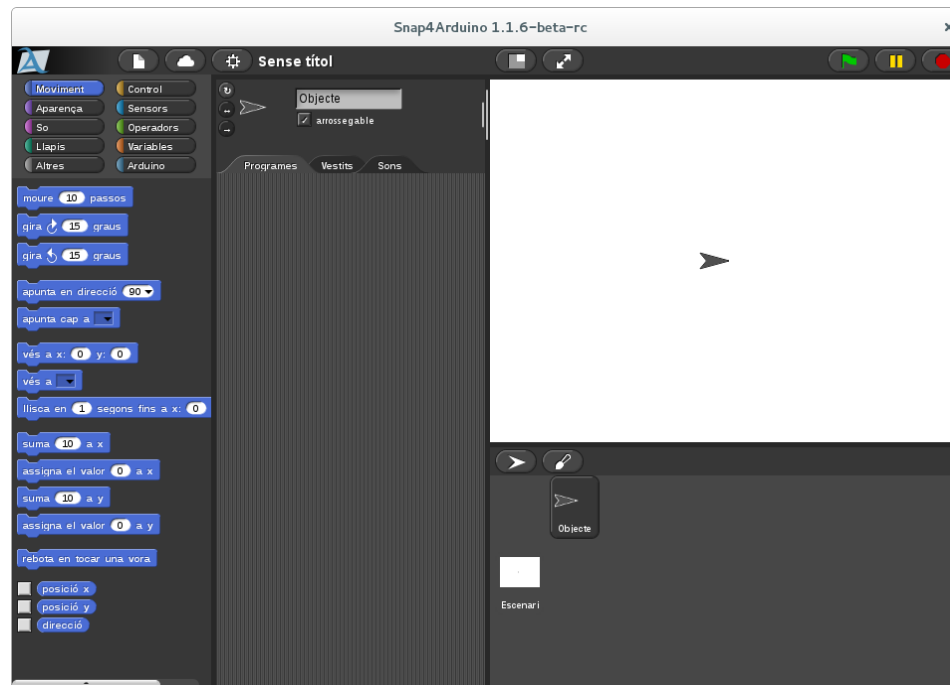
Feu la crida a Snap for Arduino des del terminal:

```
ecat@debian8: ~/Snap4Arduino
```

```
Fitxer  Edita  Visualitza  Cerca  Terminal  Ajuda
```

```
ecat@debian8:~$ cd /home/ecat/Snap4Arduino
```

```
ecat@debian8:~/Snap4Arduino$ ./Snap4Arduino
```





Arduino i Raspberry Pi

Ús d'Snap for Arduino

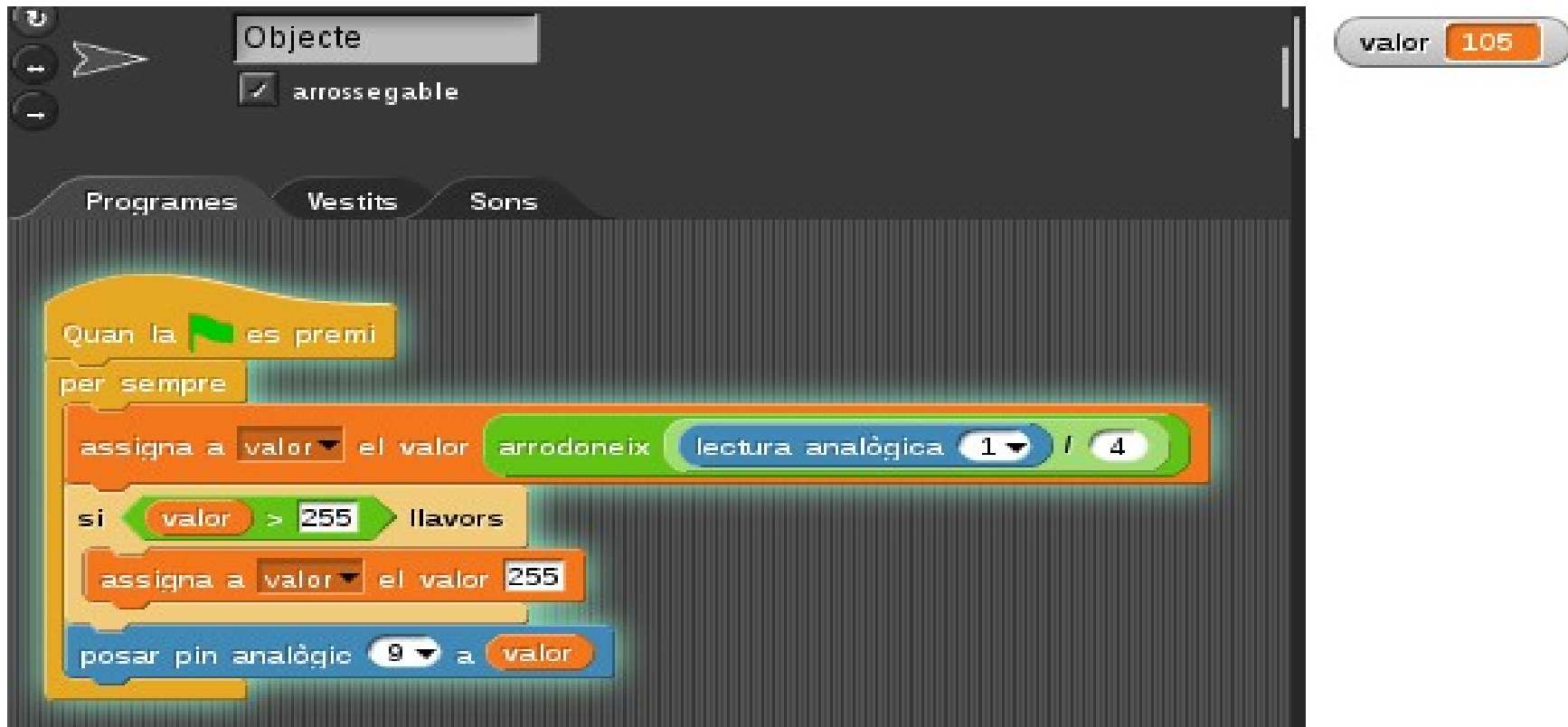


Assegureu-vos d'haver programat l'Arduino amb el programari del protocol Firmata estàndar. Quan connecteu l'Arduino seleccioneu el port `/dev/ttyUSB0`.



Arduino i Raspberry Pi

Ús d'Snap for Arduino



La sortida PWM la interpreta com a sortida analògica



Arduino i Raspberry Pi

Ús d'Snap for Arduino

Exercici

Implementeu a l'Snap for Arduino el control dels 4 relés des dels quatre botons del teclat de membrana i feu que soni el bronzidor quan es premen alhora els botons connectats a les entrades digital 2 i 3.



Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

Per a l'Snap for Arduino i l'Scratch 2.0 offline
el microprogramari
és el Firmata estàndar

Català

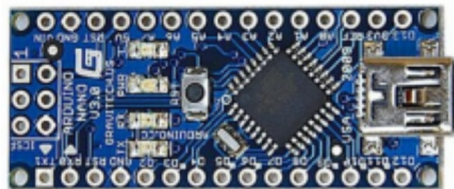
Anglès

Programari
Maquinari
Microprogramari

Software
Hardware
Firmware



Arduino Nano



Per tant, si ja l'heu programat per a l'Snap for Arduino **no cal** tornar-ho a **reprogramar**

Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

s2aio

<https://github.com/MrYsLab/s2aio/wiki>

The Arduino Hardware Extension For Snap! and the Scratch 2.0 Offline Editor



s2a_fm

Previous version of ***s2aio***

https://github.com/MrYsLab/s2a_fm



Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

```

ecat@debian8: ~/Baixades/scratch/s2a_fm-master
Fitxer  Edita  Visualitza  Cerca  Terminal  Ajuda

Could not instantiate PyMata - is your Arduino plugged in?
ecat@debian8:~/Baixades/scratch/s2a_fm-master$ ./s2a_fm.py /dev/ttyUSB0
s2a_fm version 1.5  Copyright(C) 2013-14 Alan Yorinks  All Rights Reserved

Python Version 2.7.9 (default, Mar 1 2015,
[GCC 4.9.2])

PyMata version 2.12  Copyright(C) 2013-16 Alan Yorinks

Opening Arduino Serial port /dev/ttyUSB0

Please wait while Arduino is being detected.
Board initialized in 0 seconds
Total Number of Pins Detected = 22
Total Number of Analog Pins Detected = 8
Please wait for Total Arduino Pin Discovery
additional seconds.
Arduino Total Pin Discovery completed in 0 seconds
Starting HTTP Server!
Use <Ctrl-C> to exit the extension

Please start Scratch or Snap!
Scratch detected! Ready to rock and roll...

```

A un terminal:

```

$ cd /home/ecat/prg/s2a_fm-master
$ ./s2a_fm.py /dev/ttyUSB0

```

A un altre terminal:

```

$ cd /home/ecat/prg
$ ./Scratch2

```

https://github.com/MrYsLab/s2a_fm

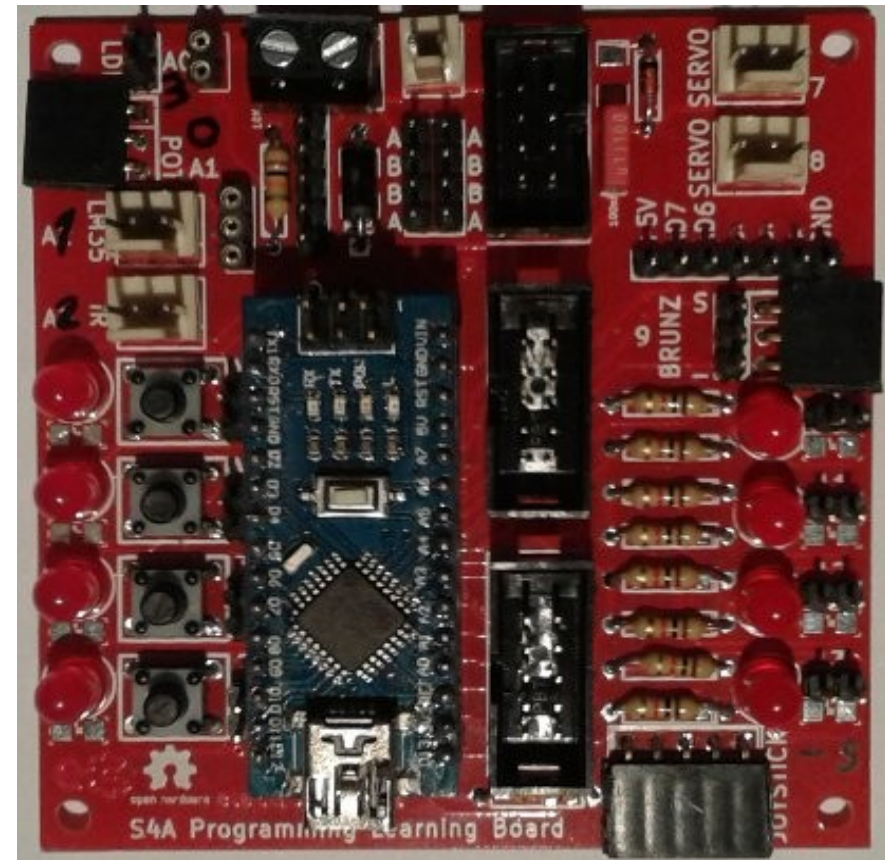
Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

sc2_prova00.sb2



A4
A5
3
2



10
11
12
13

A diferència dels programes anteriors, cal configurar si les pines són entrades o sortides.

Per a fer un programa des de zero cal carregar l'extensió de maquinari s2a_fm.s2e

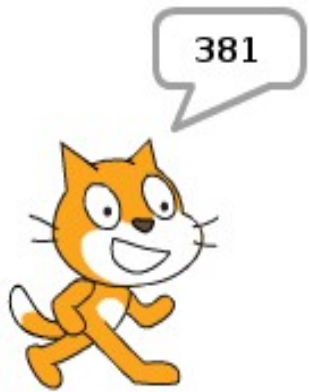
<http://binefa.cat/php/training/s4a/codi.tar.gz>



Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

Ús del potenciòmetre



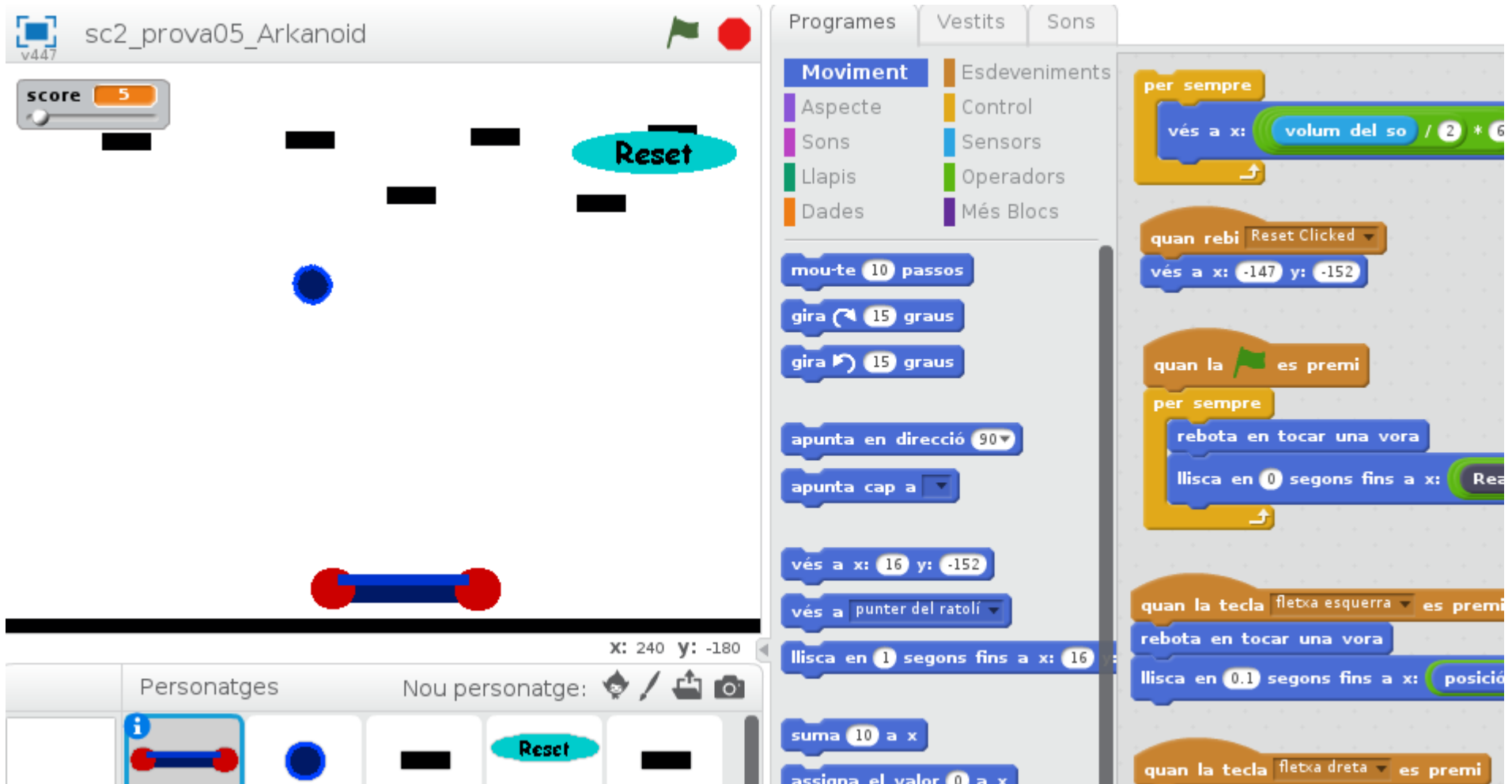
Obriu el programa sc2_prova04_potA1.sb2

<http://binefa.cat/php/training/s4a/codi.tar.gz>

Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

sc2_prova05_Arkanoid.sb2

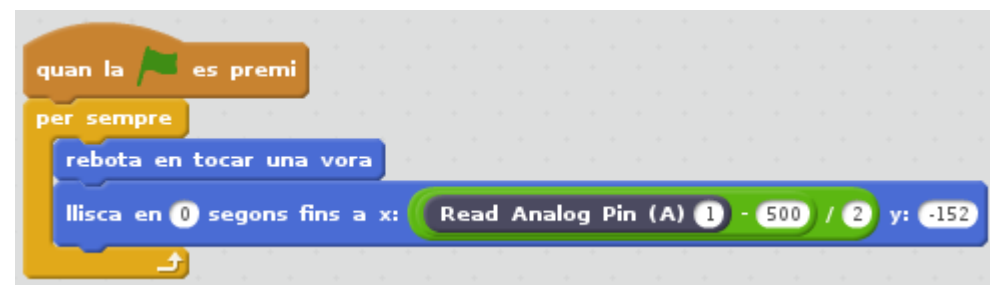
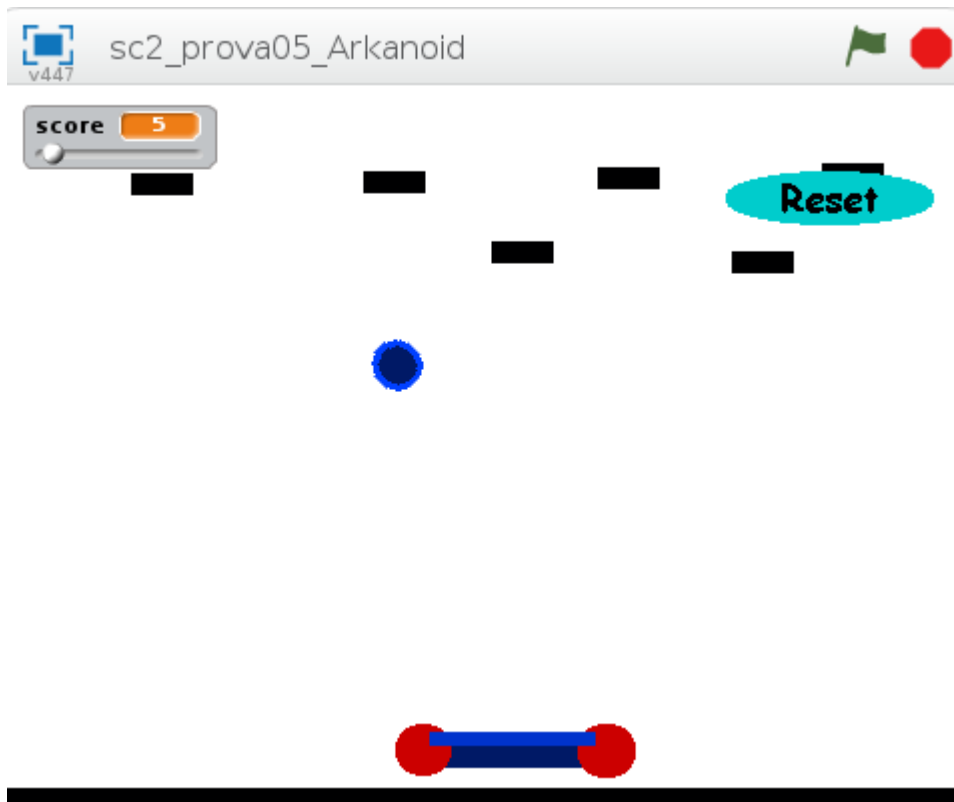


<http://binefa.cat/php/training/s4a/codi.tar.gz>

Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

sc2_prova05_Arkanoid.sb2

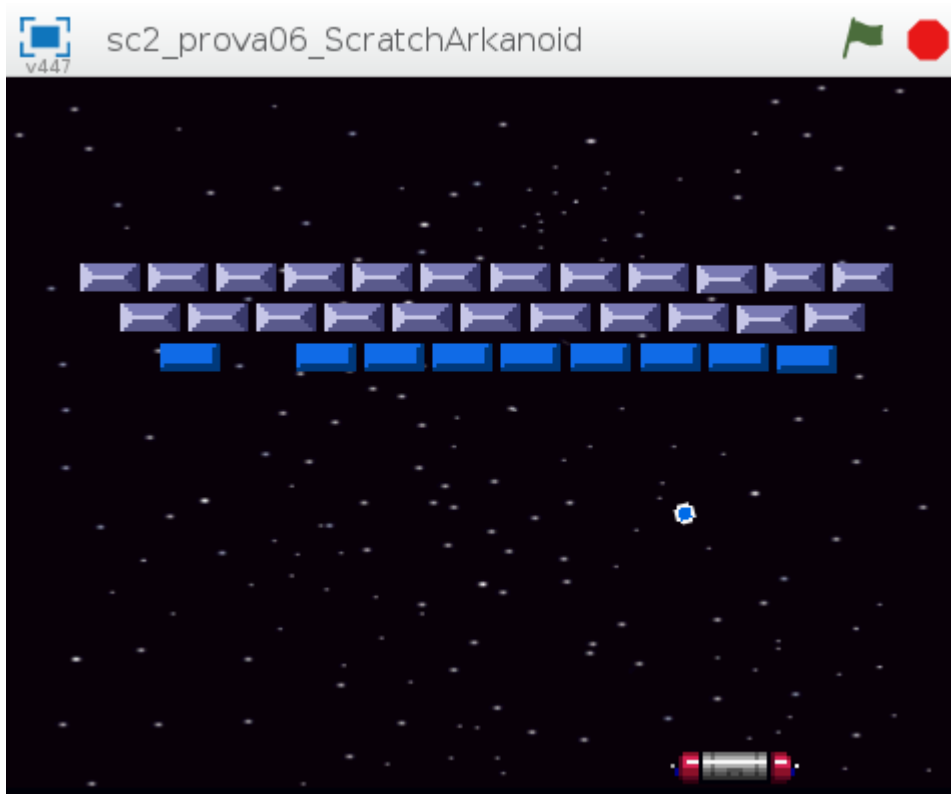




Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

sc2_prova06_ScratchArkanoid.sb2



Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

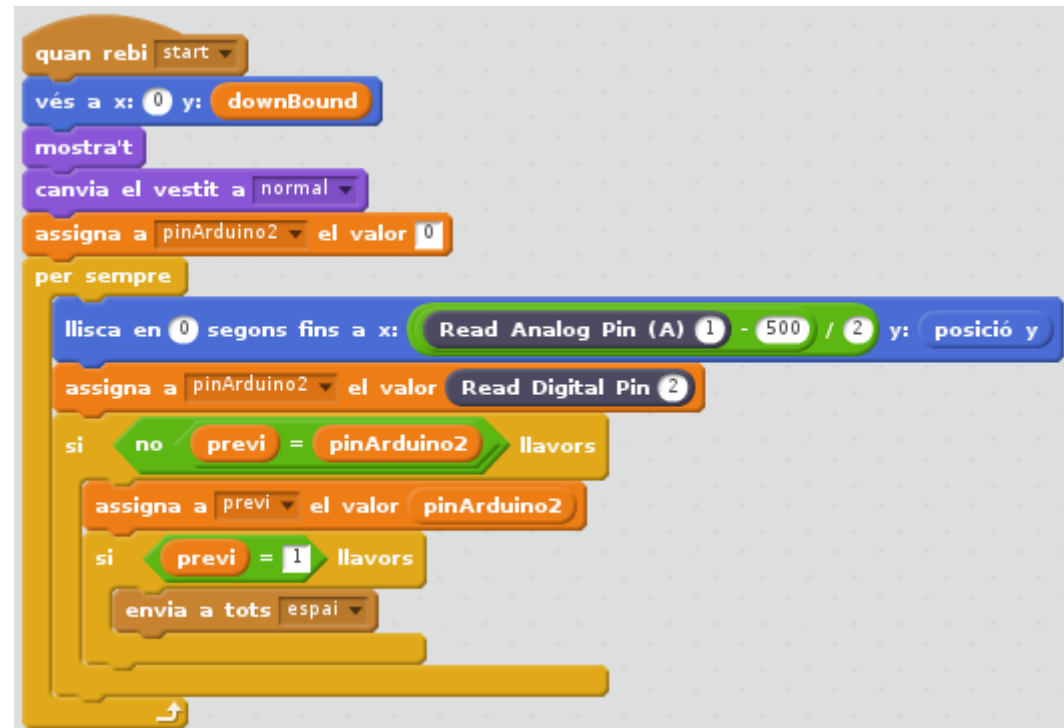
sc2_prova07_SpaceInvaders1.4.sb2



Podeu activar el volum.

Es fa servir el potenciòmetre A1 per a moure la nau i el botó 2 per a disparar.

<http://binefa.cat/php/training/s4a/codi.tar.gz>



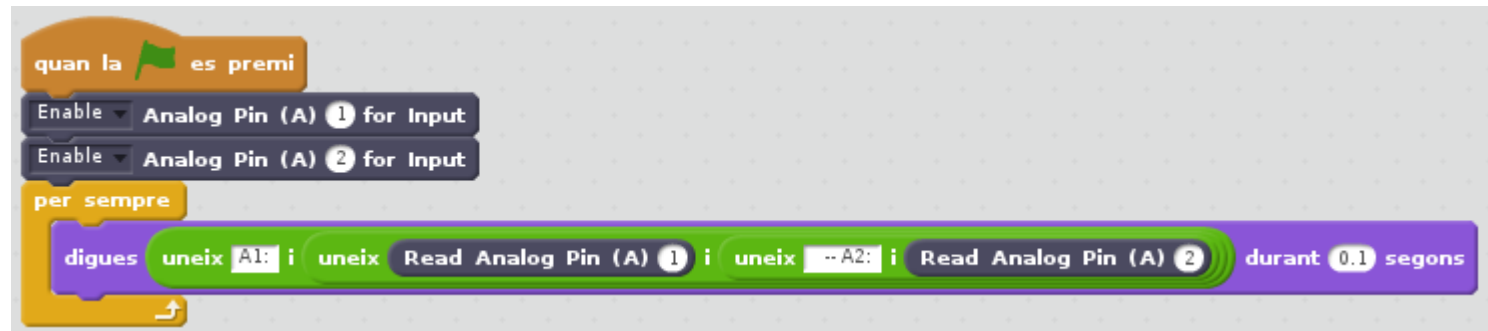
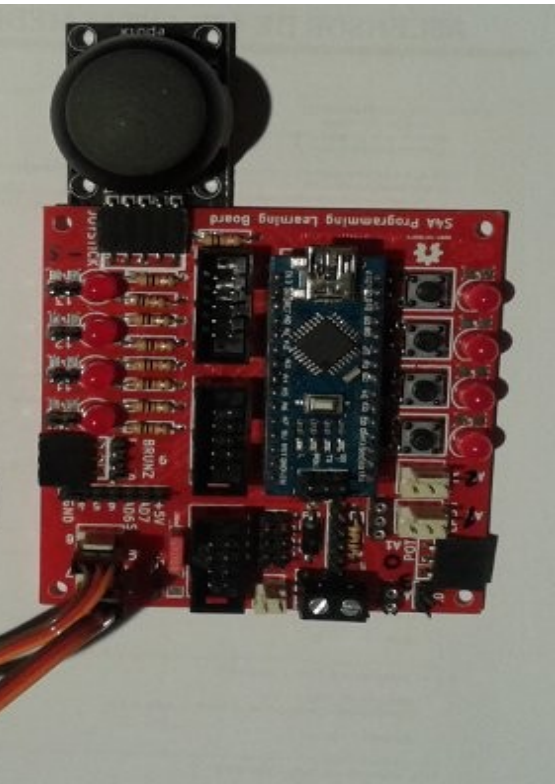


Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

Ús del joystick

sc2_prova08_JoystickA1A2.sb2



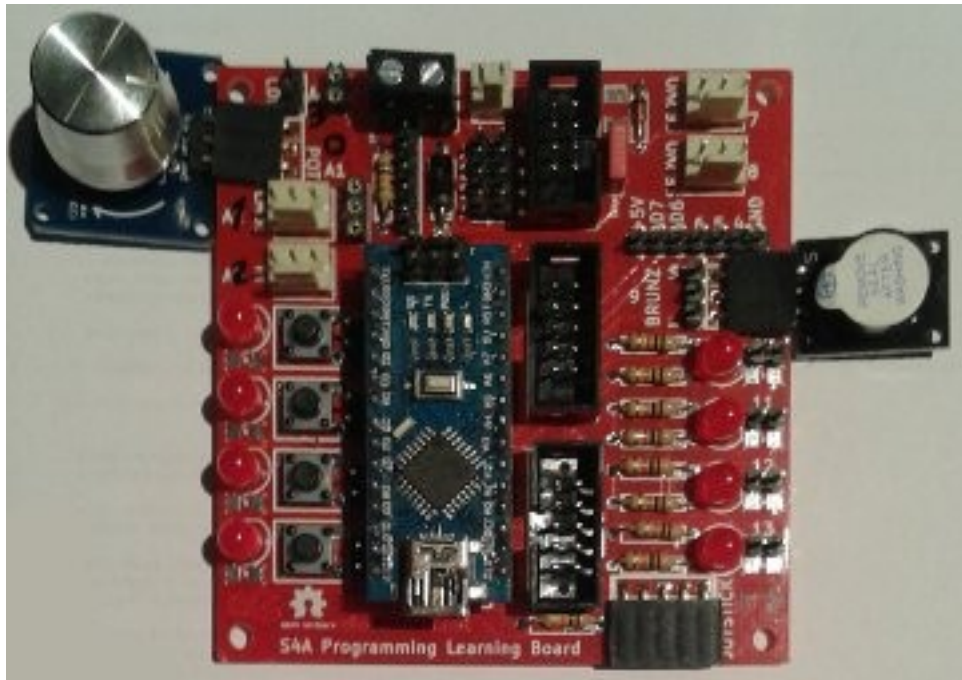
<http://binefa.cat/php/training/s4a/codi.tar.gz>



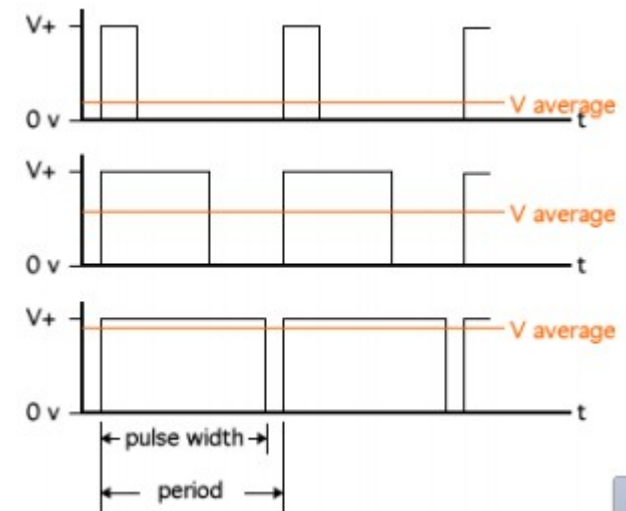
Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

sc2_prova09_potA1brunz.sb2

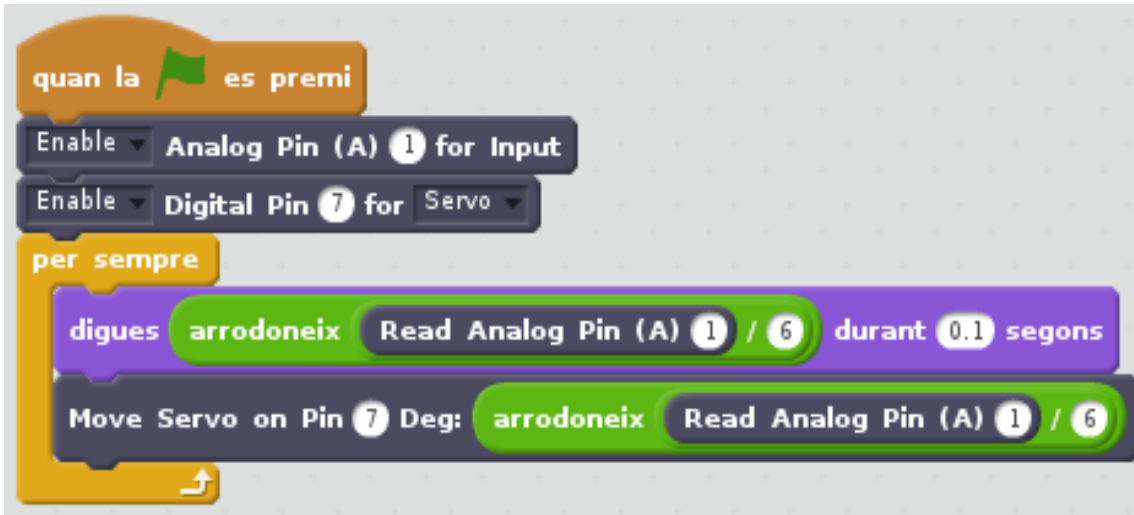


9



Arduino i Raspberry Pi

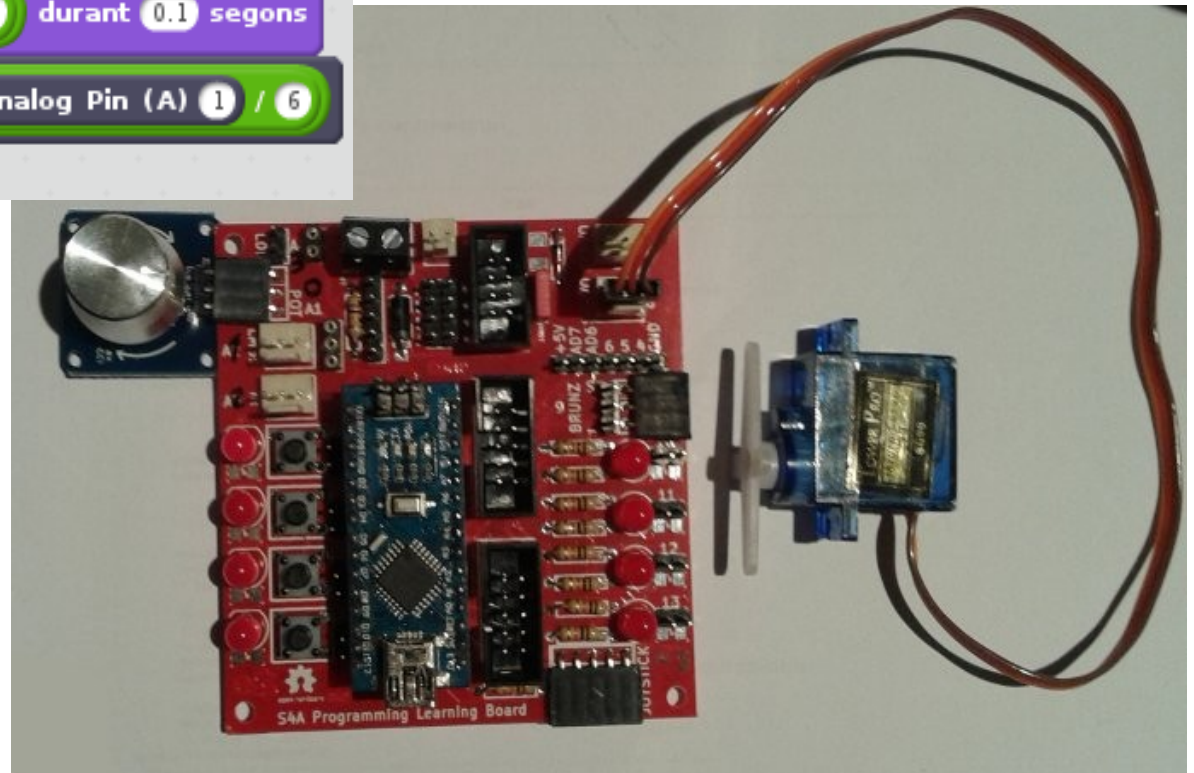
Ús d'Scratch 2.0 offline



sc2_prova10_potA1_servo7.sb2

Ús del servomotor (servo)

Abans de connectar el servo atureu
El programa en Python i l'Scratch.



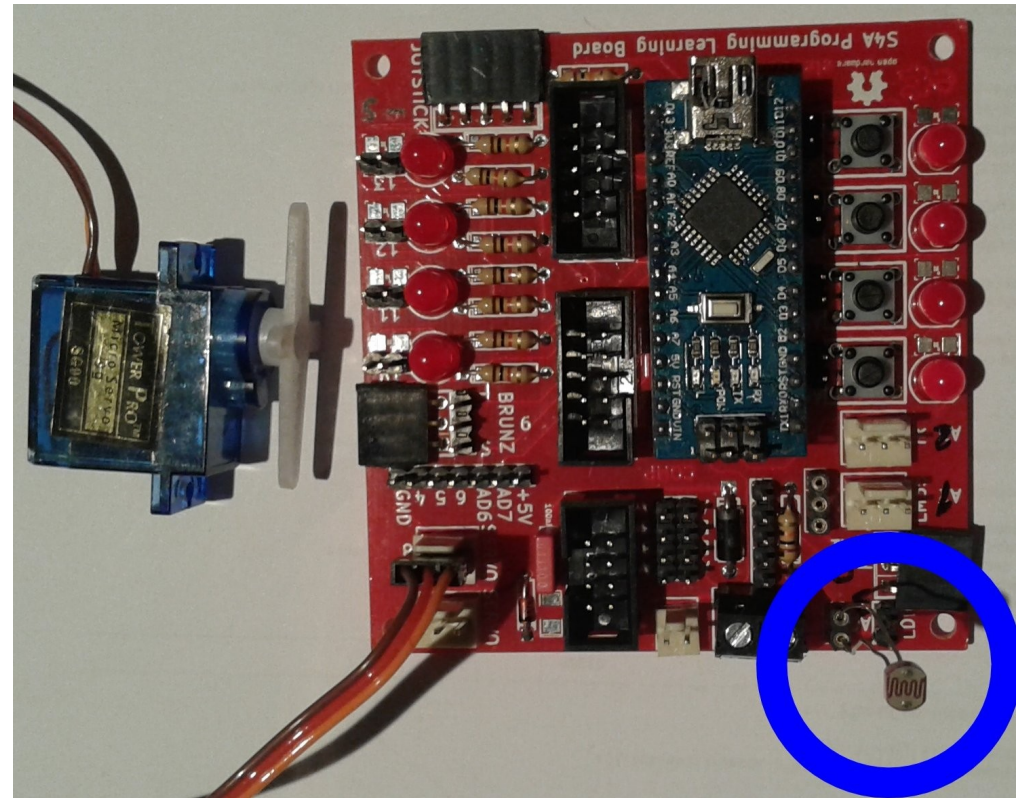
<http://binefa.cat/php/training/s4a/codi.tar.gz>

Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

Ús del fotoresistor (LDR)

sc2_prova11_ldrA0_servo7.sb2



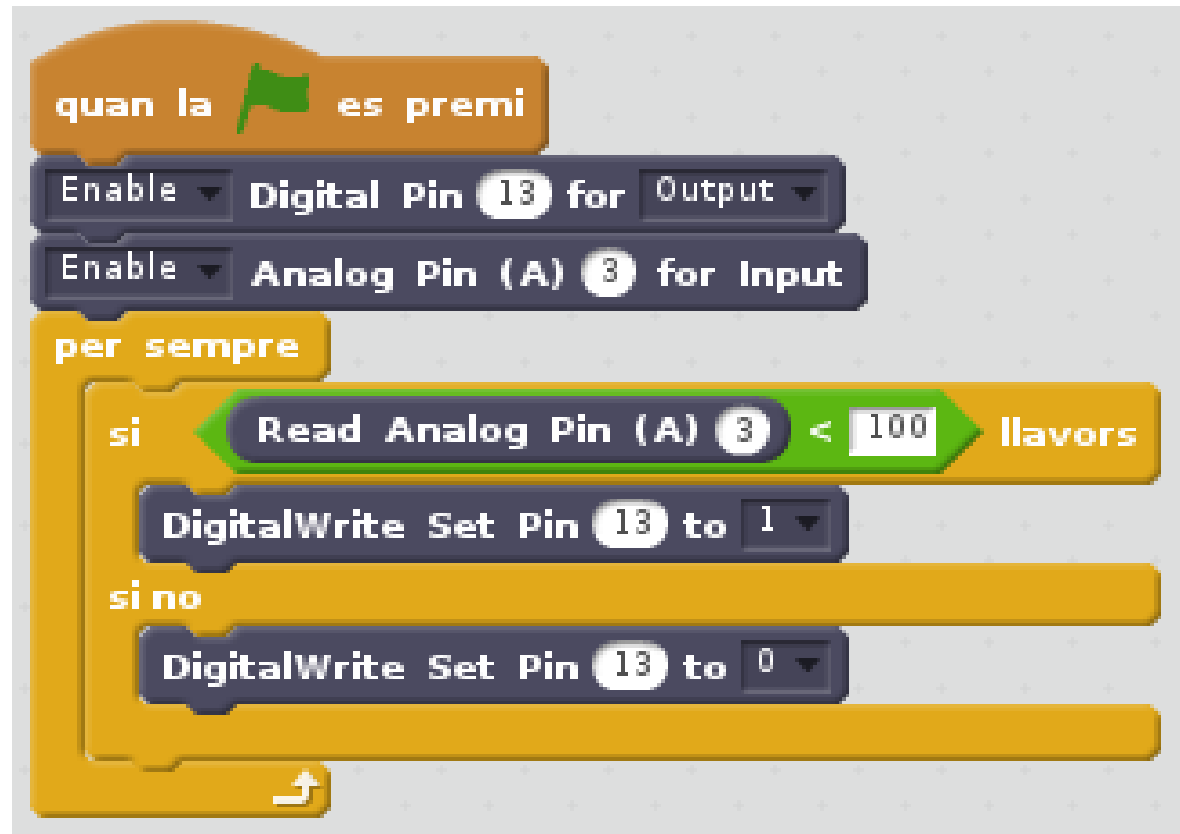
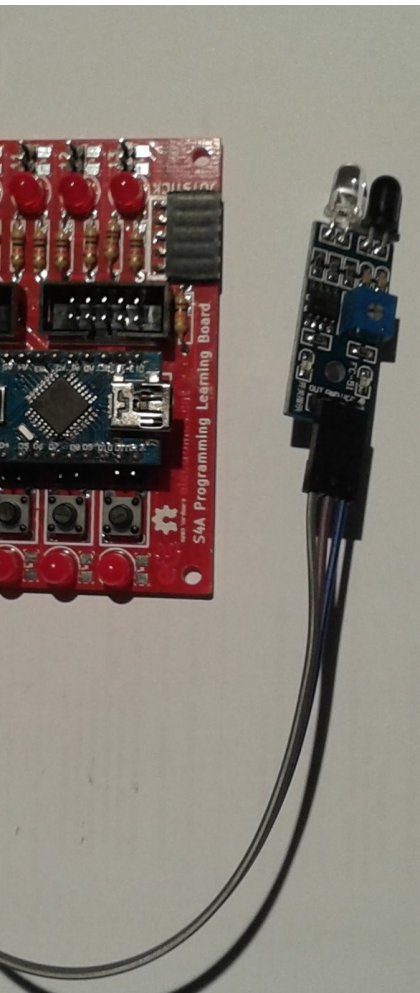
<http://binefa.cat/php/training/s4a/codi.tar.gz>



Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

sc2_prova12irRelay.sb2

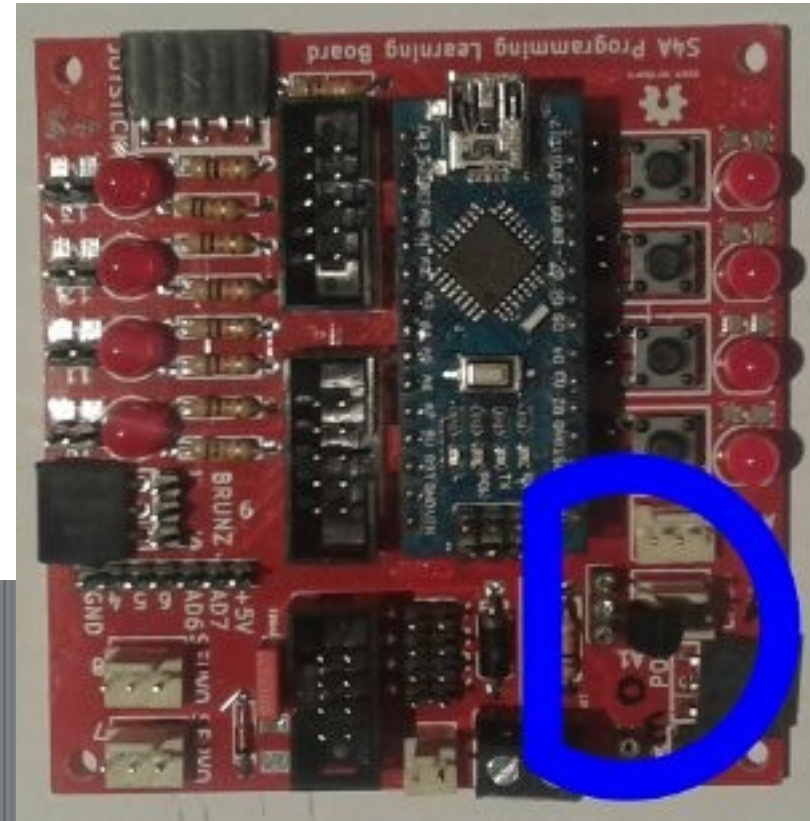


<http://binefa.cat/php/training/s4a/codi.tar.gz>

Arduino i Raspberry Pi

Ús d'Scratch 2.0 offline

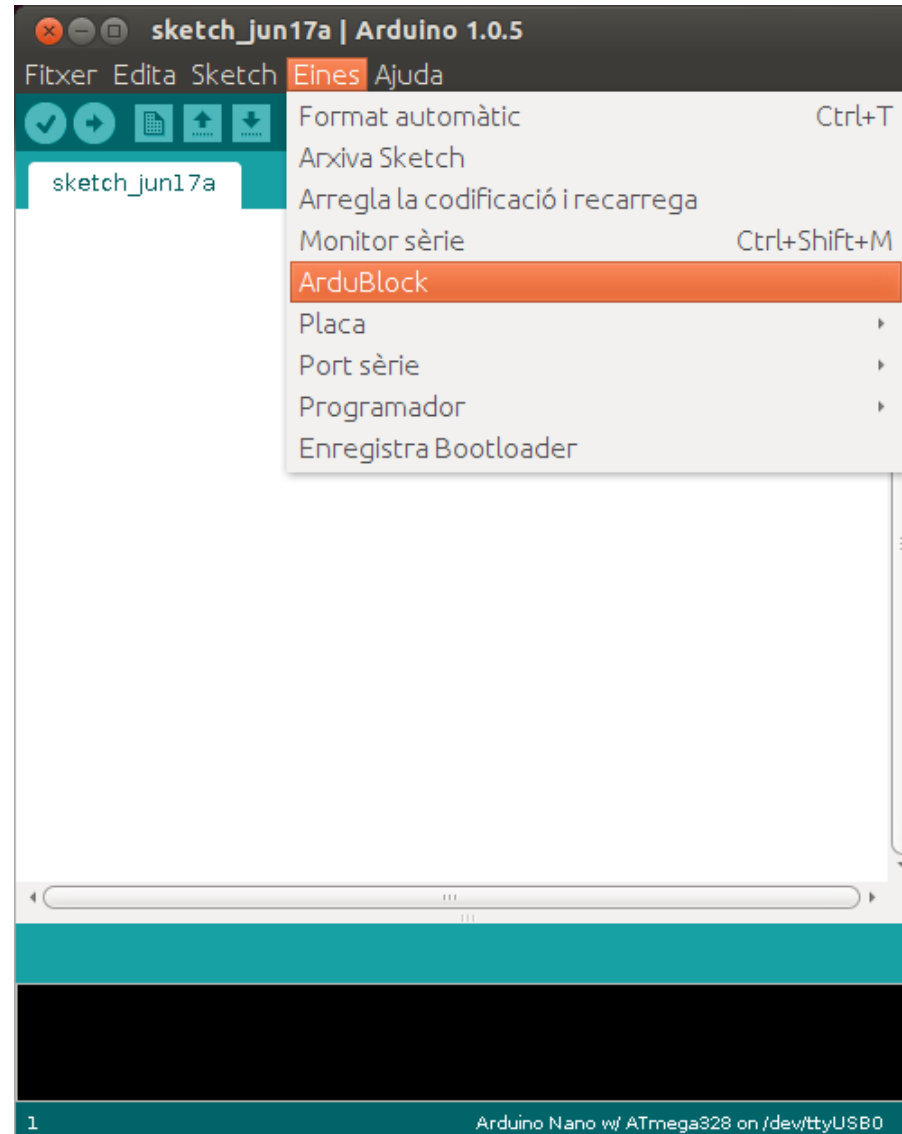
Exercici: Implementeu aquest codi en Scratch 2.0





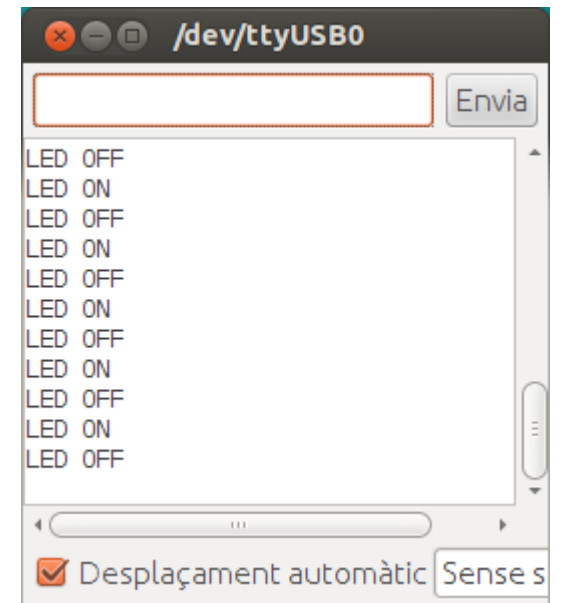
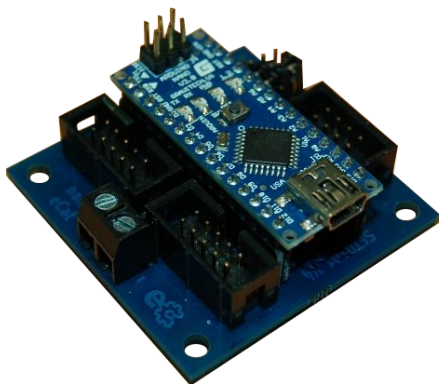
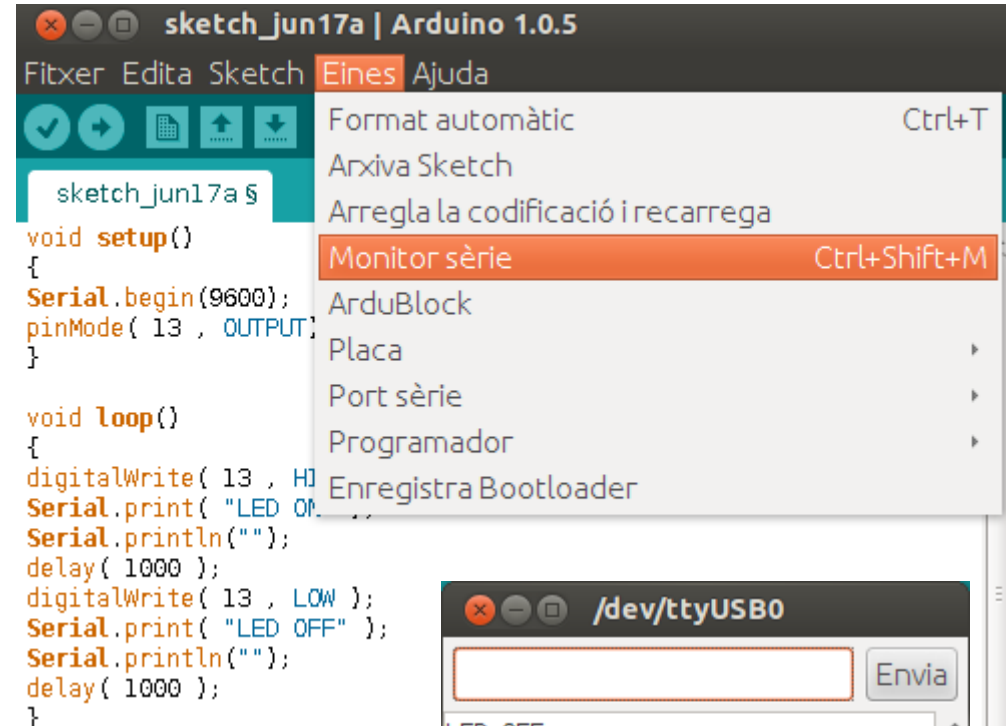
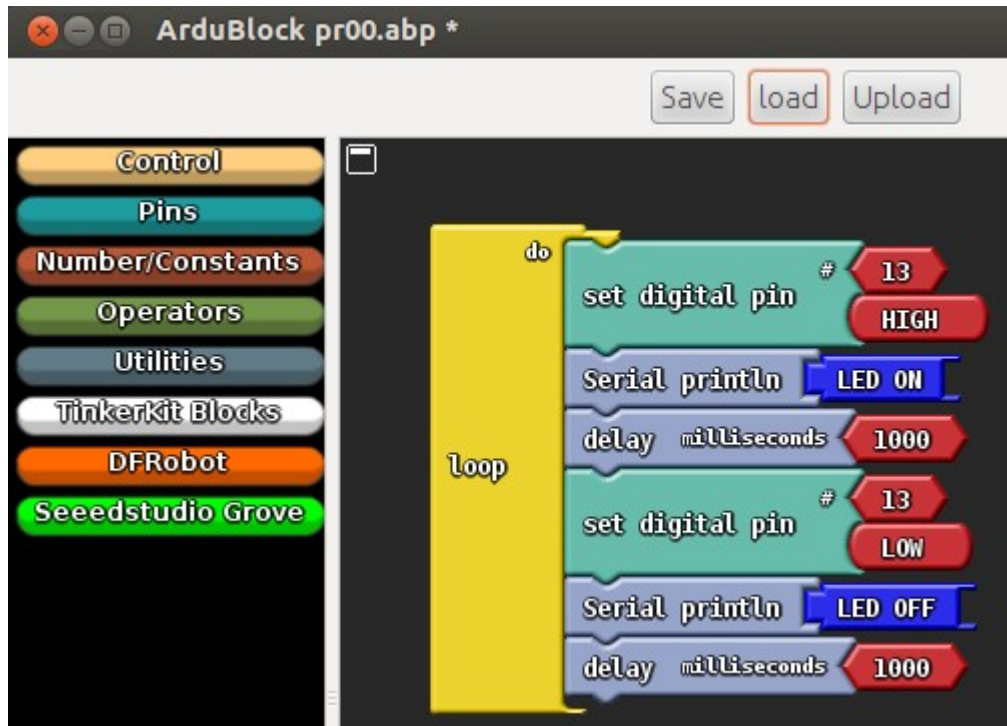
Arduino i Raspberry Pi

Ús d'ArduBlock



Arduino i Raspberry Pi

pr00.abp - Sortides digitals

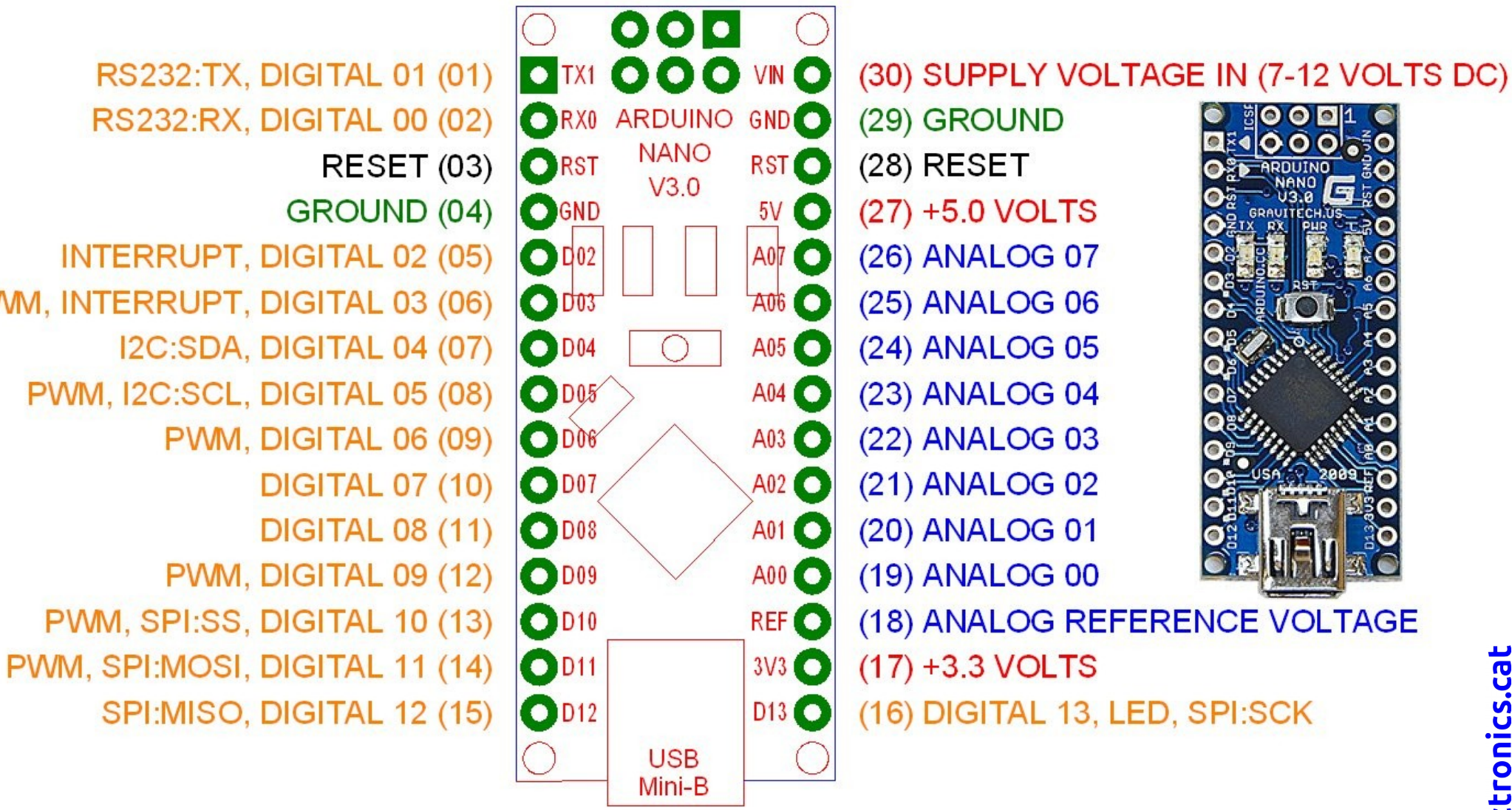


<http://www.binefa.cat/php/arduino/ardublock/pr00.abp>



Arduino i Raspberry Pi

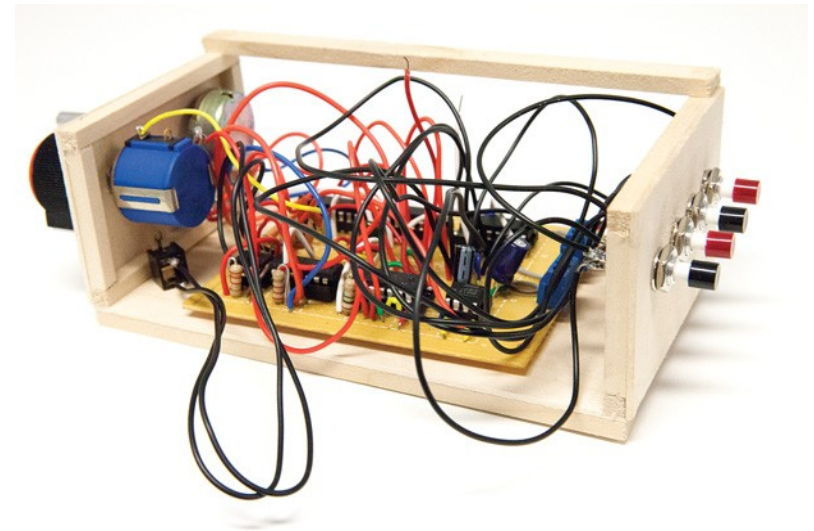
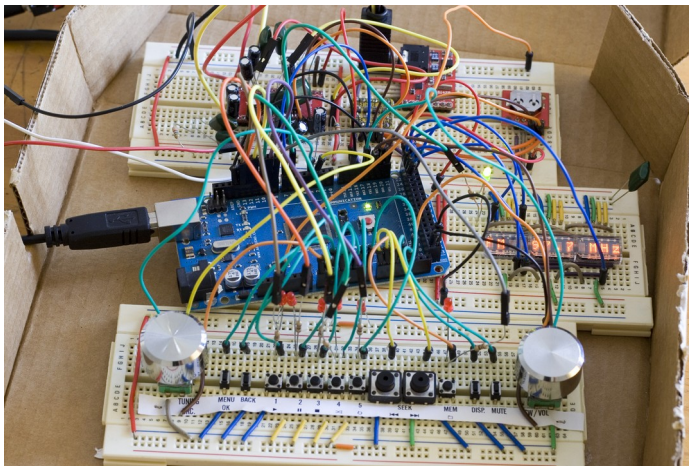
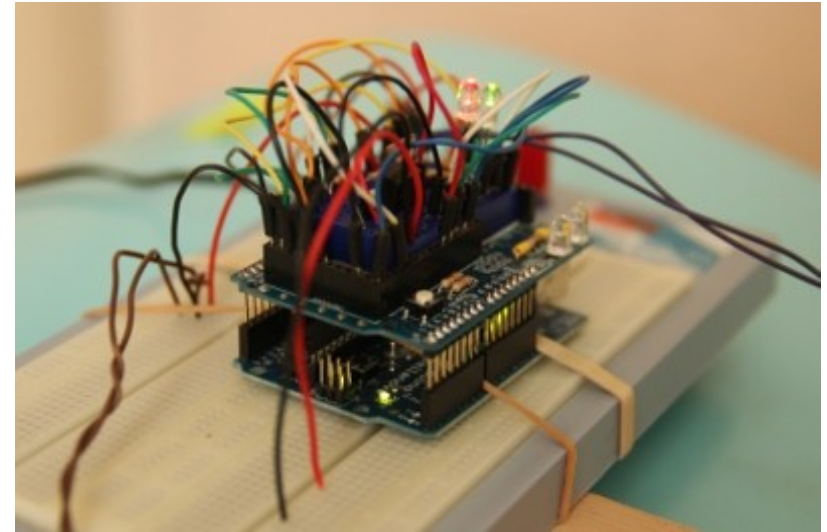
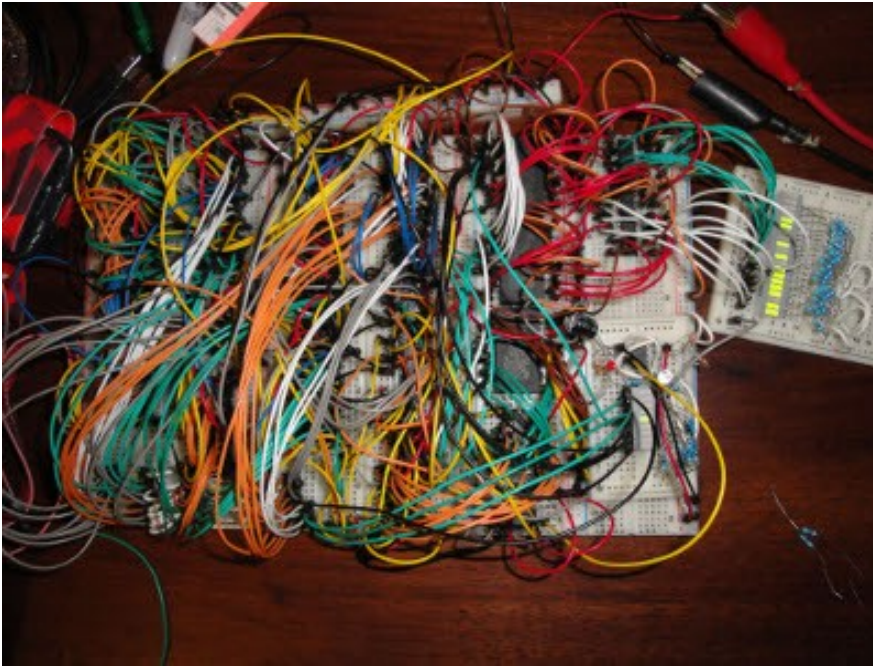
Arduino Nano





Arduino i Raspberry Pi

Inconvenients per a novells, ... i experts





Arduino i Raspberry Pi

Maquinari orientat a alumne

BUS : Sistema digital que transfereix dades entre dispositius electrònics

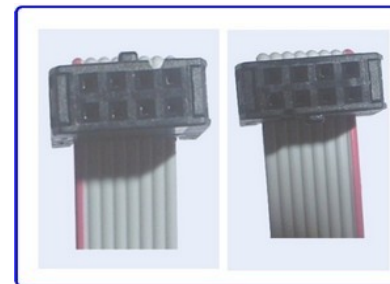
GND	b7
b6	b5
b4	b3
b2	b1
b0	+5V

Cable pla
5x2 a 5x2
(0104A)



CTS / RTS
TX / RX
RX / TX

+5V	o	CTS / RTS
o	X	
o	X	
o	GND	

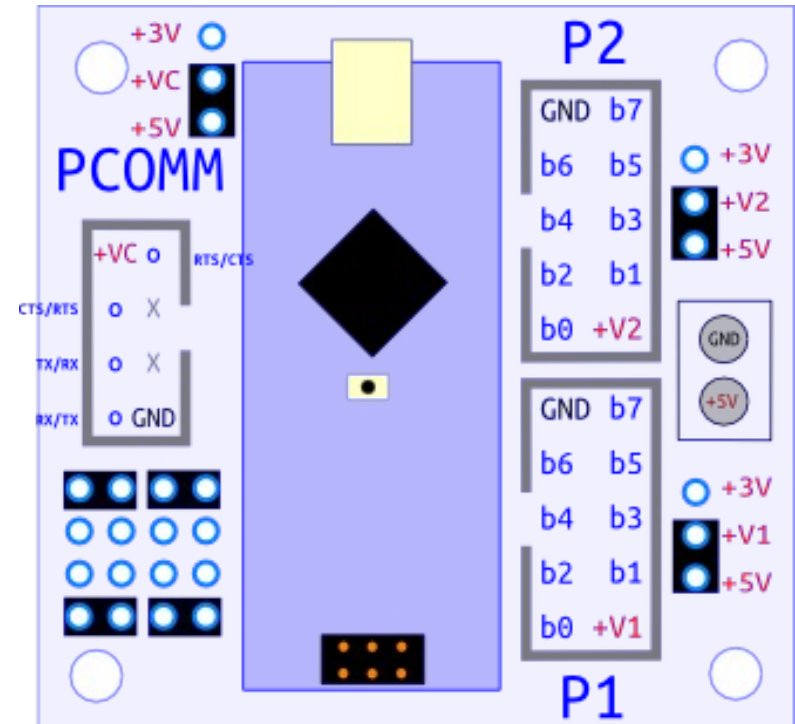
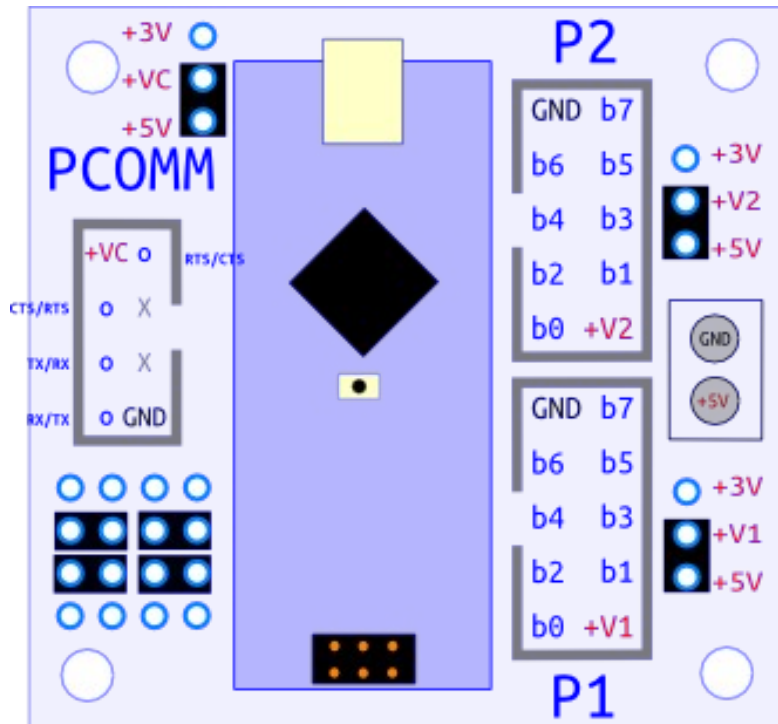


eCat System : Dos tipologies de BUS, dades (8 bits) i comunicacions

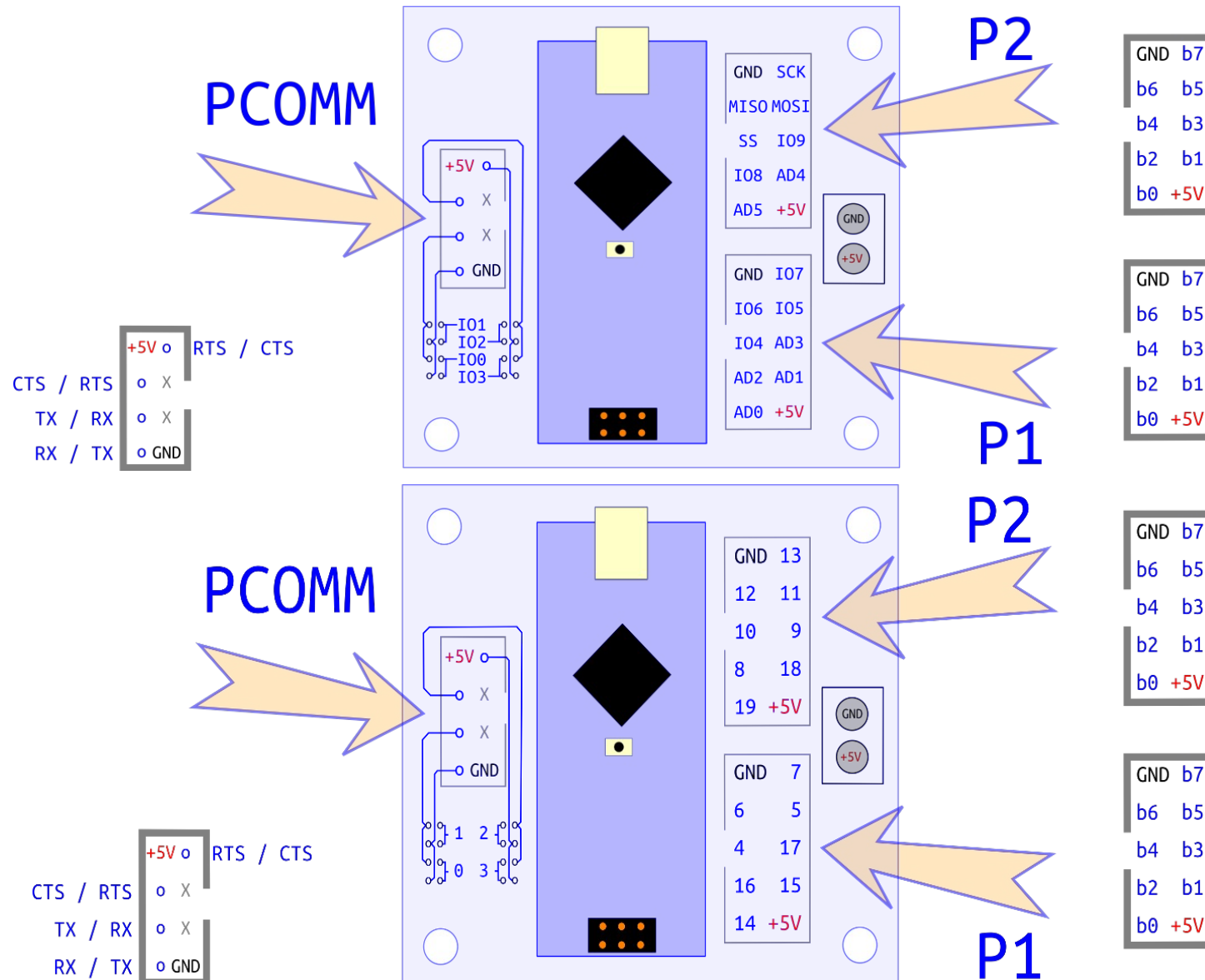


Arduino i Raspberry Pi

nano-eCat



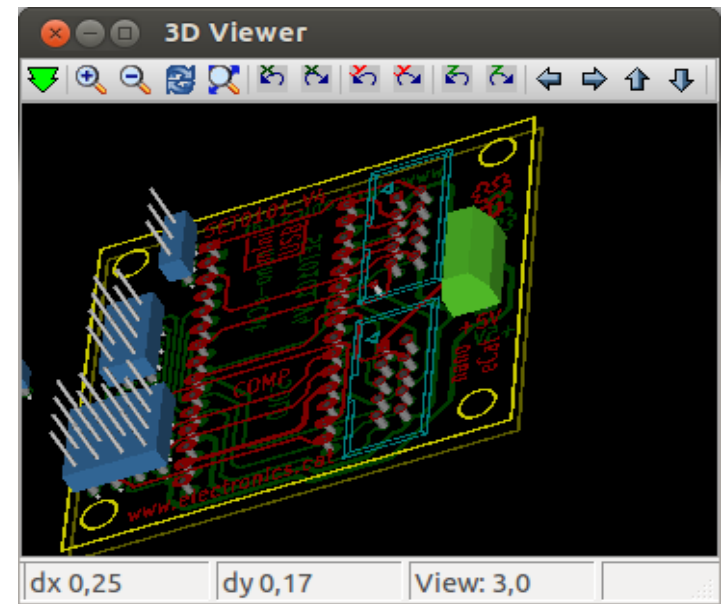
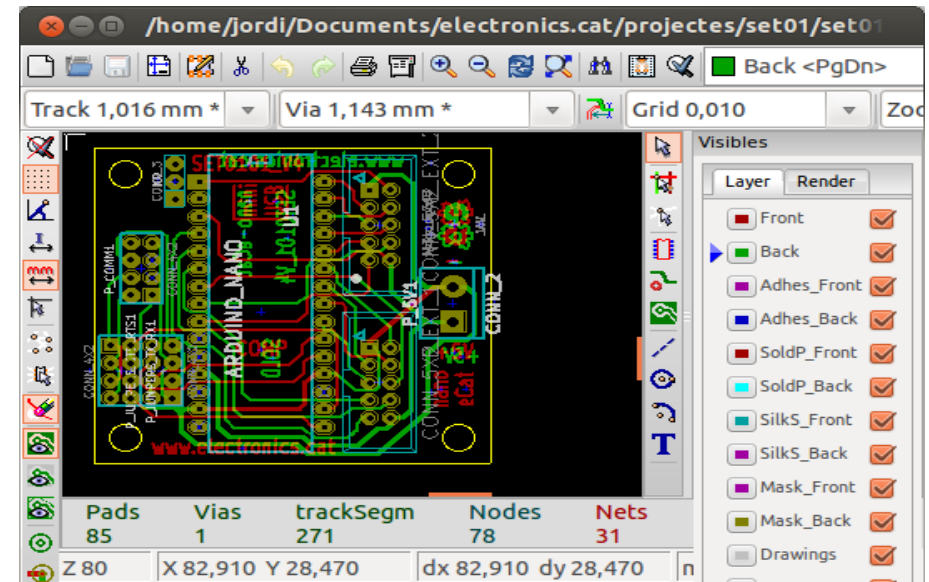
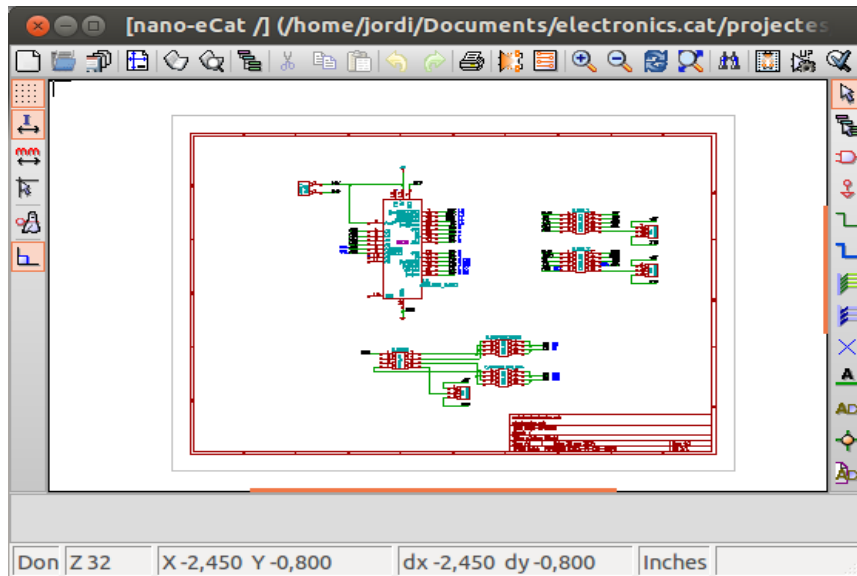
electronics.cat





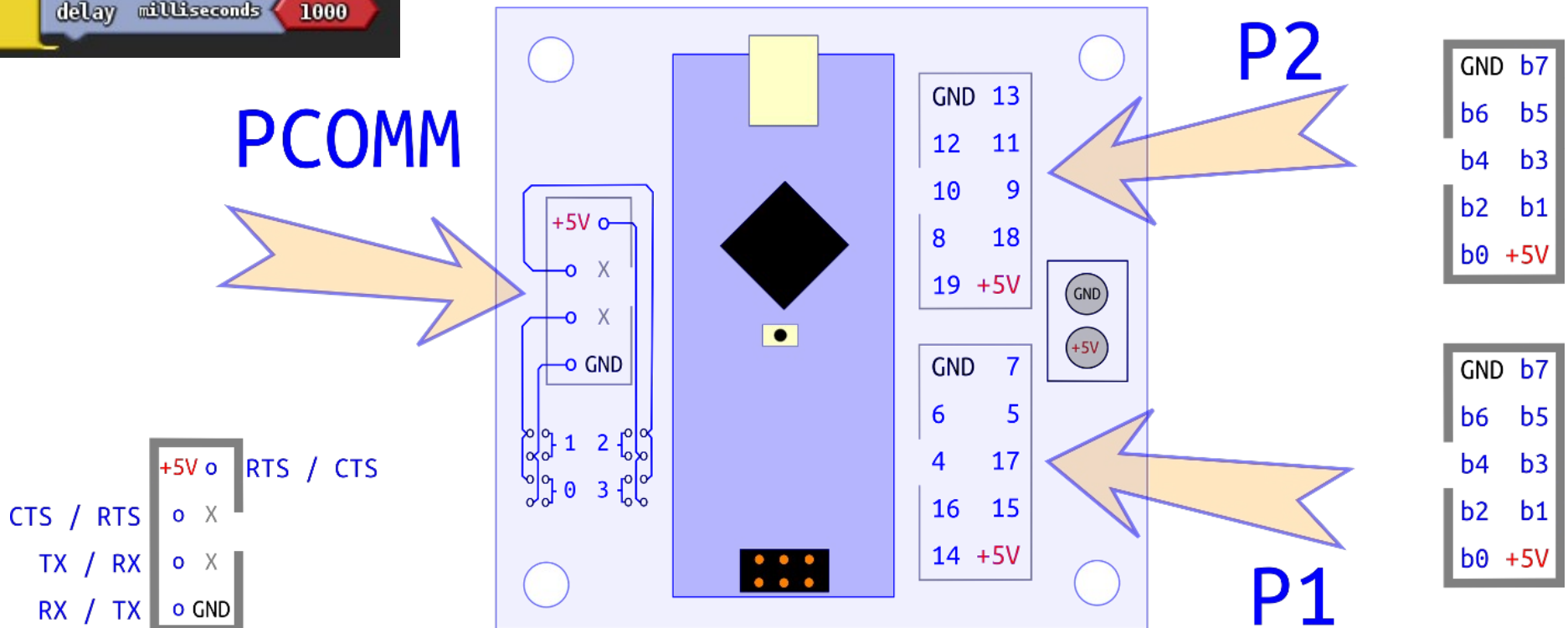
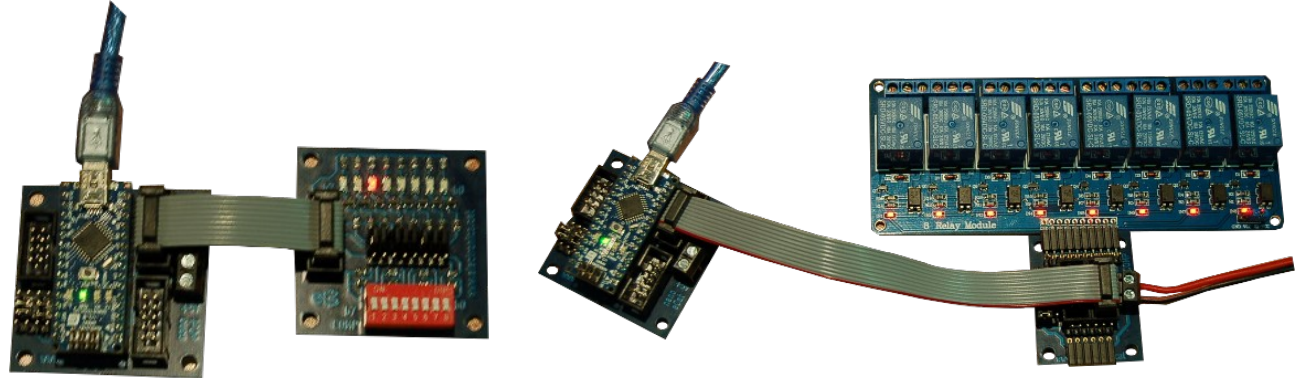
Arduino i Raspberry Pi

Maquinari lliure dissenyat amb KiCad



Arduino i Raspberry Pi

pr00.abp - Sortides digitals

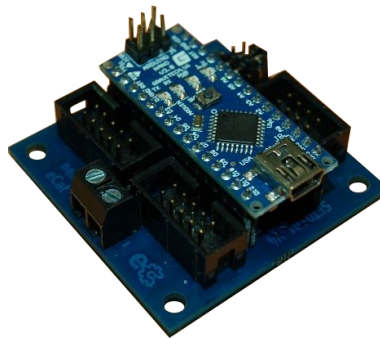




Arduino i Raspberry Pi

`minicom -b 9600 -o -D /dev/ttyUSB0`

```
jordi@eCat:~/Documents/electronics.cat/projectes/arduino/install/arduino-1.0.5$ minicom -b 9600 -o  
-D /dev/ttyUSB1  
  
Welcome to minicom 2.5  
  
OPTIONS: I18n  
Compiled on May  2 2011, 10:05:24.  
Port /dev/ttyUSB1  
  
Press CTRL-A Z for help on special keys  
  
LED OFF  
LED ON  
LED OFF  
LED ON  
LED OFF  
LED ON  
LED OFF  
LED ON  
LED OFF  
LED ON  
LED OFF  
LED ON  
LED OFF
```



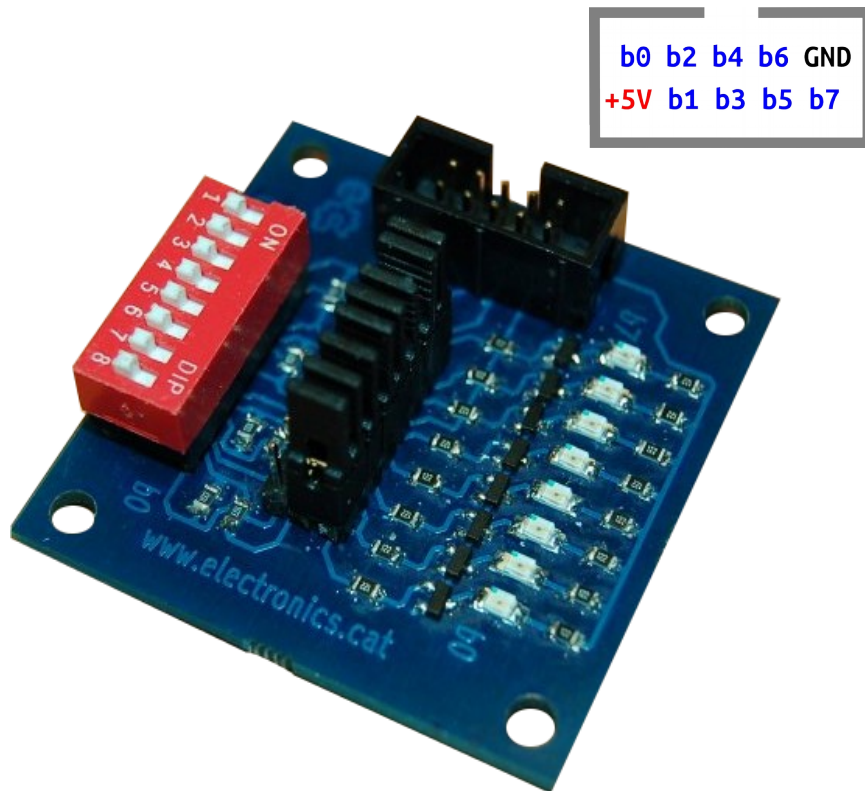


Arduino i Raspberry Pi

Placa de microruptors i leds

uSW - LEDs

01_04 v3



**Placa configurable
d'entrades / sortides.**

**La configuració de cada bit es
fa mitjançant un pont (jumper).**

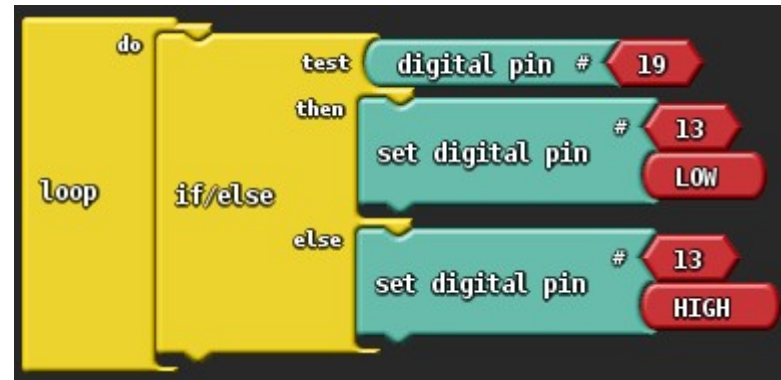
**Les entrades es fan per
microruptor (ON : zero lògic,
OFF : u lògic).**

**Les sortides es visualitzen
mitjançant leds (apagat : zero
lògic, encès : u lògic).**

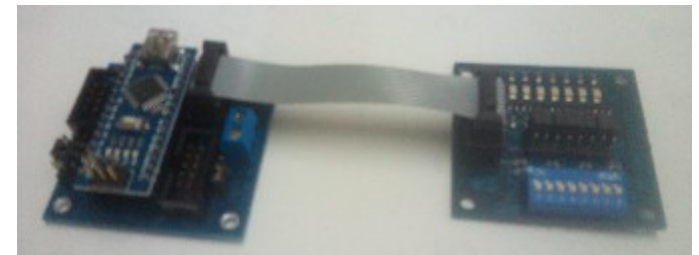
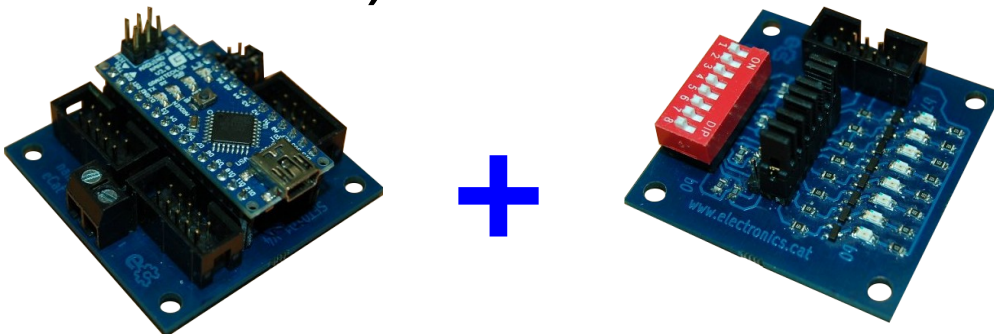


Arduino i Raspberry Pi

pr01.abp - Entrades digitals



A la placa d'entrades i sortides, 01_04 v3, s'ha de configurar el pont del bit 7 de P2 (pin 13 d'Arduino) com a sortida i el bit 0 de P2 (pin 19 d'Arduino) com a entrada.



<http://www.binefa.cat/php/arduino/ardublock/pr01.abp>

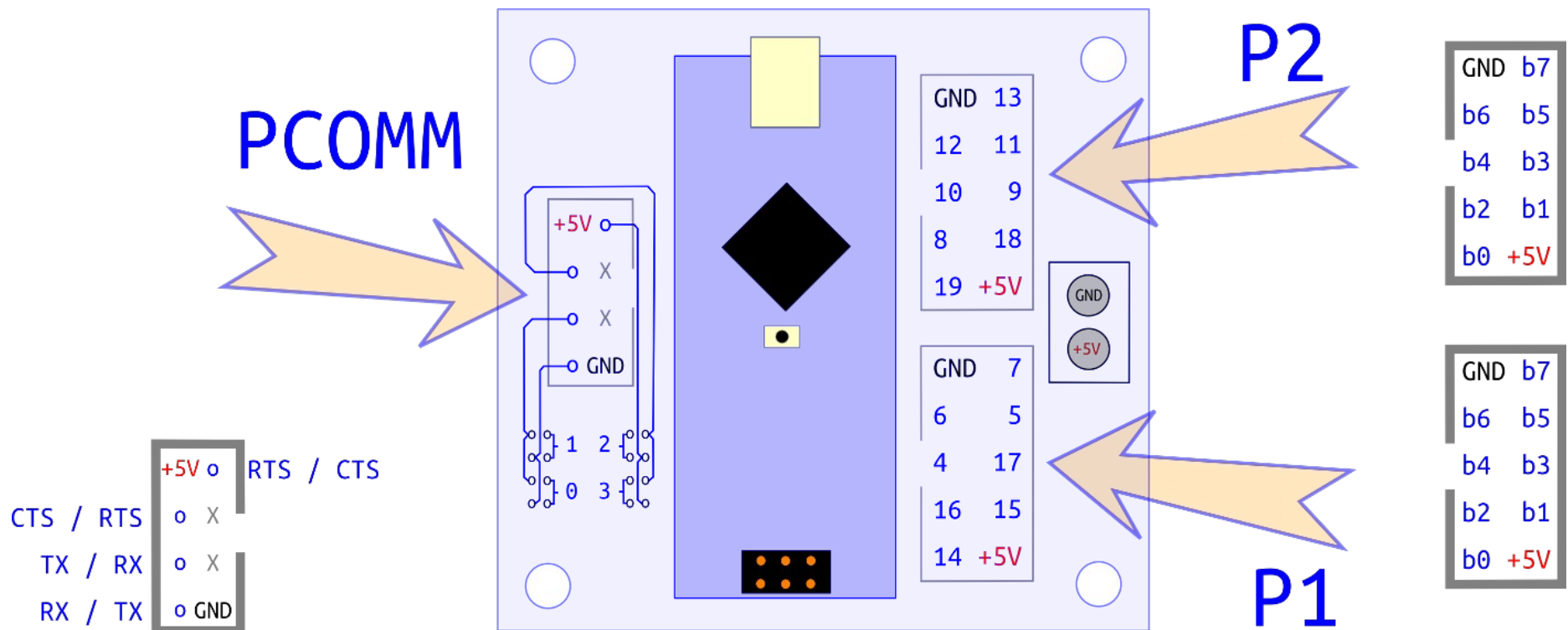


Arduino i Raspberry Pi

pr02.abp - Exercici

- Desenvolpeu pr02_P2.abp per a crear una seqüència infinita des de b7 a b0 de P2 amb un interval de mig segon (500 ms) :

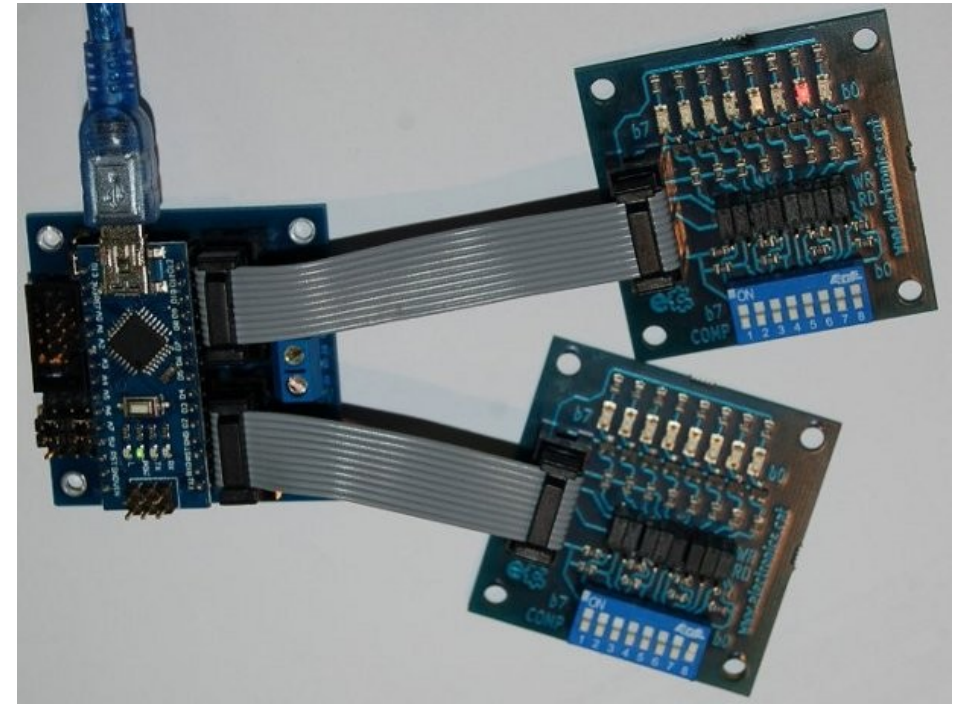
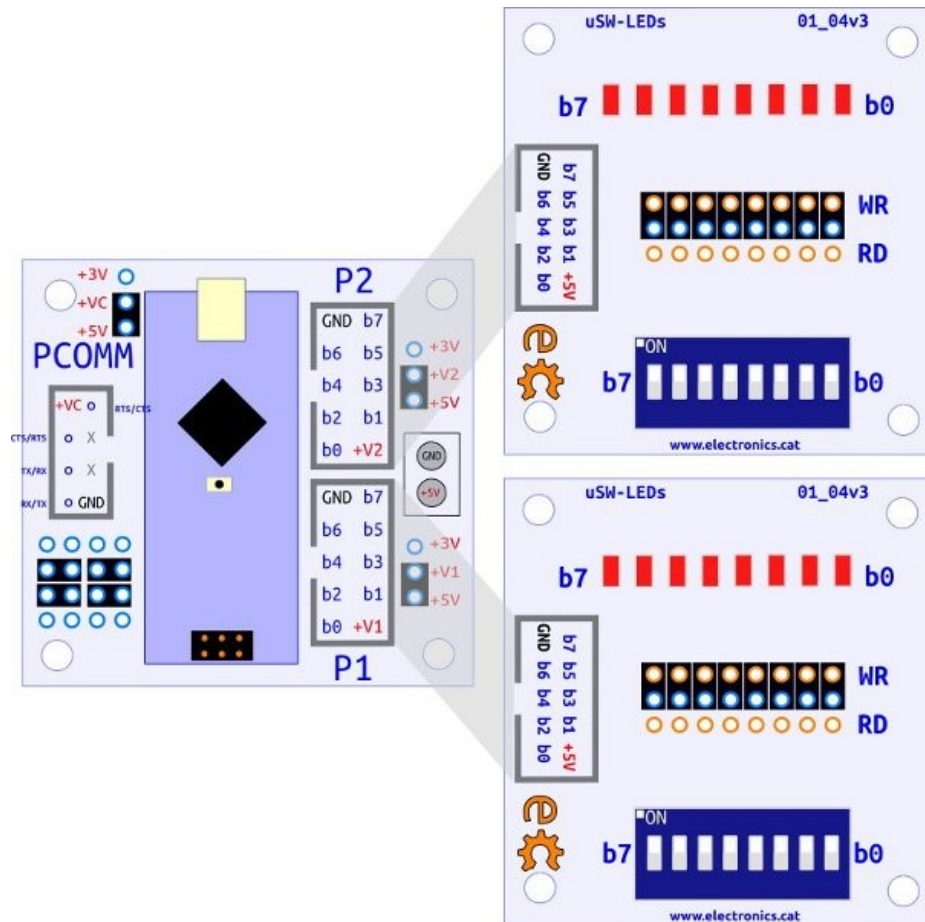
1000000, 00000000, 01000000, 00000000, 00100000, ... , 00000000, 00000001, 00000000



http://www.binefa.cat/php/arduino/ardublock/pr02_P2.abp
http://www.binefa.cat/php/arduino/ardublock/pr02_P1.abp

Arduino i Raspberry Pi

pr02.abp - Exercici



Vídeo : <https://www.youtube.com/watch?v=efSOm-Zllq0>

http://www.binefa.cat/php/arduino/ardublock/pr02_P2.abp
http://www.binefa.cat/php/arduino/ardublock/pr02_P1.abp



Arduino i Raspberry Pi

pr02.abp - Exercici

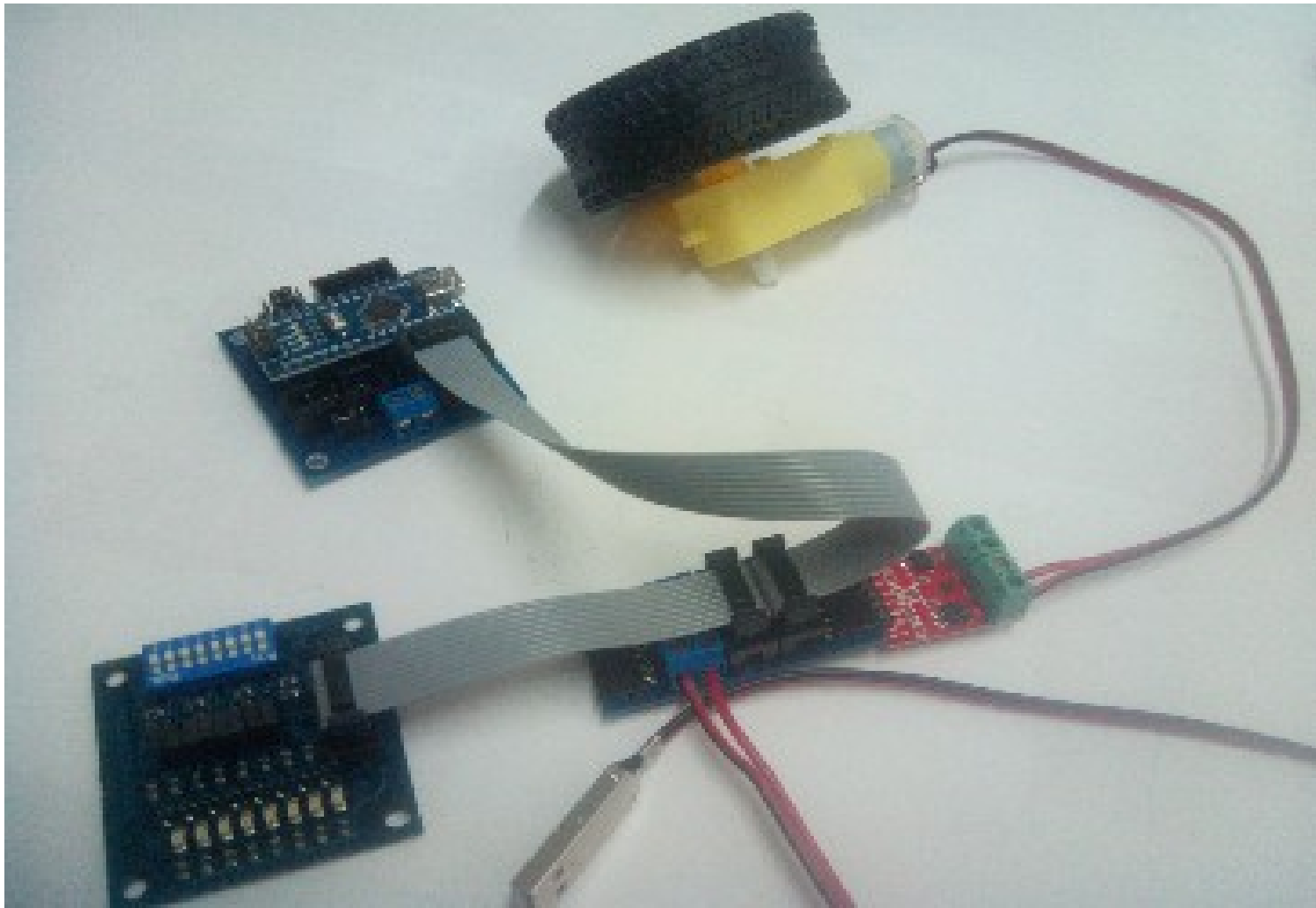


http://www.binefa.cat/php/arduino/ardublock/pr02_P2.abp
http://www.binefa.cat/php/arduino/ardublock/pr02_P1.abp



Arduino i Raspberry Pi

pr02.abp - Exercici

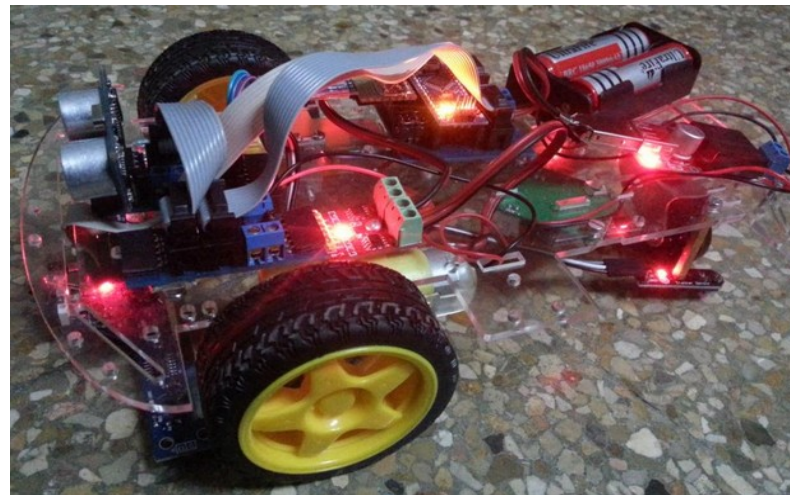
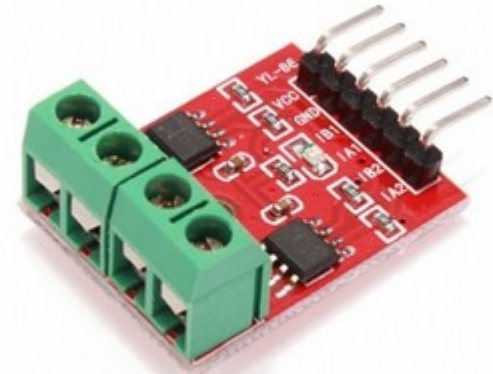
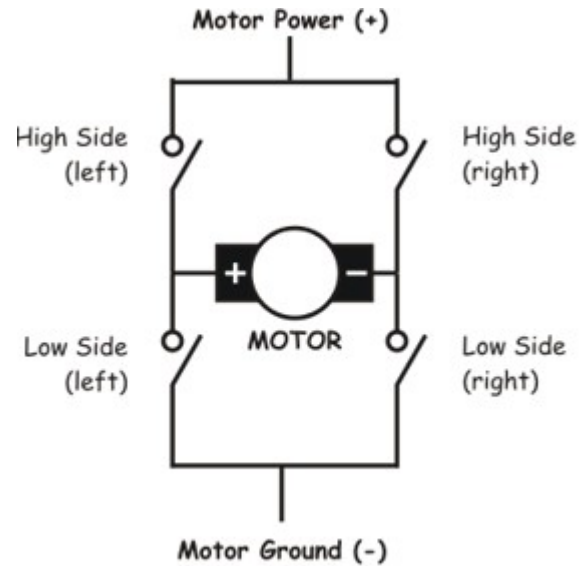


http://www.binefa.cat/php/arduino/ardublock/pr02_P2.abp
http://www.binefa.cat/php/arduino/ardublock/pr02_P1.abp



Arduino i Raspberry Pi

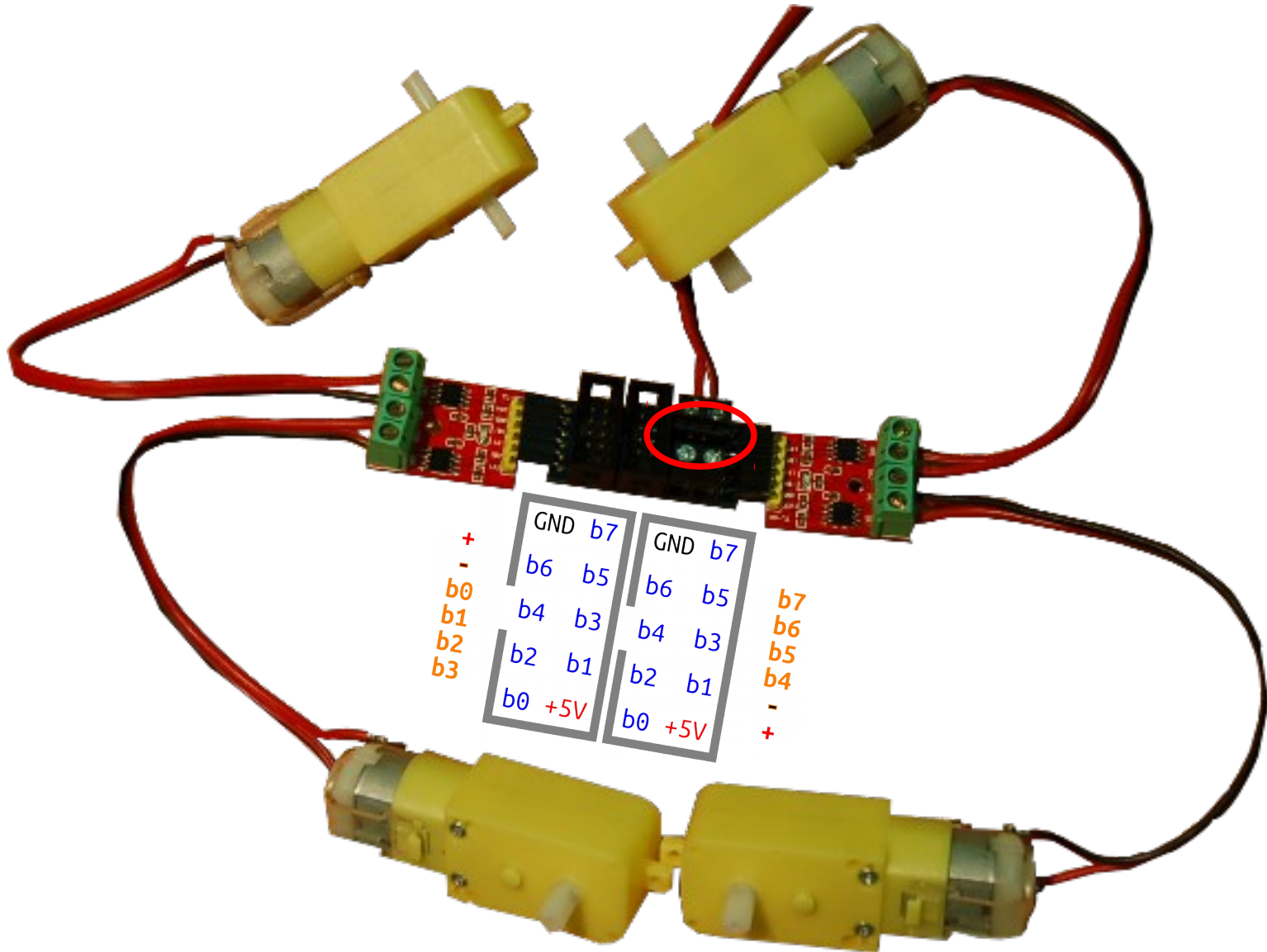
Pont en H





Arduino i Raspberry Pi

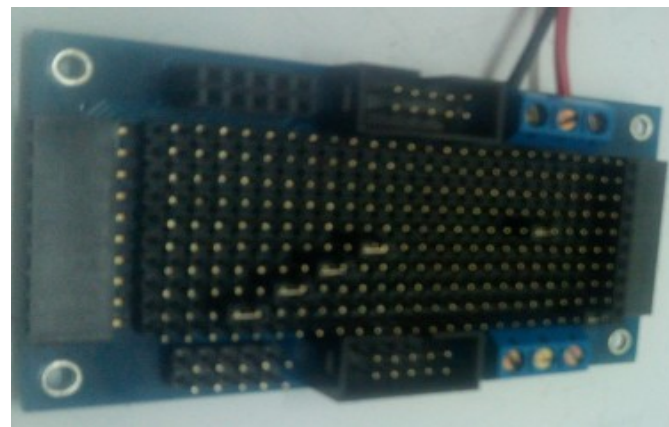
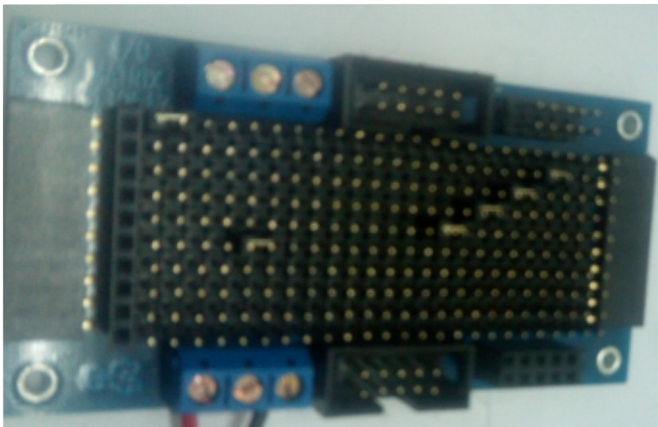
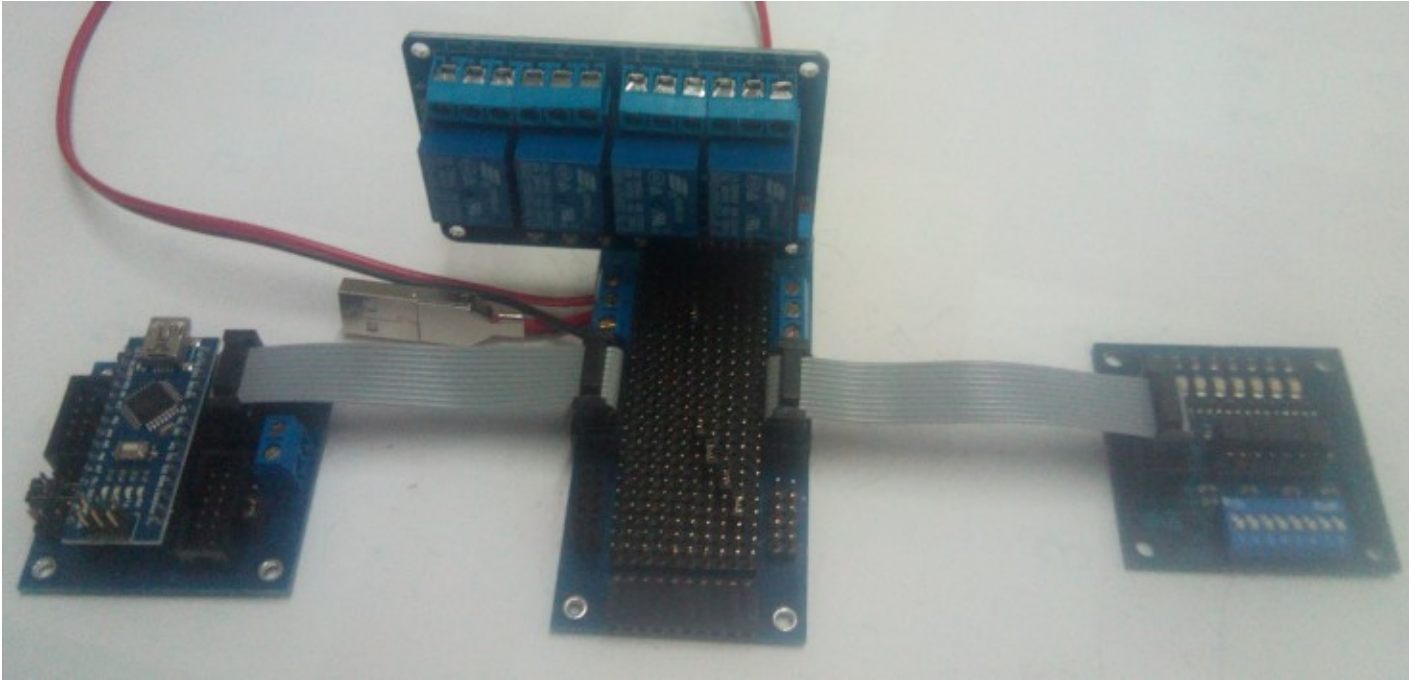
Pont en H





Arduino i Raspberry Pi

pr02.abp - Exercici



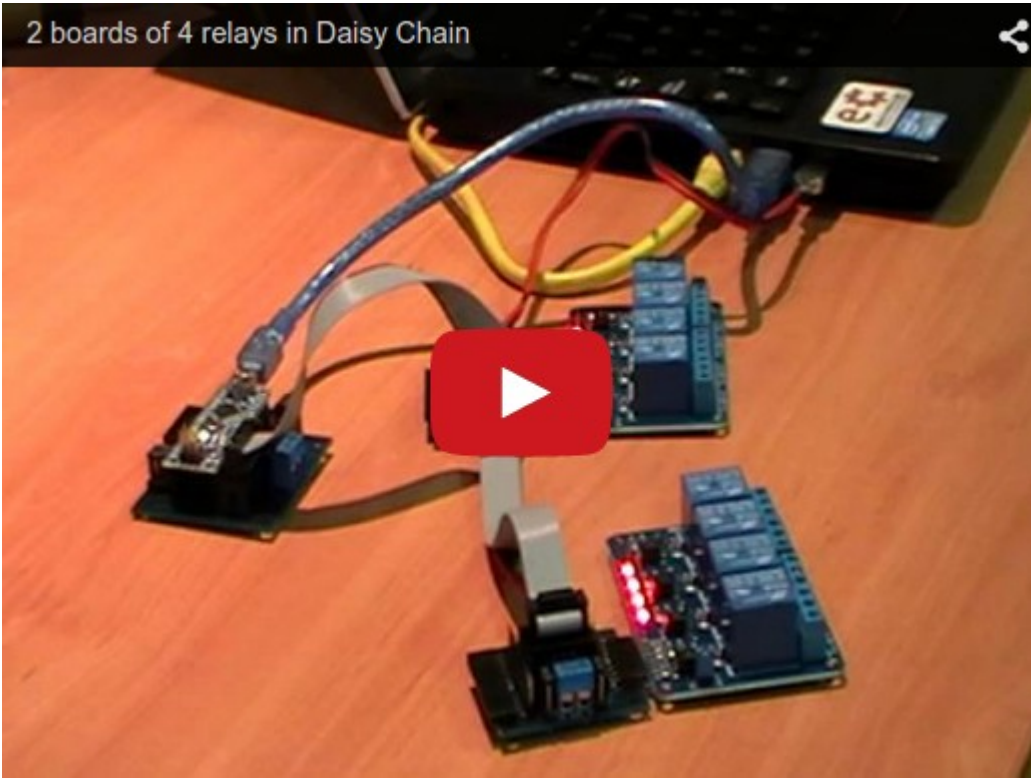
http://www.binefa.cat/php/arduino/ardublock/pr02_P2.abp
http://www.binefa.cat/php/arduino/ardublock/pr02_P1.abp



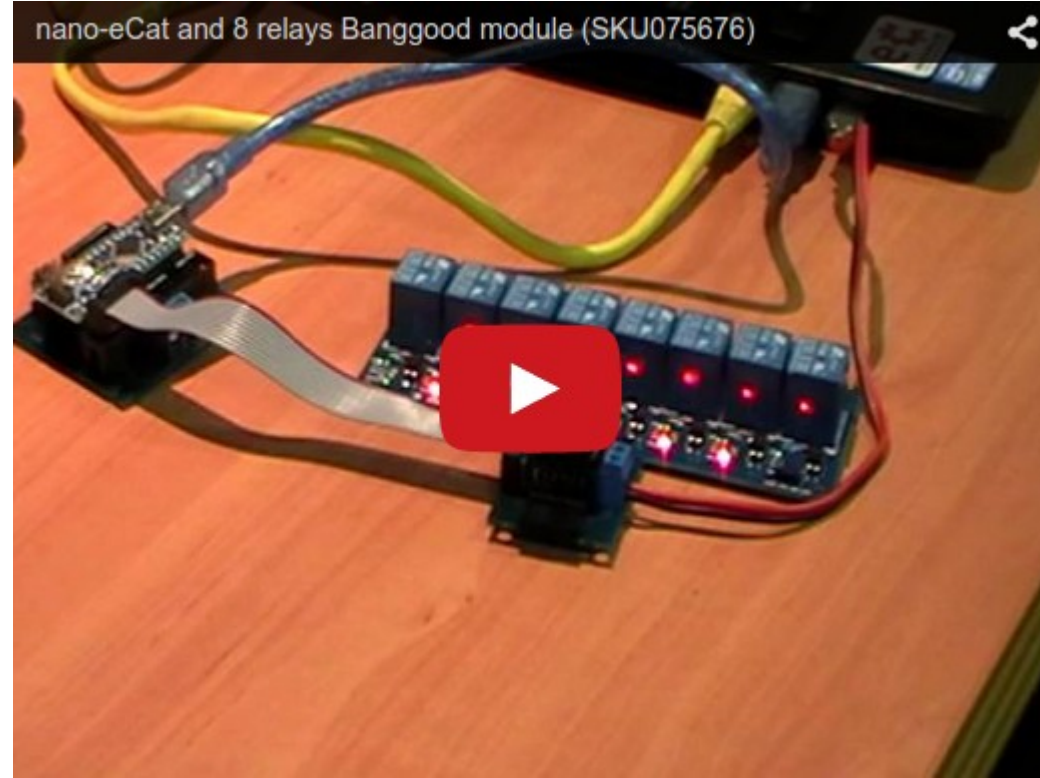
Arduino i Raspberry Pi

pr02.abp - Exercici

2 boards of 4 relays in Daisy Chain



nano-eCat and 8 relays Banggood module (SKU075676)



<http://binefa.cat/blog/>

http://www.binefa.cat/php/arduino/ardublock/pr02_P2.abp

http://www.binefa.cat/php/arduino/ardublock/pr02_P1.abp

Maquinari

Concepte de relé

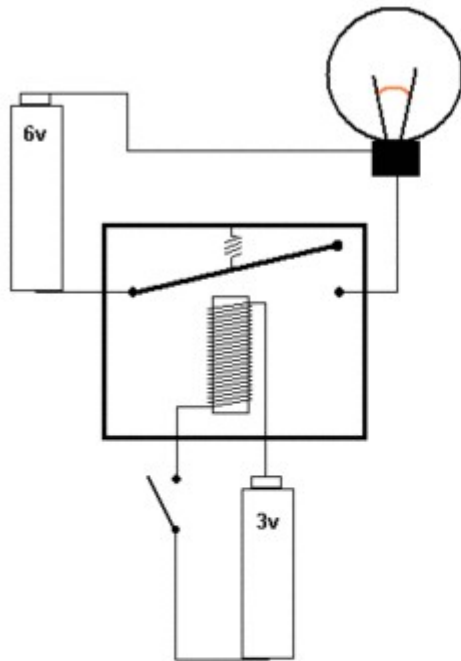


Figure 1: Relay off

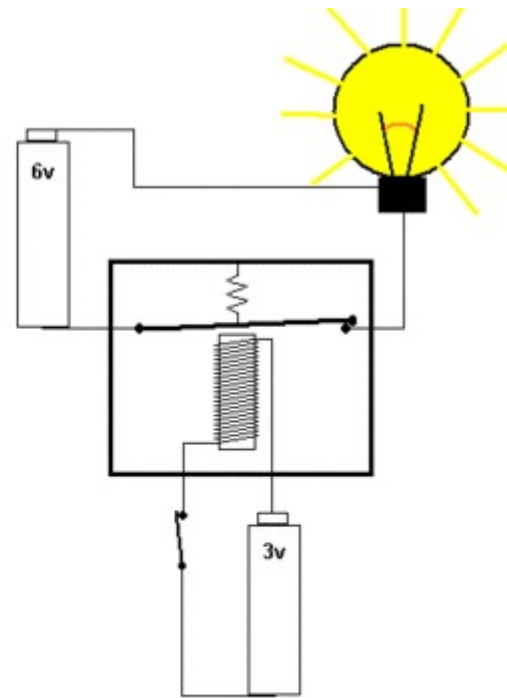
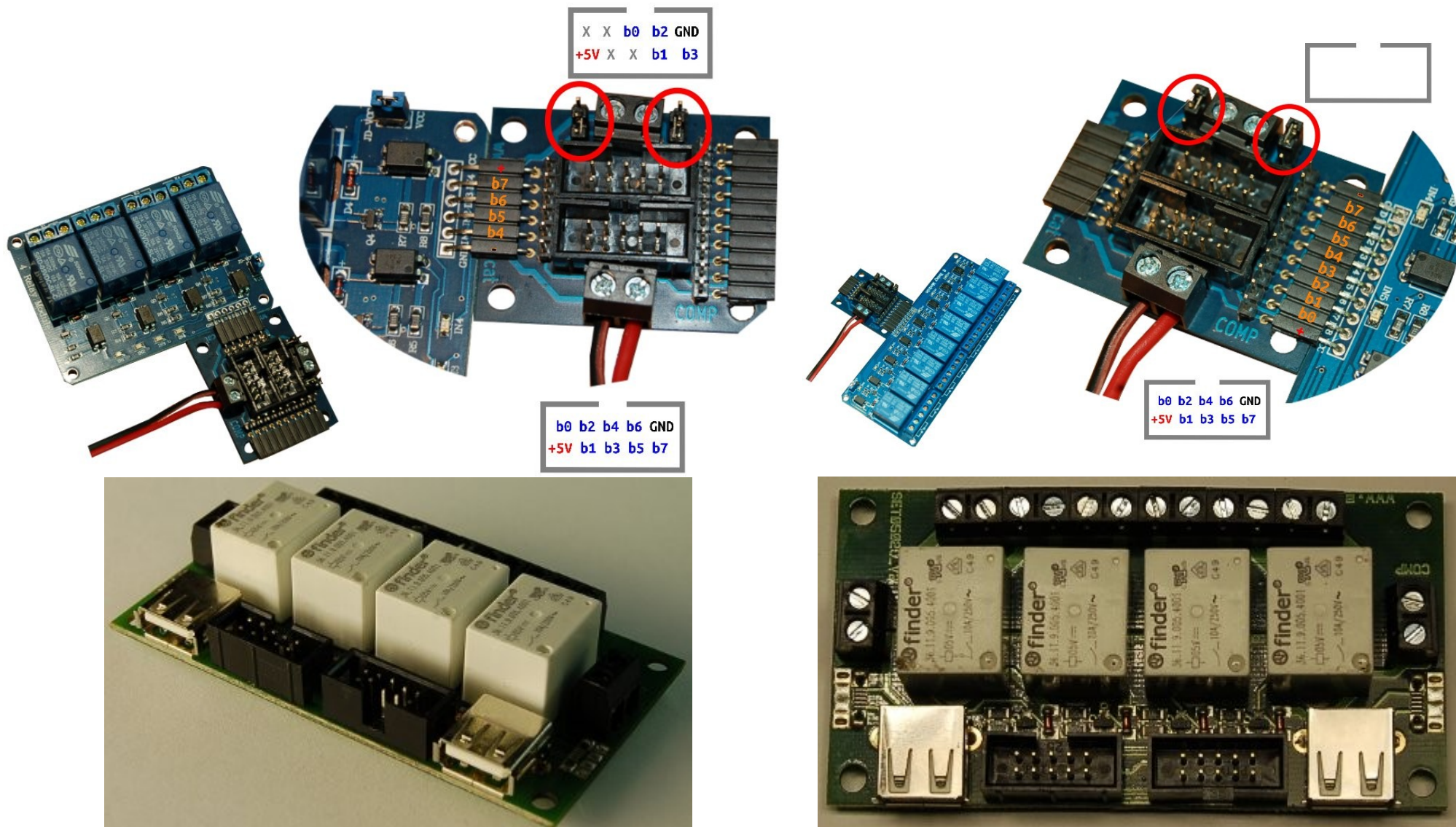


Figure 2: Relay on

Maquinari

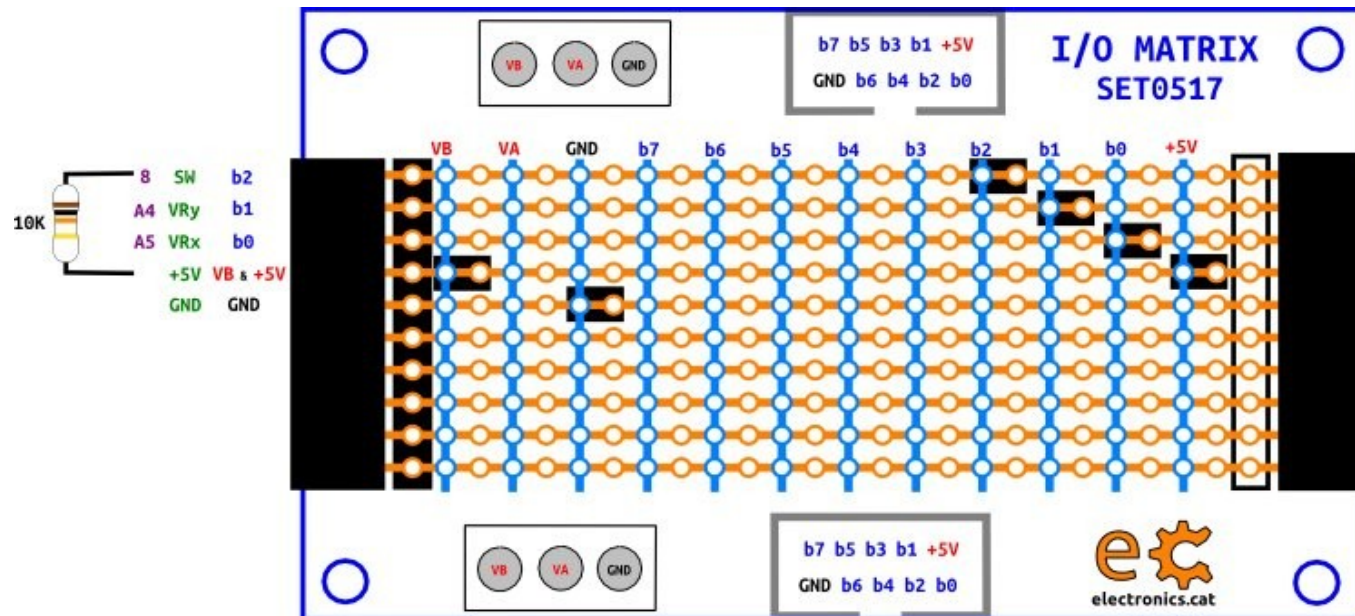
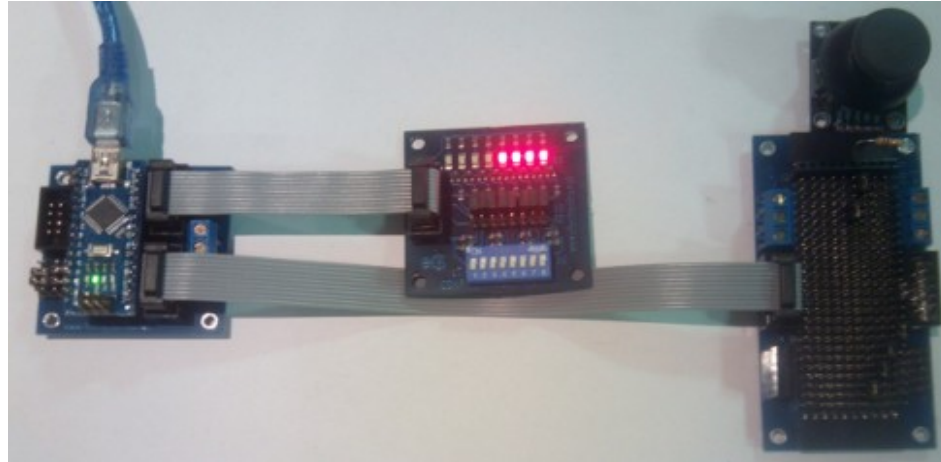
4 Relés - Placa set05_02





Arduino i Raspberry Pi

pr03vuMeter.abp - Exercici



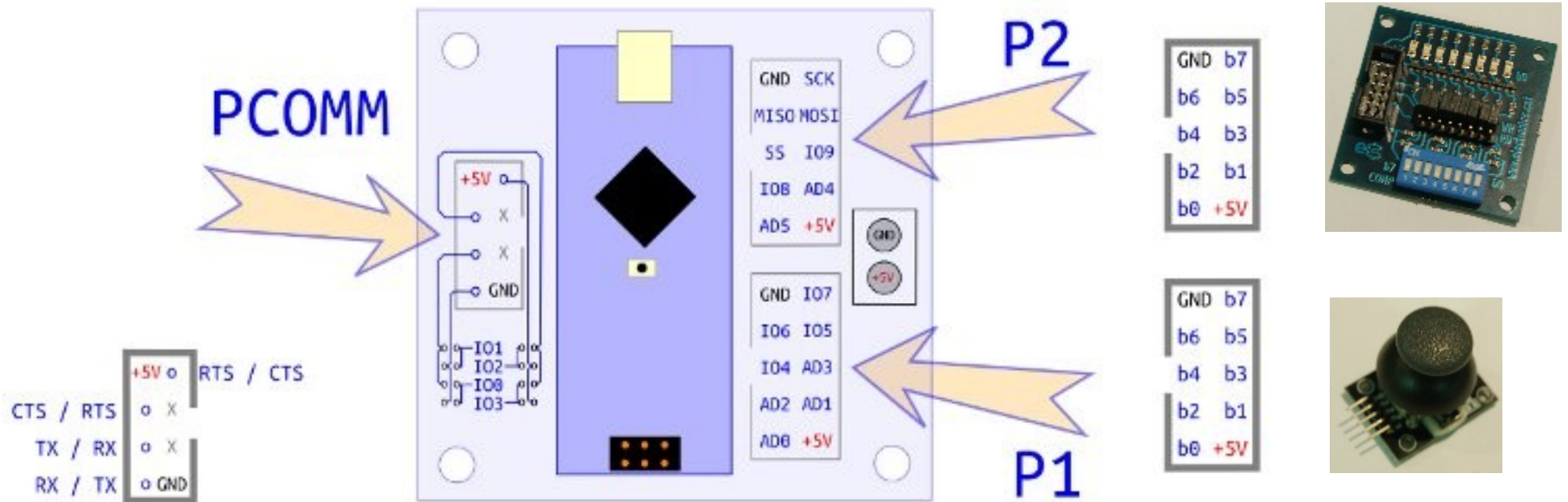
<http://www.binefa.cat/php/arduino/ardublock/pr03vuMeter3bits.abp>

<http://www.binefa.cat/php/arduino/ardublock/pr03vuMeter8bits.abp>



Arduino i Raspberry Pi

pr03vuMeter.abp - Exercici



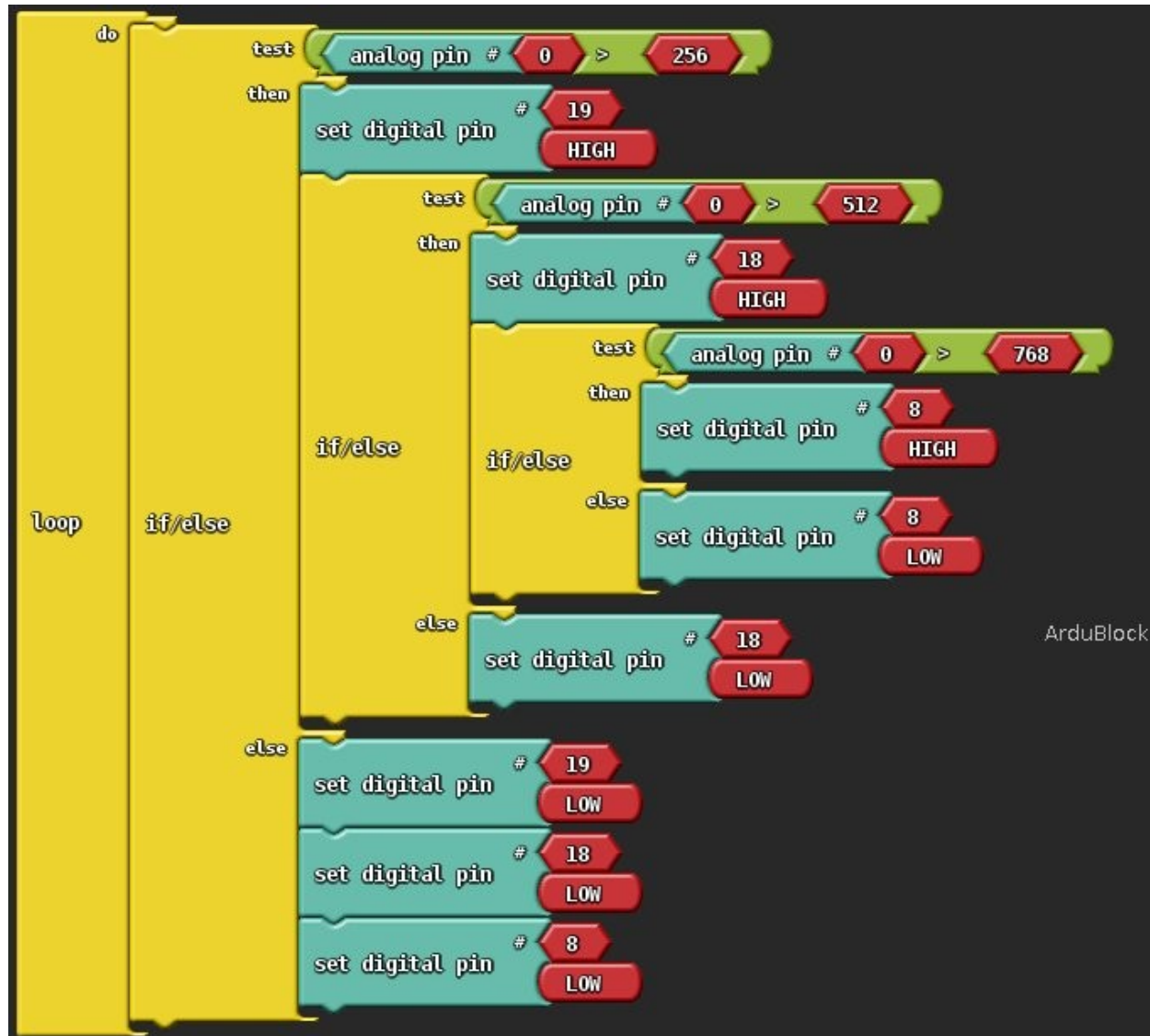
El valor analògic llegit màxim és 1023 i el mínim és 0

<http://www.binefa.cat/php/arduino/ardublock/pr03vuMeter3bits.abp>

<http://www.binefa.cat/php/arduino/ardublock/pr03vuMeter8bits.abp>

Arduino i Raspberry Pi

pr03vuMeter3bits.abp - Exercici

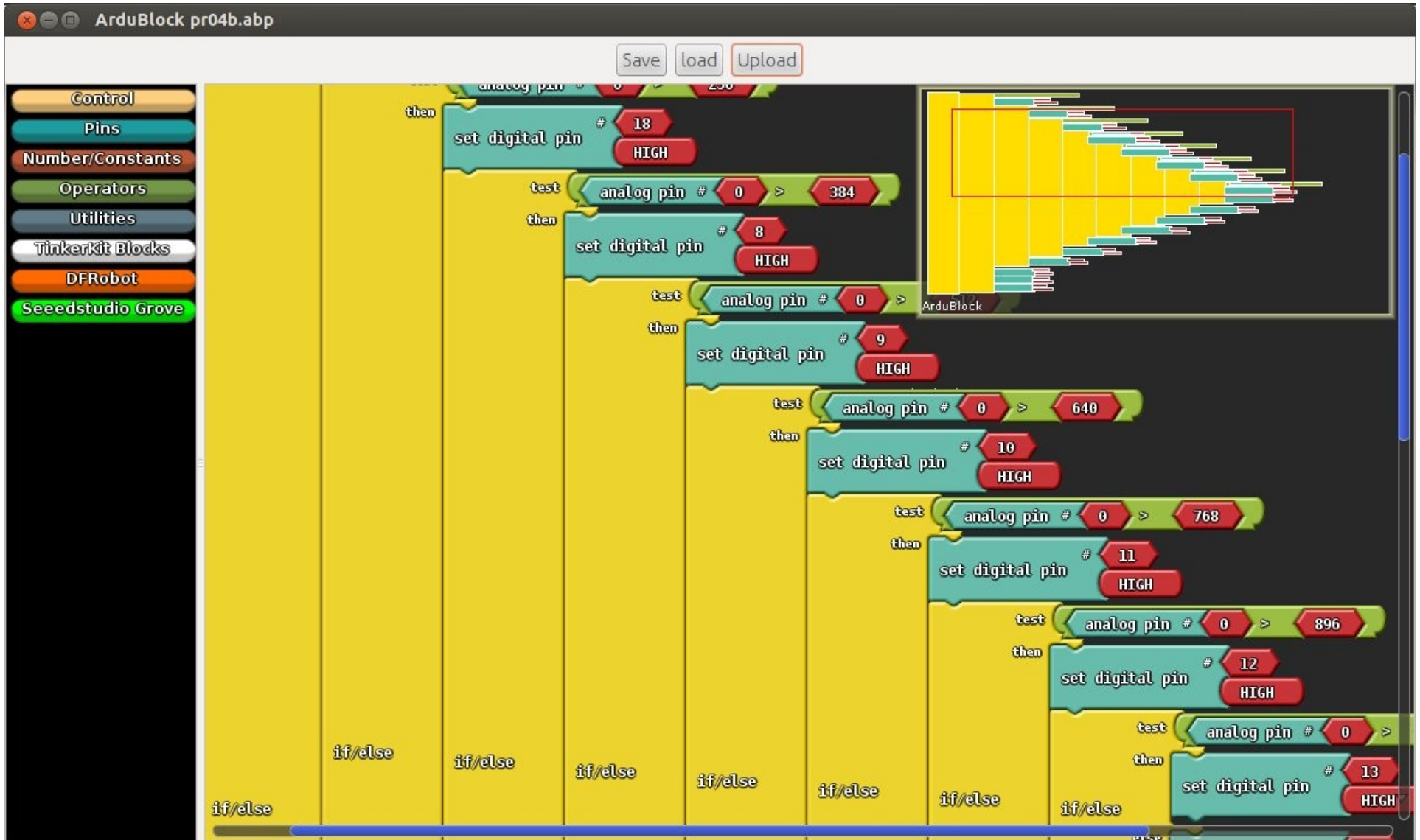


<http://www.binefa.cat/php/arduino/ardublock/pr03vuMeter3bits.abp>

<http://www.binefa.cat/php/arduino/ardublock/pr03vuMeter8bits.abp>

Arduino i Raspberry Pi

pr03vuMeter8bits.abp - Exercici



<http://www.binefa.cat/php/arduino/ardublock/pr03vuMeter3bits.abp>

<http://www.binefa.cat/php/arduino/ardublock/pr03vuMeter8bits.abp>



Arduino i Raspberry Pi

KIWIBOT



@_Leantec

@jo_pujol

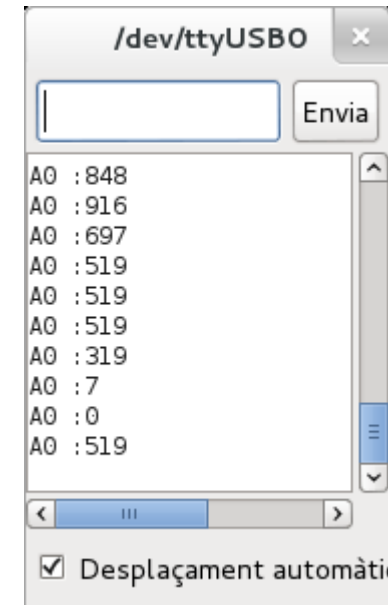
<http://www.kiwibot.es>

Arduino i Raspberry Pi

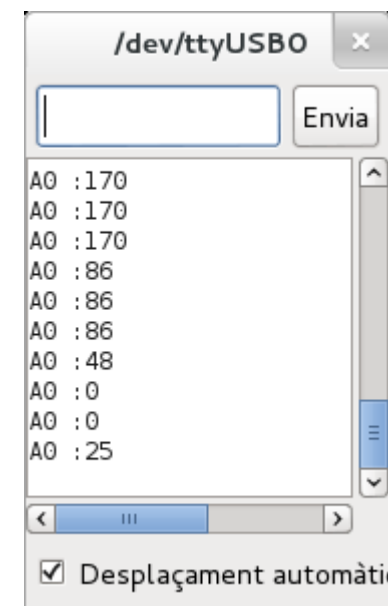
pr04joystick.abp - Exercici



<http://www.binefa.cat/php/arduino/ardublock/pr04joystick.abp>



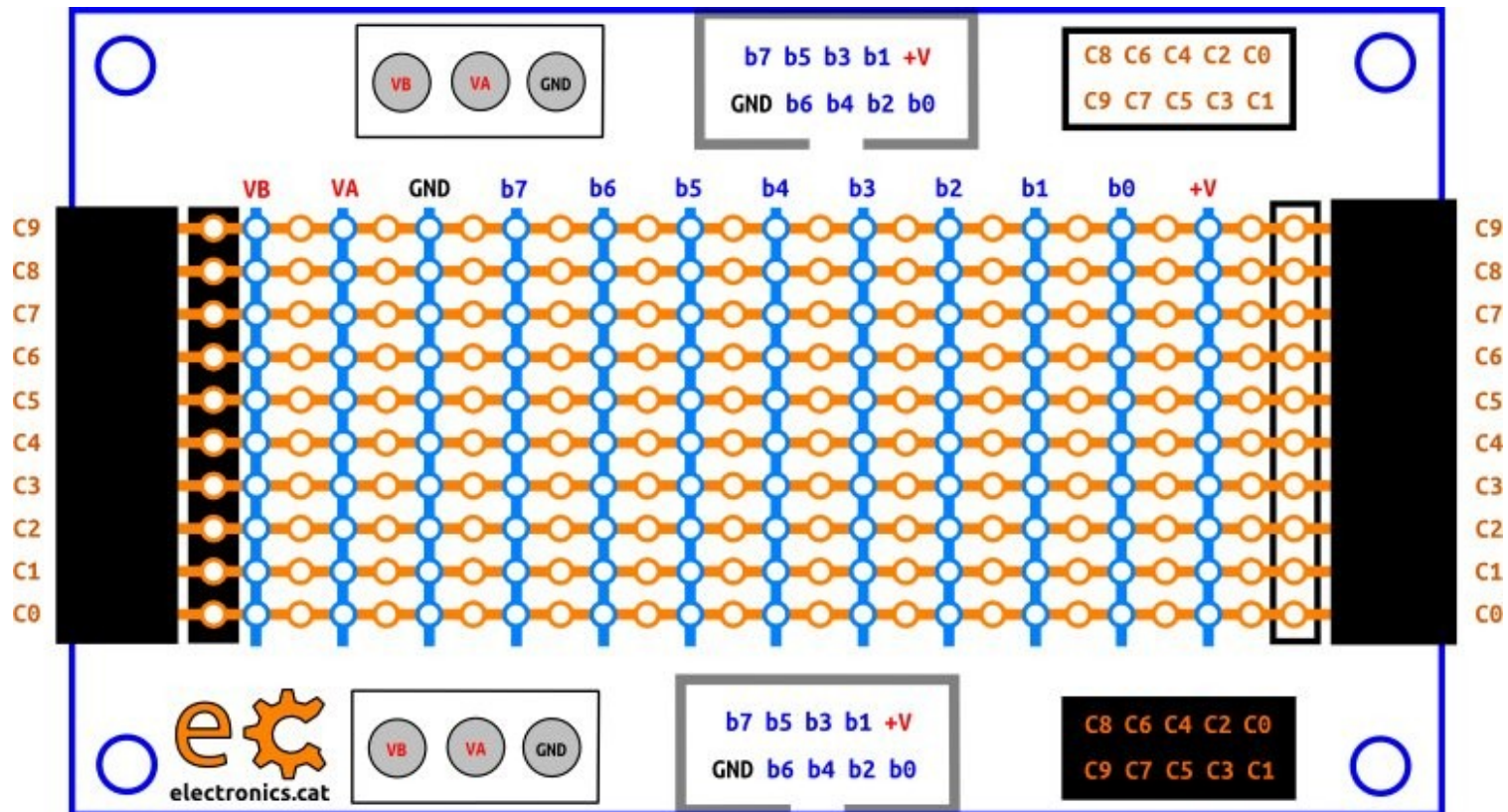
<http://www.binefa.cat/php/arduino/ardublock/pr04joystickB.abp>





Arduino i Raspberry Pi

Matriu

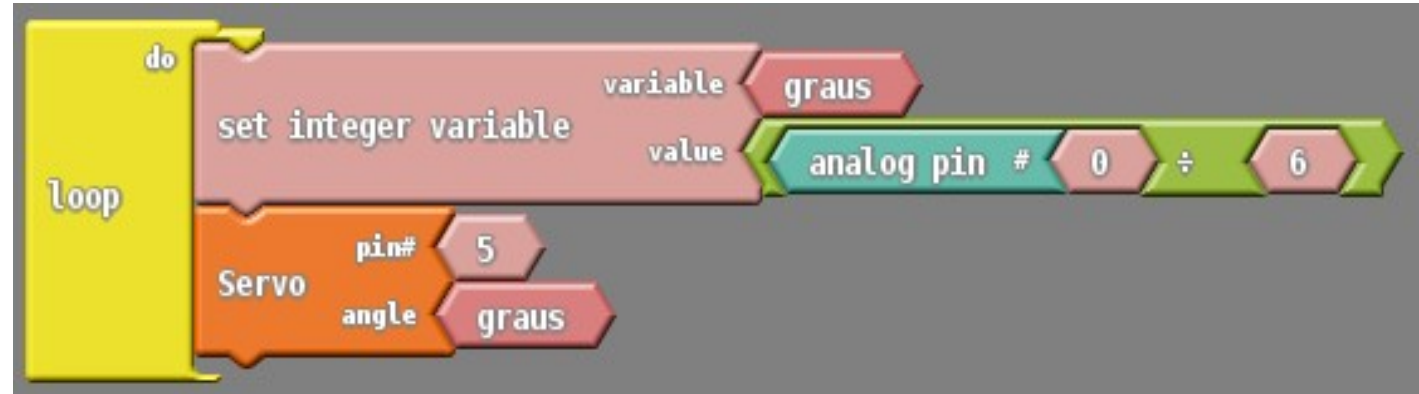
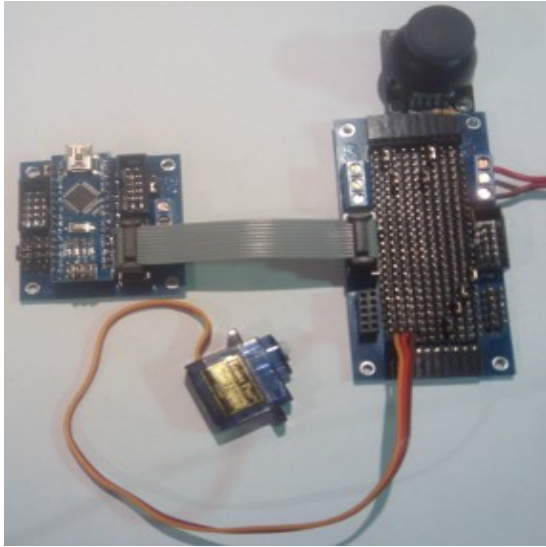


<http://electronics.cat/php/common/index.php?lang=ca&page=517>

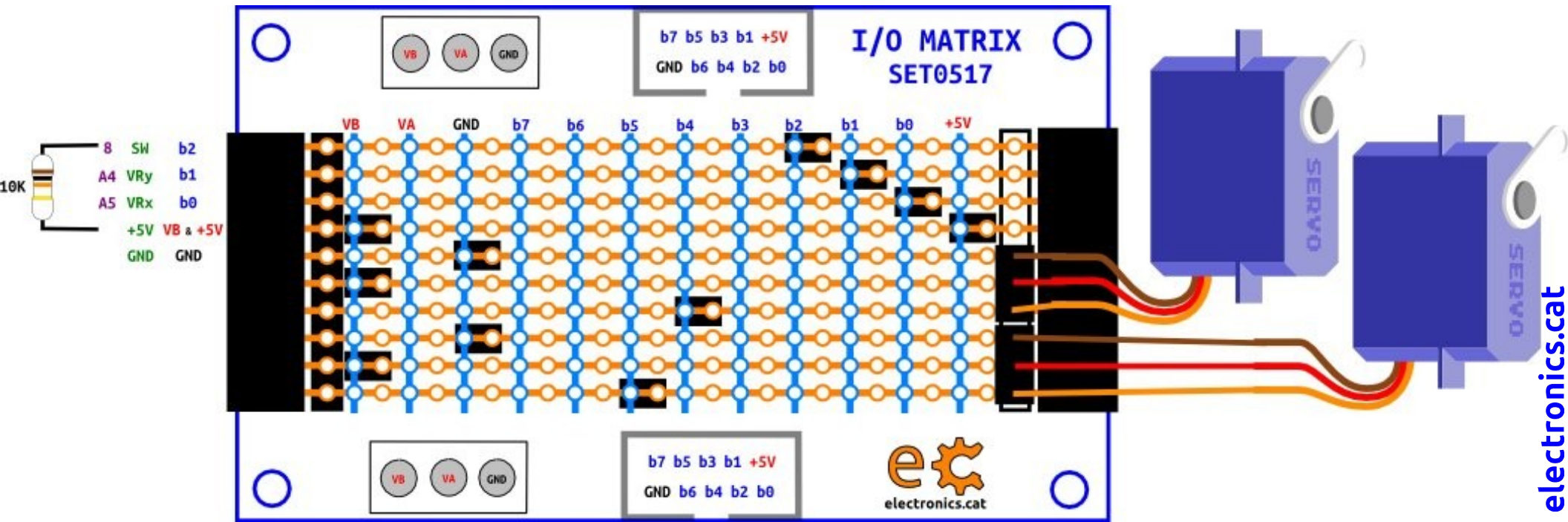


Arduino i Raspberry Pi

pr04joystickServo.abp - Exercici



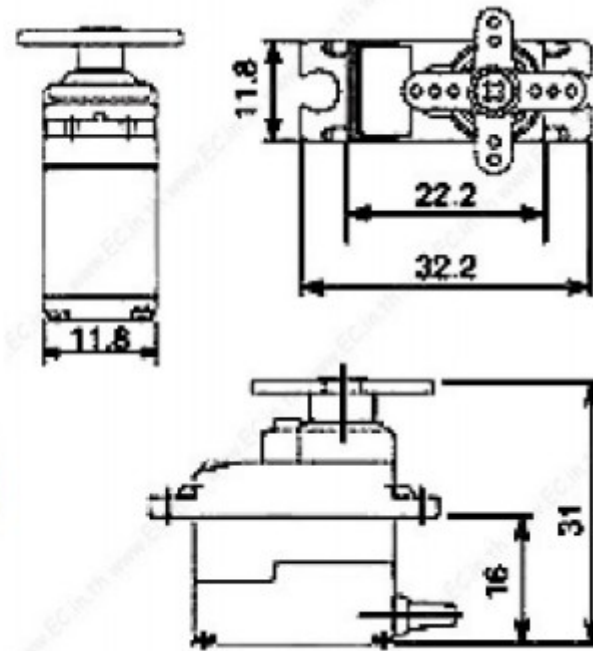
<http://www.binefa.cat/php/arduino/ardublock/pr04joystickServo.abp>





Arduino i Raspberry Pi

Servo



Specifications

- Weight: 9 g
- Dimension: 22.2 x 11.8 x 31 mm approx.
- Stall torque: 1.8 kgf·cm
- Operating speed: 0.1 s/60 degree
- Operating voltage: 4.8 V (~5V)
- Dead band width: 10 μ s
- Temperature range: 0 °C – 55 °C

<http://datasheet.sparkgo.com.br/SG90Servo.pdf>



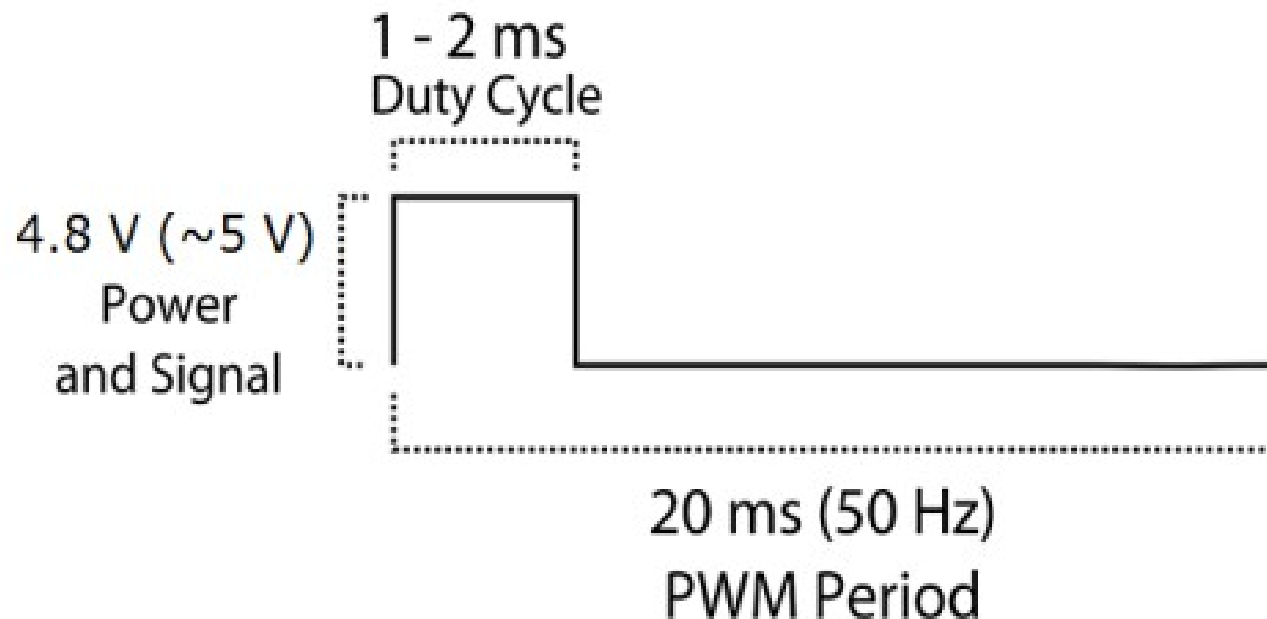
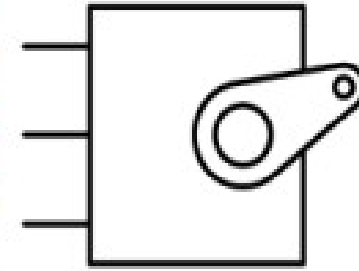
Arduino i Raspberry Pi

Servo

PWM=Orange (⏏)

Vcc = Red (+)

Ground=Brown (-)



Position "0" (1.5 ms pulse) is middle, "90" (~2 ms pulse) is all the way to the right, "-90" (~1 ms pulse) is all the way to the left.

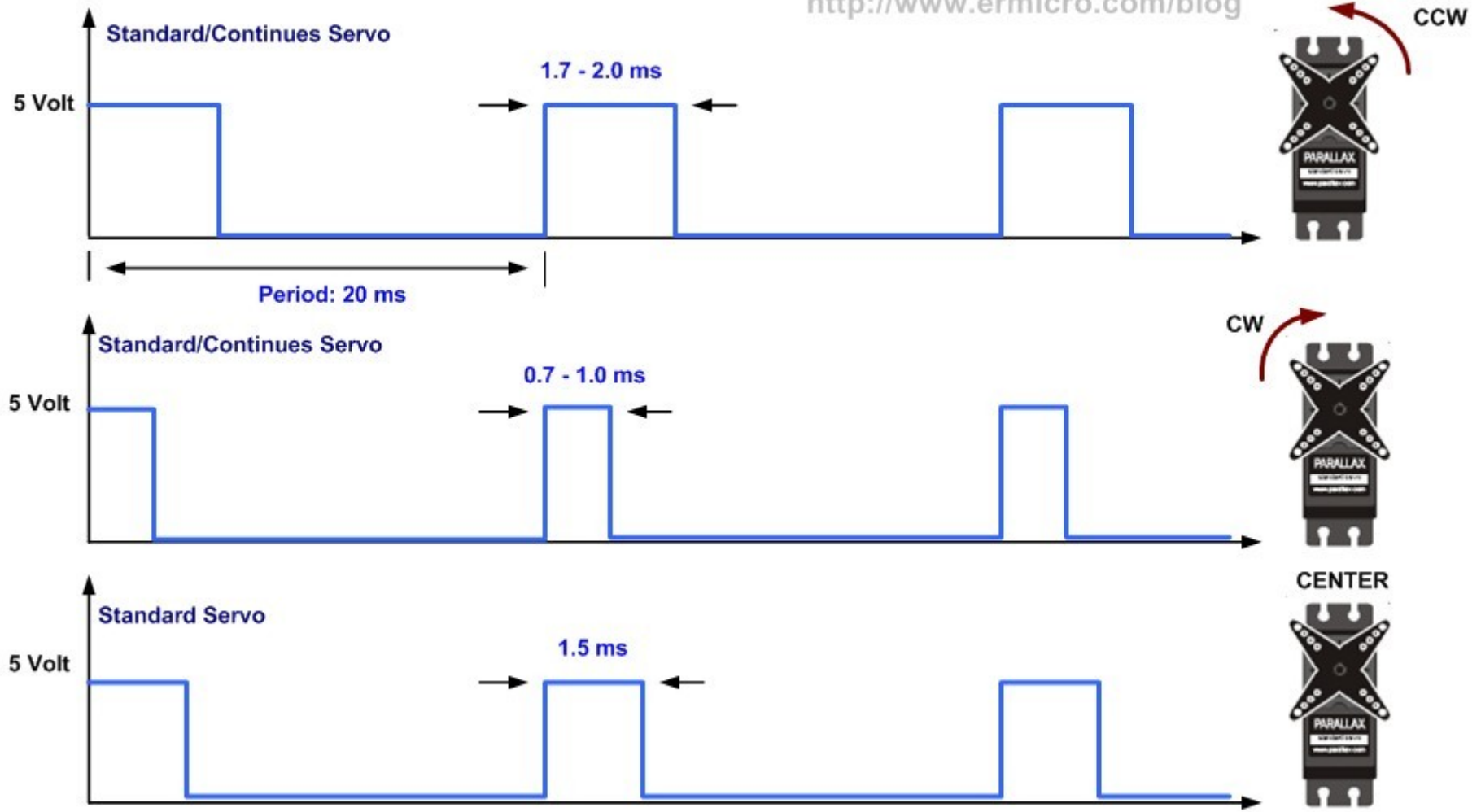
<http://datasheet.sparkgo.com.br/SG90Servo.pdf>



Arduino i Raspberry Pi

Servo

<http://www.ermicro.com/blog>



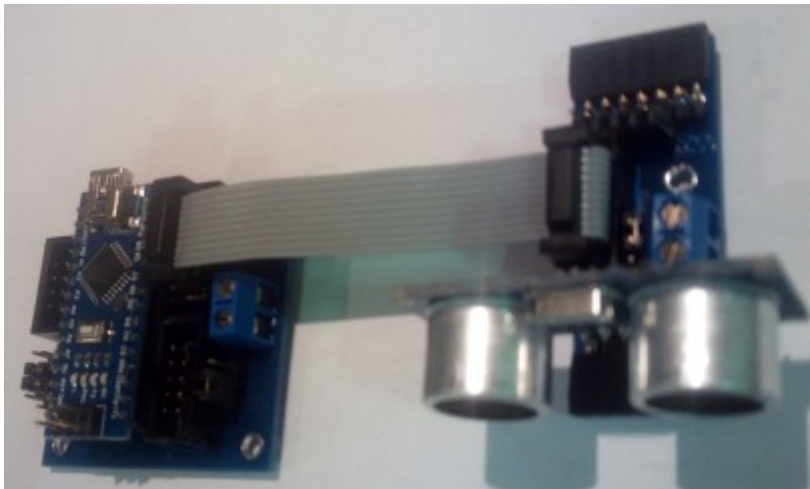
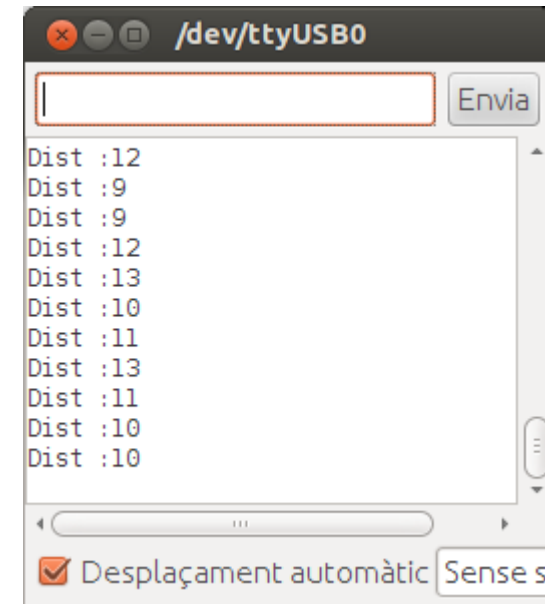
Servo Motor PWM Timing Diagram

http://www.ermicro.com/blog/wp-content/uploads/2009/02/servo_01.jpg



Arduino i Raspberry Pi

pr05ultrasons.abp Mesura ultrasònica



<http://www.binefa.cat/php/arduino/ardublock/pr05ultrasons.abp>

<http://www.binefa.cat/php/doc/pr002/>



Arduino i Raspberry Pi

Exercici Ultrasons + Servo

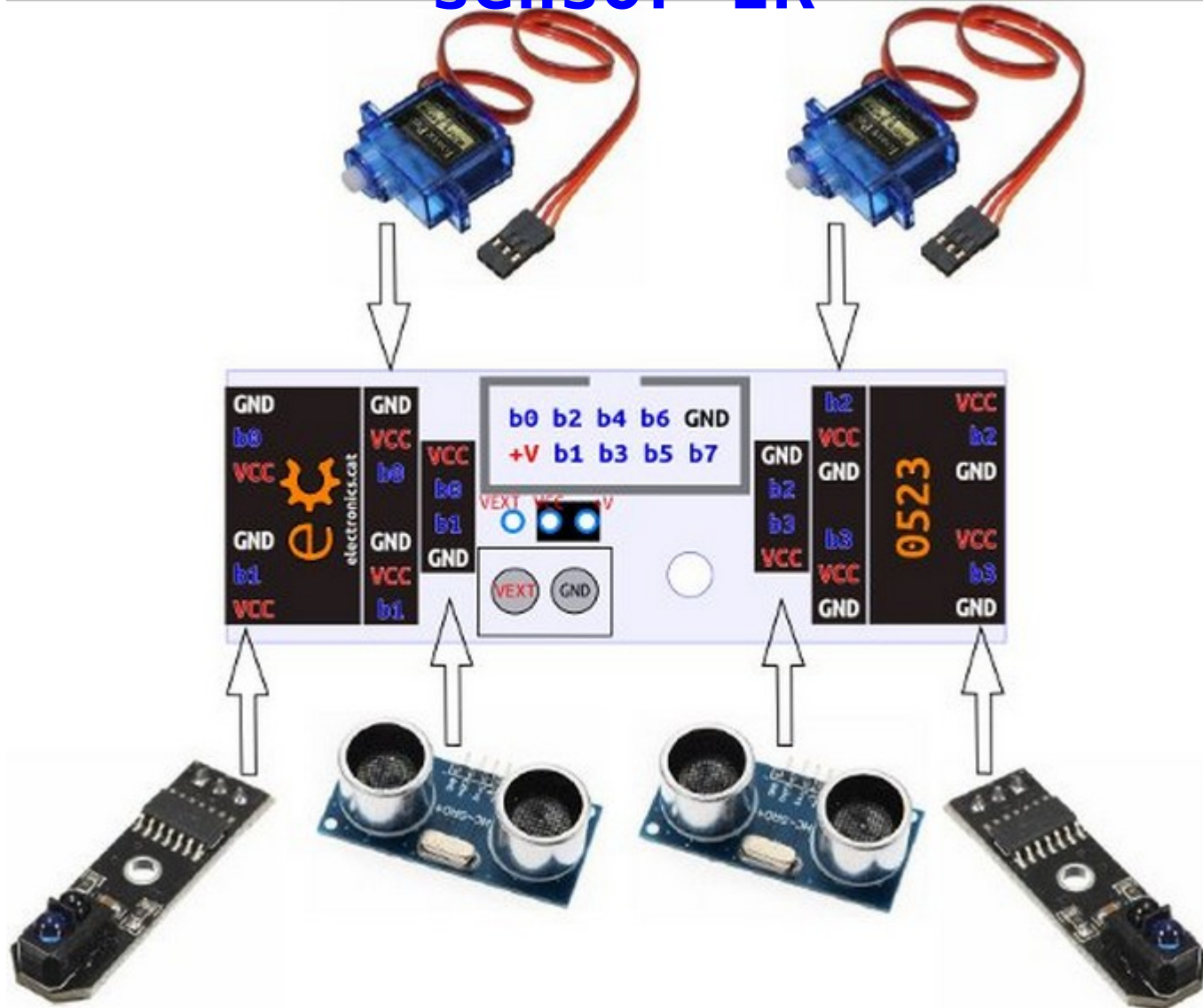
Emprant l'ArduBlock feu que el servo es mogui en funció de la distància llegida pels ultrasons.

Haureu de tenir en compte que el servo accepta un valor mínim i un màxim.



Arduino i Raspberry Pi

Connexions a la placa 0523 – Connexió sensor IR





Arduino i Raspberry Pi

Exercici Ultrasons + Servo + sensor IR

Emprant l'ArduBlock feu que el servo es mogui en funció de la distància llegida pels ultrasons, en cas de que el sensor d'infrarojos detecti presència.

Haureu de tenir en compte que el servo accepta un valor mínim i un màxim.



Arduino i Raspberry Pi

Arduino Nano + LCD + Joystick + Servo

```
#include <LiquidCrystal.h>
#include <Servo.h>

LiquidCrystal lcd(16, 17, 4, 5, 6, 7); // P1
//LiquidCrystal lcd(8,9,10,11,12,13); // P2
Servo servo1; Servo servo2;

const int buttonPin = 8;
//const int buttonPin = 16;
int analogPinX = 5, analogPinY = 4;
//int analogPinX = 0, analogPinY = 1;
int buttonState = 0;

void setup() {
  // set up the LCD's number of columns and rows:
  lcd.begin(16, 2);
  lcd.print("electronics.cat");
  pinMode(buttonPin, INPUT);
  servo1.attach(10);
  servo2.attach(11);
  servo1.write(90);
  servo2.write(90);
}
```

```
unsigned long int nAnalogValue2Degrees(unsigned long int nAnalogValue){
  return (nAnalogValue * 180) / 1023;
}

void loop() {
  buttonState = digitalRead(buttonPin);
  unsigned long int degX = nAnalogValue2Degrees(analogRead(analogPinX));
  unsigned long int degY = nAnalogValue2Degrees(analogRead(analogPinY));
  // set the cursor to column 0, line 1 (note: line 1 is the second row, since counting begins from 0)
  lcd.setCursor(0, 1);
  if (buttonState == HIGH) {
    lcd.print("F ");
  } else {
    lcd.print("N ");
  }
  lcd.print("X:"); lcd.print(degX); lcd.print("d Y:"); lcd.print(degY); lcd.print("d ");
  servo1.write(degX);
  servo2.write(degY);
}
```



<http://www.binefa.cat/php/doc/lcdJsServo/>

<http://www.binefa.cat/php/arduino/ardublock/lcdJsServo/lcdJsServo.ino>



Arduino i Raspberry Pi

Arduino Nano + LCD + Joystick + Servo

```
#include <LiquidCrystal.h>
#include <Servo.h>

LiquidCrystal lcd(16, 17, 4,5, 6, 7); // P1
//LiquidCrystal lcd(8,9,10,11,12,13); // P2
Servo servol; Servo servo2;

const int buttonPin = 8;
//const int buttonPin = 16;
int analogPinX = 5,analogPinY = 4;
//int analogPinX = 0,analogPinY = 1;
int buttonState = 0;

void setup() {
  // set up the LCD's number of columns and rows:
  lcd.begin(16, 2);
  lcd.print("electronics.cat");
  pinMode(buttonPin, INPUT);
  servol.attach(10);
  servo2.attach(11);
  servol.write(90);
  servo2.write(90);
}
```

<http://www.binefa.cat/php/doc/lcdJsServo/>

<http://www.binefa.cat/php/arduino/ardublock/lcdJsServo/lcdJsServo.ino>



Arduino i Raspberry Pi

Arduino Nano + LCD + Joystick + Servo

```

unsigned long int nAnalogValue2Degrees(unsigned long int nAnalogValue){
    return (nAnalogValue * 180) / 1023;
}

void loop() {
    buttonState = digitalRead(buttonPin);
    unsigned long int degX = nAnalogValue2Degrees(analogRead(analogPinX));
    unsigned long int degY = nAnalogValue2Degrees(analogRead(analogPinY));
    // set the cursor to column 0, line 1 (note: line 1 is the second row, since counting begins with 0):
    lcd.setCursor(0, 1);
    if (buttonState == HIGH) {
        lcd.print("F ");
    }else{
        lcd.print("N ");
    }
    lcd.print("X:");lcd.print(degX); lcd.print("d  Y:");lcd.print(degY);lcd.print("d      ");
    servo1.write(degX);
    servo2.write(degY);
}

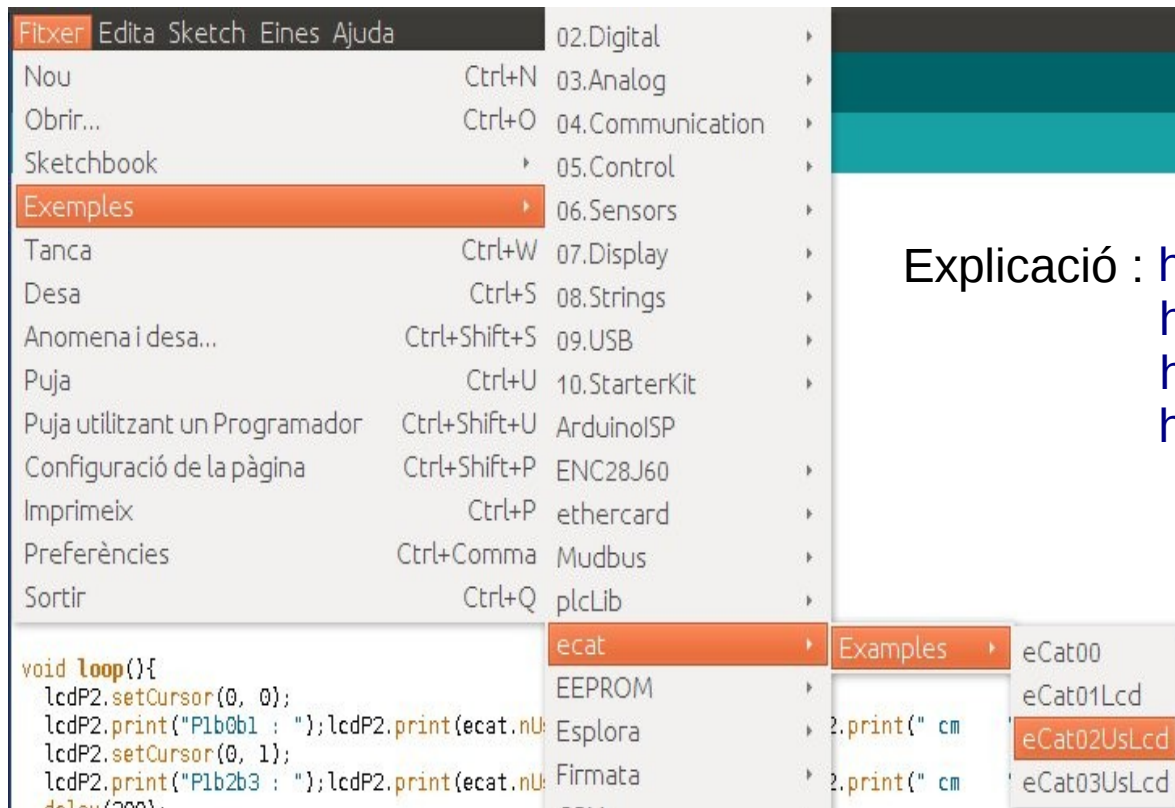
```



Arduino i Raspberry Pi

Biblioteca **ecat.h** per a l'IDE d'Arduino

<http://www.electronics.cat/doc/arduinoLib/ecat.zip>



Explicació : <http://www.binefa.cat/php/doc/lib-eCat01/>
<http://www.binefa.cat/php/doc/lib-eCat02/>
<http://www.binefa.cat/php/doc/lib-eCat03/>
<http://binefa.cat/blog/?p=140>



Arduino i Raspberry Pi

Biblioteca **ecat.h** per a l'IDE d'Arduino

<http://www.electronics.cat/doc/arduinoLib/ecat.zip>

Explicació : <http://www.binefa.cat/php/doc/lib-eCat01/>
<http://www.binefa.cat/php/doc/lib-eCat02/>
<http://www.binefa.cat/php/doc/lib-eCat03/>
<http://binefa.cat/blog/?p=140>

```

1  #include <ecat.h>
2
3  #define ROBOT_ATURAT      0
4  #define ROBOT_ENDAVANT    1
5  #define ROBOT_ENDARRERA   2
6  #define ROBOT_DRETA       3
7  #define ROBOT_ESQUERRA    4
8
9  String szMissatge;
10 Ecat ecat;
11 boolean bConnectat;
12 int nG,nA,nB,nEstatActual;
13
14 void setup(){
15     ecat.setupNibbleMode(NIBBLE_H_P1,OUTPUT);
16     ecat.vUltrasonicSensorP1b0b1_init();
17     pinMode(ecat.nPinP1B2,INPUT);
18     pinMode(ecat.nPinP1B3,INPUT);
19     pinMode(ecat.nPinP2B7,OUTPUT);
20     pinMode(ecat.nPinP2B6,INPUT);
21     pinMode(ecat.nPinP2B5,INPUT);
22     pinMode(ecat.nPinP2B4,INPUT);
23     ecat.setupNibbleMode(NIBBLE_L_P2,INPUT);
24     Serial.begin(9600);
25     nG = 150;
26     nA = nB = 30;
27     bConnectat = false;
28     nEstatActual = ROBOT_ATURAT;
29 }
30

```

<http://electronics.cat/downloads/code/robot08.ino>

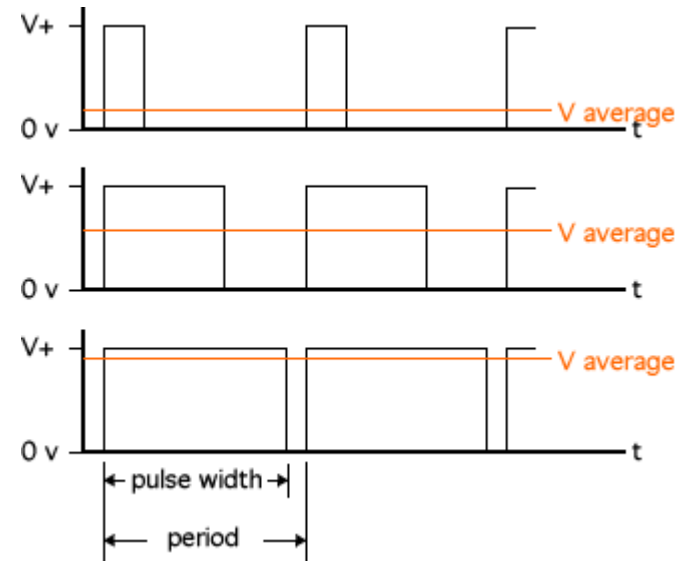
Arduino i Raspberry Pi

Modulació per amplitada de pols PWM

```

31 int nPwmA(){
32     int nAux = nG + nA;
33     if(nAux > 255)
34         nAux = 255;
35     return nAux;
36 }
37
38 int nPwmB(){
39     int nAux = nG + nB;
40     if(nAux > 255)
41         nAux = 255;
42     return nAux;
43 }
44
45 void vRobotAturat(){
46     nEstatActual = ROBOT_ATURAT;
47     ecat.vWriteHighNibbleP1(0x00);
48 }
49
50 void vRobotEndavant(){
51     //ecat.vWriteHighNibbleP1(B00000110);
52     nEstatActual = ROBOT_ENDAVANT;
53     digitalWrite(ecat.nPinP1B4, LOW);
54     analogWrite(ecat.nPinP1B5, nPwmA());
55     analogWrite(ecat.nPinP1B6, nPwmB());
56     digitalWrite(ecat.nPinP1B7, LOW);
57 }

```





Arduino i Raspberry Pi

Preparant la comunicació BlueTooth

```
#include <ecat.h>

Ecat ecat;
boolean bP2B0;

void setup(){
  pinMode(ecat.nPinP2B7, OUTPUT);
  pinMode(ecat.nPinP2B0, INPUT);
  Serial.begin(9600);
  bP2B0 = digitalRead(ecat.nPinP2B0);
}

void loop(){
  String szMsg;

  while(Serial.available()){
    delay(3);
    char c = Serial.read();
    szMsg += c;
  }
  if(szMsg == "n"){
    digitalWrite(ecat.nPinP2B7, HIGH);
  }
  if(szMsg == "f"){
    digitalWrite(ecat.nPinP2B7, LOW);
  }
  if(bP2B0 != digitalRead(ecat.nPinP2B0)){
    bP2B0 = digitalRead(ecat.nPinP2B0);
    if(bP2B0){
      Serial.println("P2B0 HIGH");
    }else{
      Serial.println("P2B0 LOW");
    }
  }
  szMsg = "";
}
```



<http://electronics.cat/doc/hc06/bluetooth04.ino>

Arduino i Raspberry Pi

Preparant la comunicació Bluetooth

```
#include <ecat.h>

Ecat ecat;
boolean bP2B0;

void setup(){
  pinMode(ecat.nPinP2B7, OUTPUT);
  pinMode(ecat.nPinP2B0, INPUT);
  Serial.begin(9600);
  bP2B0 = digitalRead(ecat.nPinP2B0);
}
```

Arduino i Raspberry Pi

Preparant la comunicació Bluetooth

```
void loop(){
  String szMsg;

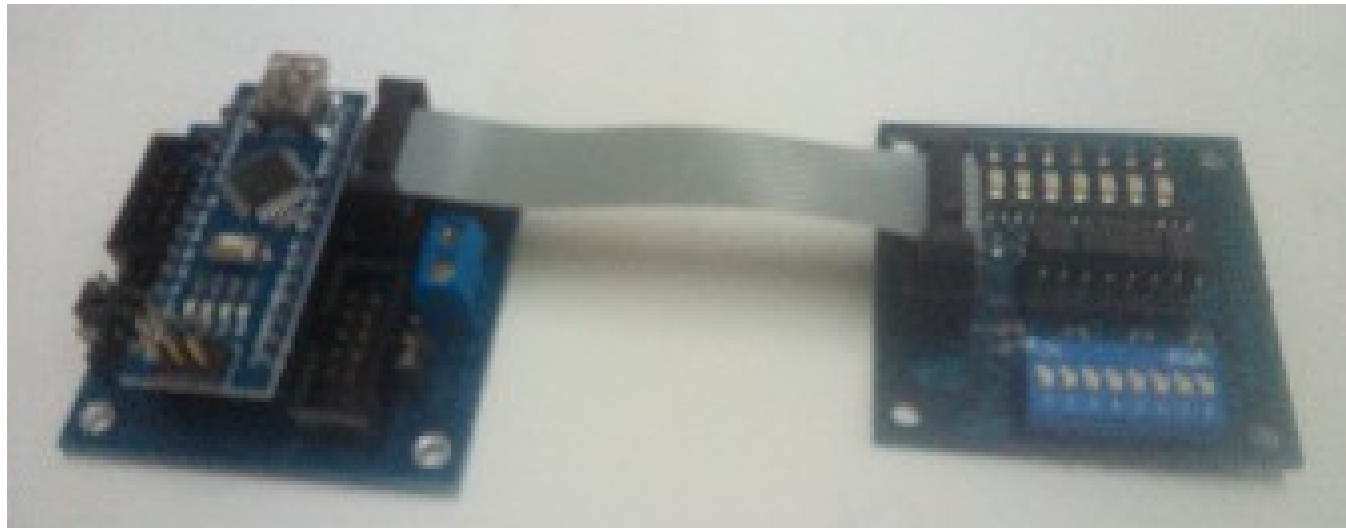
  while(Serial.available()){
    delay(3);
    char c = Serial.read();
    szMsg += c;
  }
  if(szMsg == "n"){
    digitalWrite(ecat.nPinP2B7,HIGH);
  }
  if(szMsg == "f"){
    digitalWrite(ecat.nPinP2B7,LOW);
  }
  if(bP2B0 != digitalRead(ecat.nPinP2B0)){
    bP2B0 = digitalRead(ecat.nPinP2B0);
    if(bP2B0){
      Serial.println("P2B0 HIGH");
    }else{
      Serial.println("P2B0 LOW");
    }
  }
  szMsg = "";
}
```

<http://electronics.cat/doc/hc06/bluetooth04.ino>

Arduino i Raspberry Pi

Preparant la comunicació BlueTooth

Verifiquen el funcionament del programa bluetooth04.ino interactuant amb qualsevol dels programes de comunicacions que coneixeu



<http://electronics.cat/doc/hc06/bluetooth04.ino>



Arduino i Raspberry Pi

App Inventor

MIT App Inventor | Explore MIT App Inventor - Mozilla Firefox

MIT App Inventor | E... x

appinventor.mit.edu/explore/

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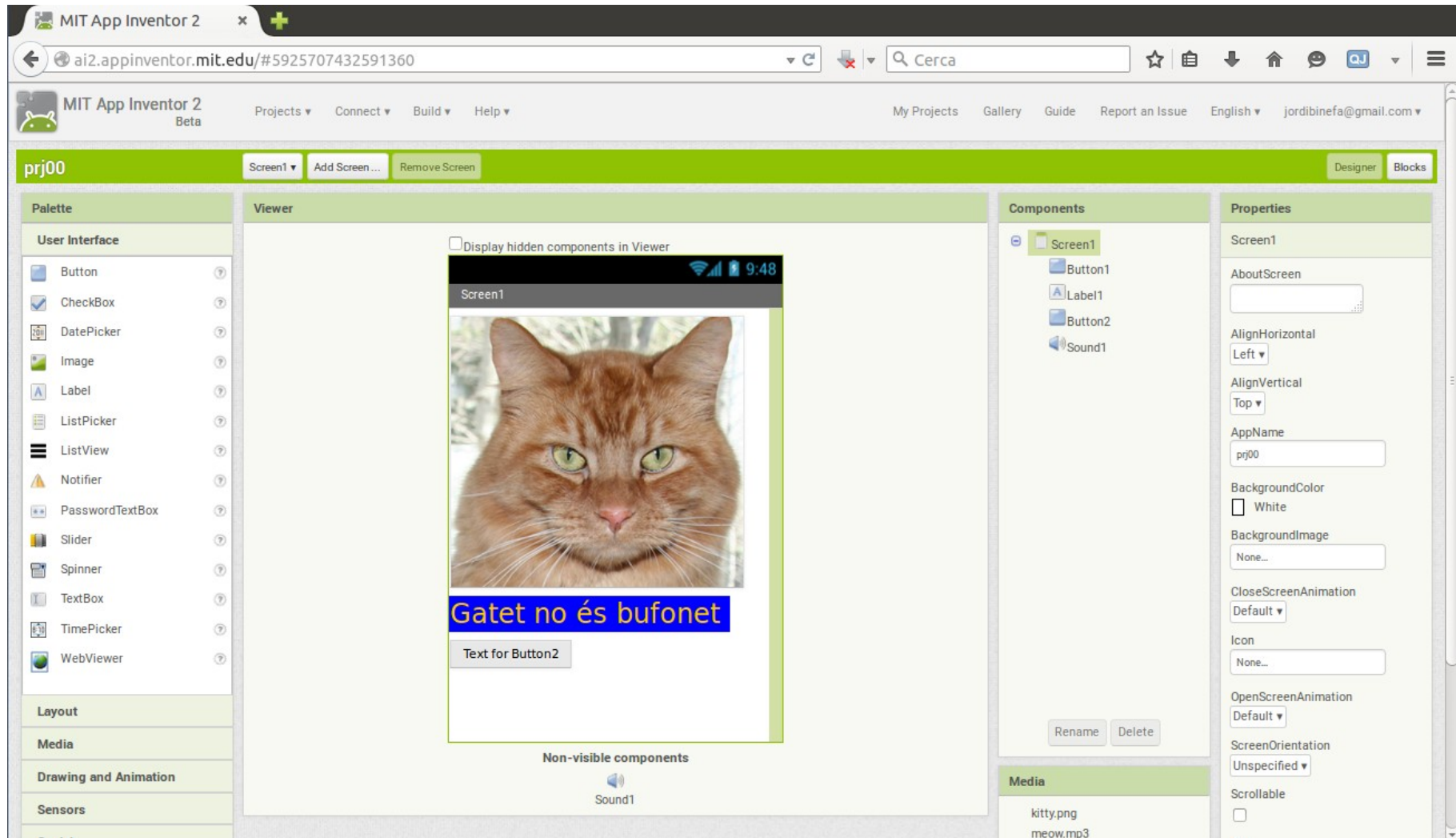
MIT App Inventor @MITAppInventor 6h

<http://appinventor.mit.edu/>



Arduino i Raspberry Pi

App Inventor

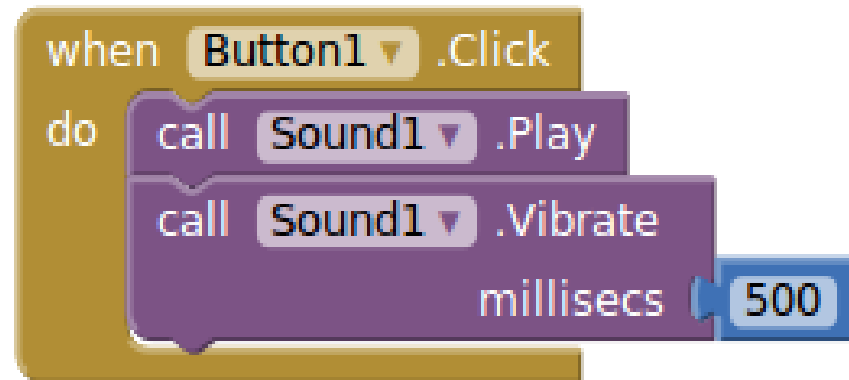


<http://binefa.cat/php/appinventor/prj00.aia>



Arduino i Raspberry Pi

App Inventor



<http://binefa.cat/php/appinventor/prj00.aia>



Arduino i Raspberry Pi

App Inventor

Un cop us heu validat a l'App Inventor, importeu l'arxiu prj00.aia -Projects / Import projects (.aia) from my computer- i genereu l'arxiu prj00.apk -Build / App (save .apk to my computer)-.

Un cop generat l'arxiu .apk el passeu al vostre mòbil Android fent servir el cable USB, trametent-lo mitjançant correu electrònic o anant a l'adreça de sota mitjançant el vostre navegador.

A l'hora de fer la instal·lació el telèfon us avisarà de que la font del programa no és l'estàndard. Temporalment, doneu al vostre mòbil permisos per a fer una instal·lació des de font desconeguda.

Verifiquen el seu funcionament.

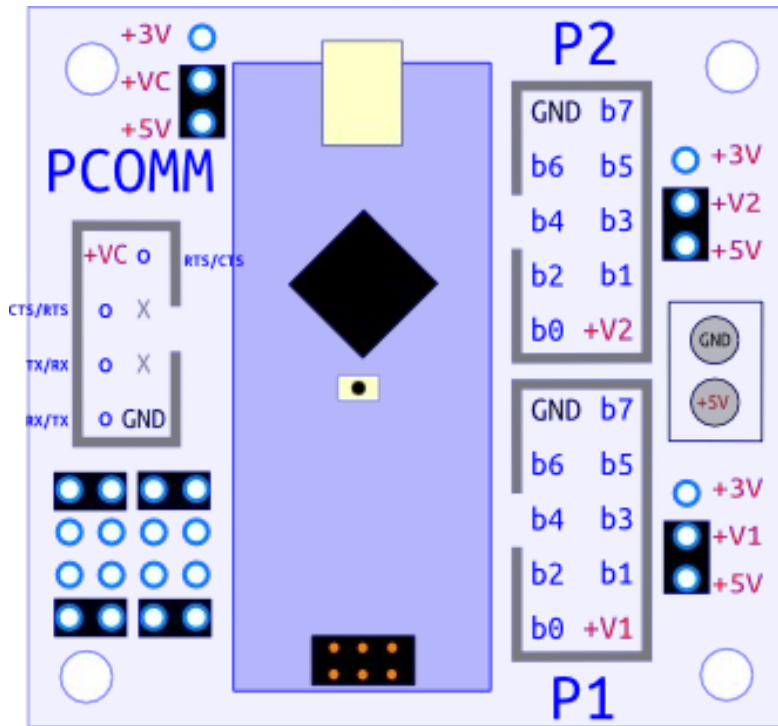
<http://binefa.cat/php/appinventor/prj00.aia>


<http://binefa.cat/php/appinventor/prj00.apk>



Arduino i Raspberry Pi

Comunicació mitjançant Bluetooth



- Carregueu bluetooth04.ino a l'Arduino Nano
- Desconnecteu cable mini-USB de l'Arduino Nano
- Alimenteu separatament la placa nano-eCat (cal tornavís)
- Assegureu-vos de la posició dels ponts (jumpers) de comunicació
- Preneu nota del número identificador de Bluetooth
- Connecteu placa set0525 a la nano-eCat
- Vinculeu el dispositiu BlueTooth al vostre mòbil Android (contrasenya : 1234)
- Proveu el fi  direccional

<http://electronics.cat/doc/hc06/bluetooth04.ino>
http://electronics.cat/doc/hc06/HC06_04b.aia
http://electronics.cat/doc/hc06/HC06_04b.apk



Arduino i Raspberry Pi

Com trobar pel terminal el número ID del
Bluetooth

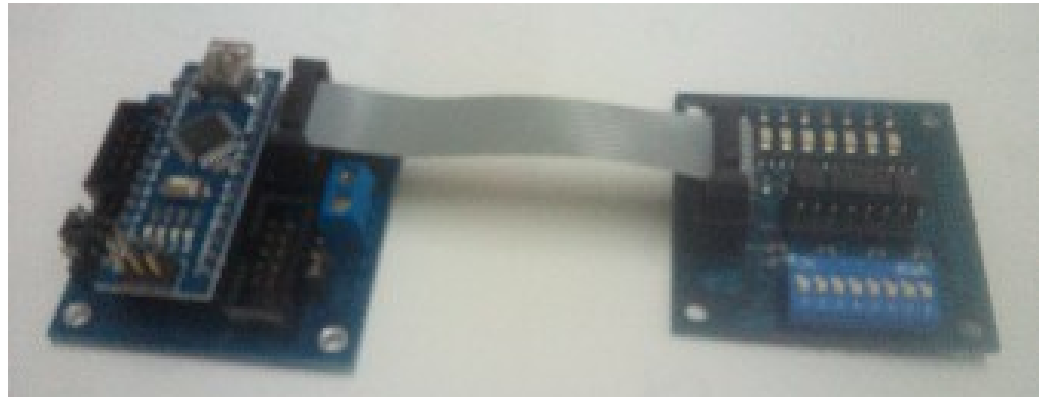
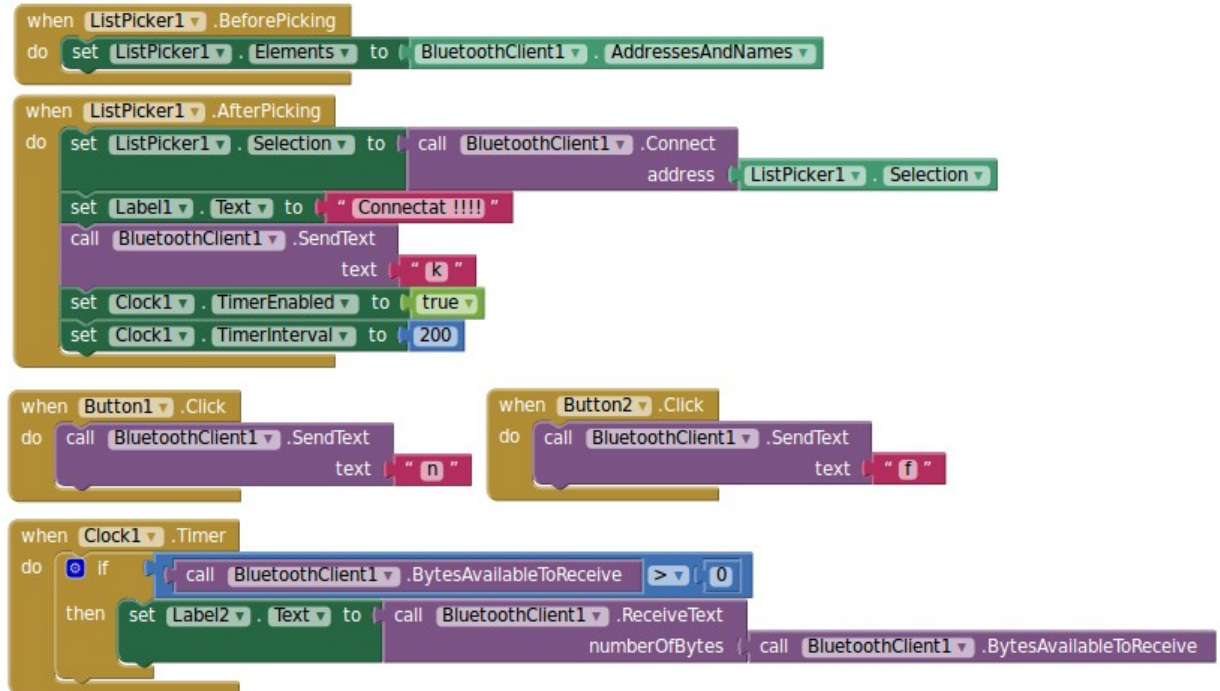
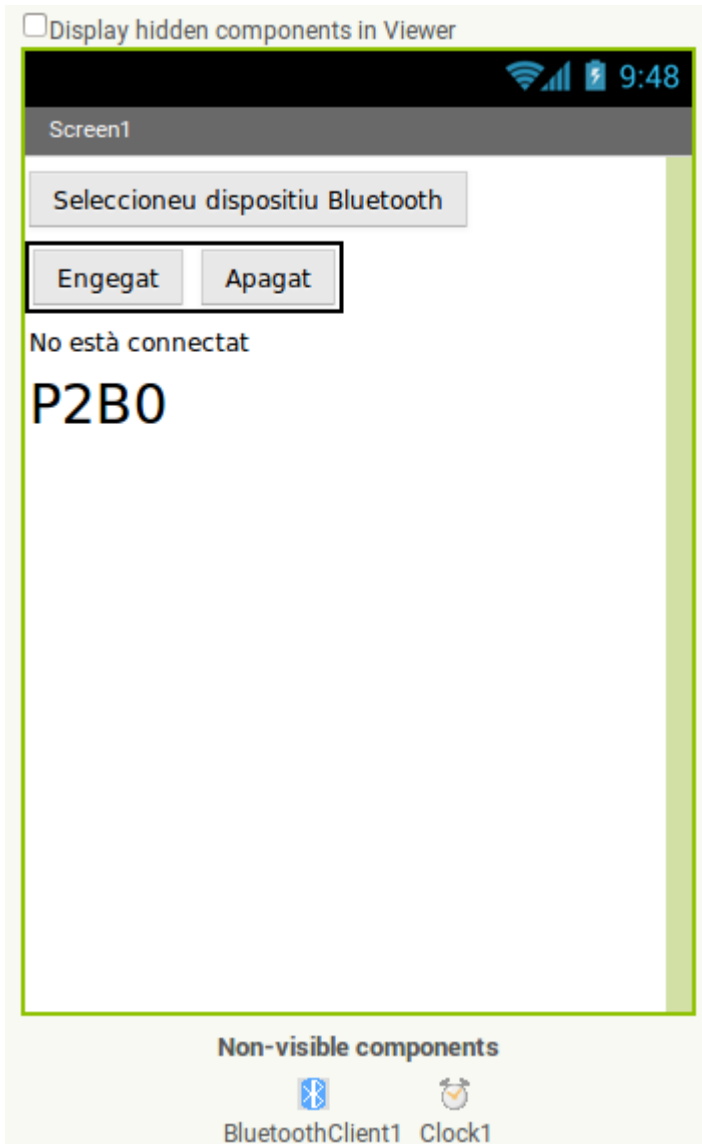
```
$ hcitool scan  
Scanning ...  
98:D3:31:30:2C:0D HC-06
```





Arduino i Raspberry Pi

App Inventor - Comunicació mitjançant Bluetooth





Arduino i Raspberry Pi

App Inventor - Comunicació mitjançant Bluetooth

```

when ListPicker1.BeforePicking
do
  set ListPicker1.Elements to BluetoothClient1.AddressesAndNames

when ListPicker1.AfterPicking
do
  set ListPicker1.Selection to call BluetoothClient1.Connect
    address ListPicker1.Selection
  set Label1.Text to "Connectat !!!! "
  call BluetoothClient1.SendText
    text "k"
  set Clock1.TimerEnabled to true
  set Clock1.TimerInterval to 200

when Button1.Click
do
  call BluetoothClient1.SendText
    text "n"

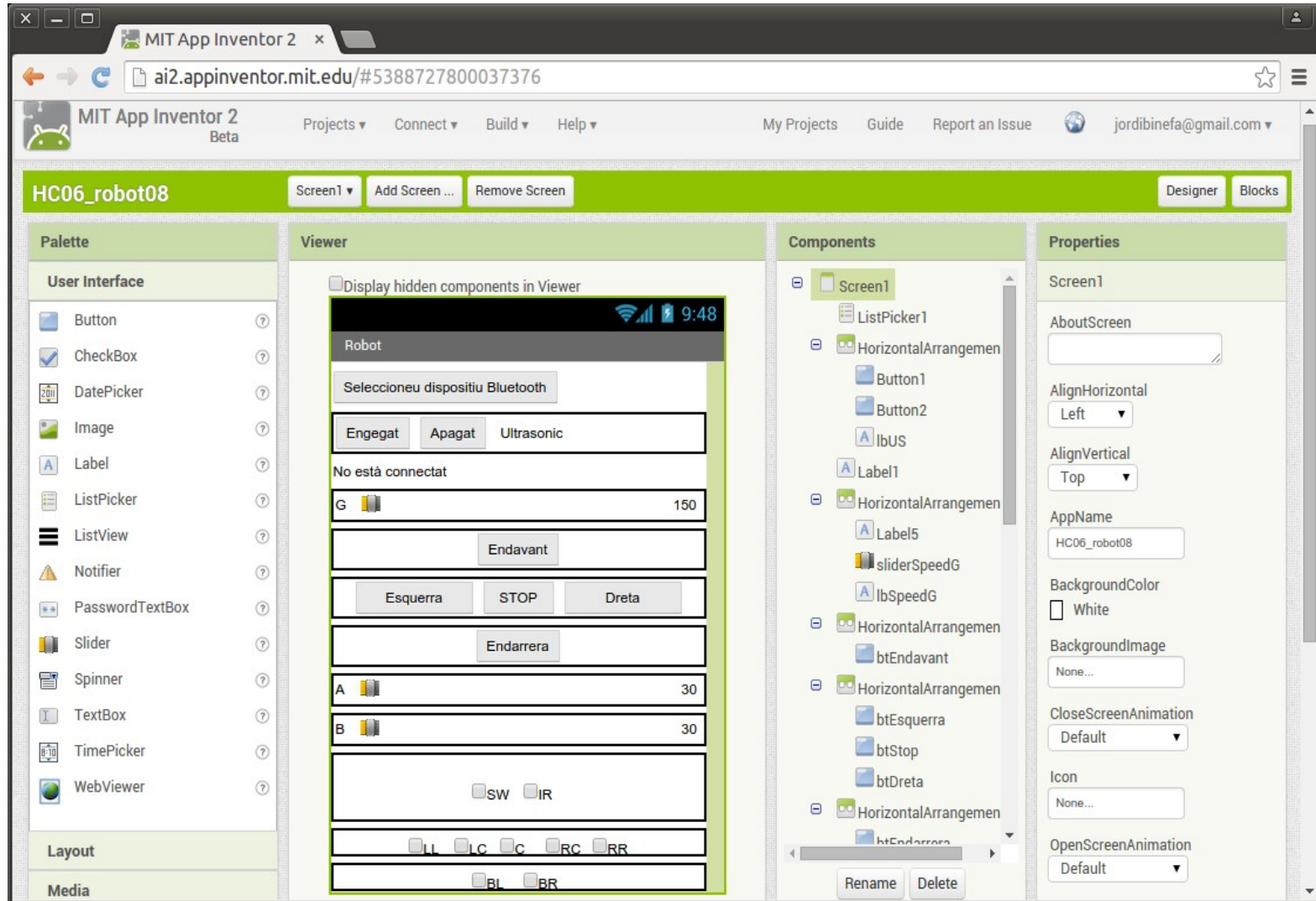
when Button2.Click
do
  call BluetoothClient1.SendText
    text "f"

when Clock1.Timer
do
  if call BluetoothClient1.BytesAvailableToReceive > 0
  then
    set Label2.Text to call BluetoothClient1.ReceiveText
      numberOfBytes call BluetoothClient1.BytesAvailableToReceive
  
```



Arduino i Raspberry Pi

Programar al mòbil Android – App Inventor

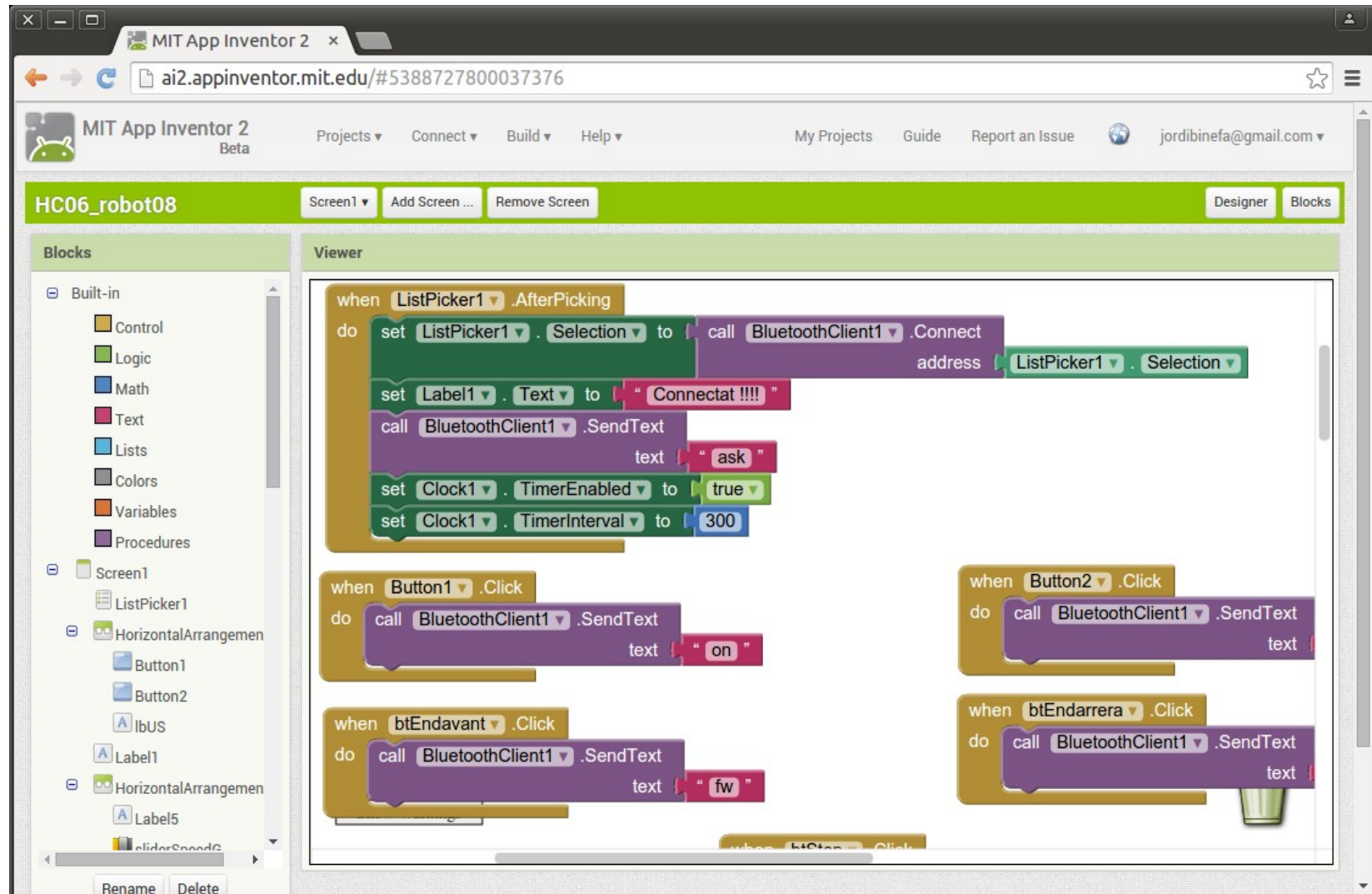


<http://appinventor.mit.edu/>



Arduino i Raspberry Pi

Programar al mòbil Android – App Inventor



http://electronics.cat/downloads/code/HC06_robot08.aia

<http://appinventor.mit.edu/>



Arduino i Raspberry Pi

Arduino i App Inventor - Comunicació

```
147 void vManageMsg(){
148     vSliders();
149     if(szMissatge == "on"){
150         //digitalWrite(ecat.nPinP2B7,HIGH);
151         analogWrite(ecat.nPinP2B7,nG);
152     }
153     if(szMissatge == "off"){
154         digitalWrite(ecat.nPinP2B7,LOW);
155     }
156     if(szMissatge == "ask"){
157         bConnectat = true;
158         vInformaSensors();
159     }
160     if(szMissatge == "fw"){
161         vRobotEndavant();
162     }
163     if(szMissatge == "bw"){
164         vRobotEndarrera();
165     }
166     if(szMissatge == "st"){
167         vRobotAturat();
168     }
169     if(szMissatge == "le"){
170         vRobotEsquerra();
171     }
172     if(szMissatge == "ri"){
173         vRobotDreta();
174     }
175 }
```

<http://electronics.cat/downloads/code/robot08.ino>

http://electronics.cat/downloads/code/HC06_robot08.aia

Torn de preguntes ...



... i sessió pràctica.



Arduino i Raspberry Pi

Presentació descarregable a : <http://binefa.cat/blog>

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<https://twitter.com/JordiBinefa>

<https://twitter.com/electronicscat>



<http://es.linkedin.com/pub/jordi-binefa/13/717/90b>

Plaques aviat disponibles a :

<http://www.electronics.cat>

<http://www.makeit.cat>

Moltes gràcies per la vostra atenció