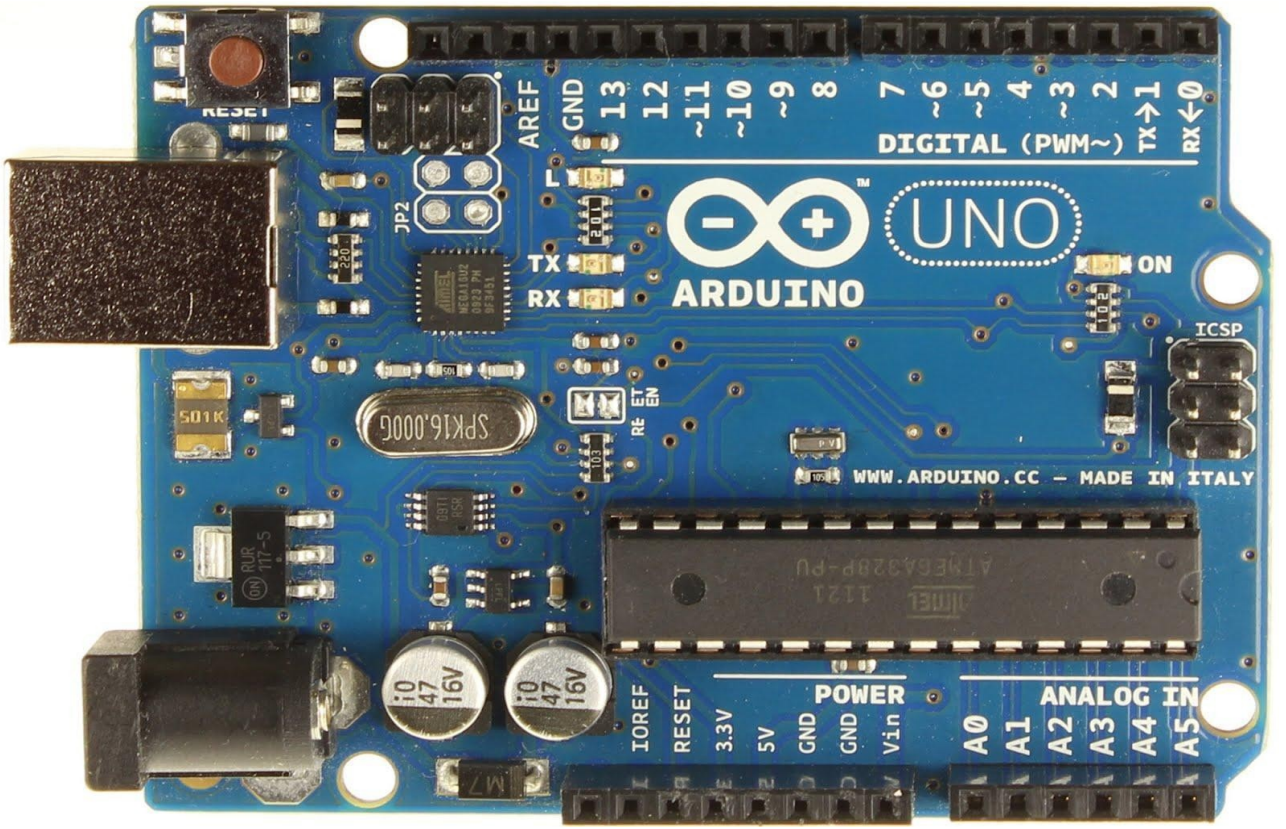


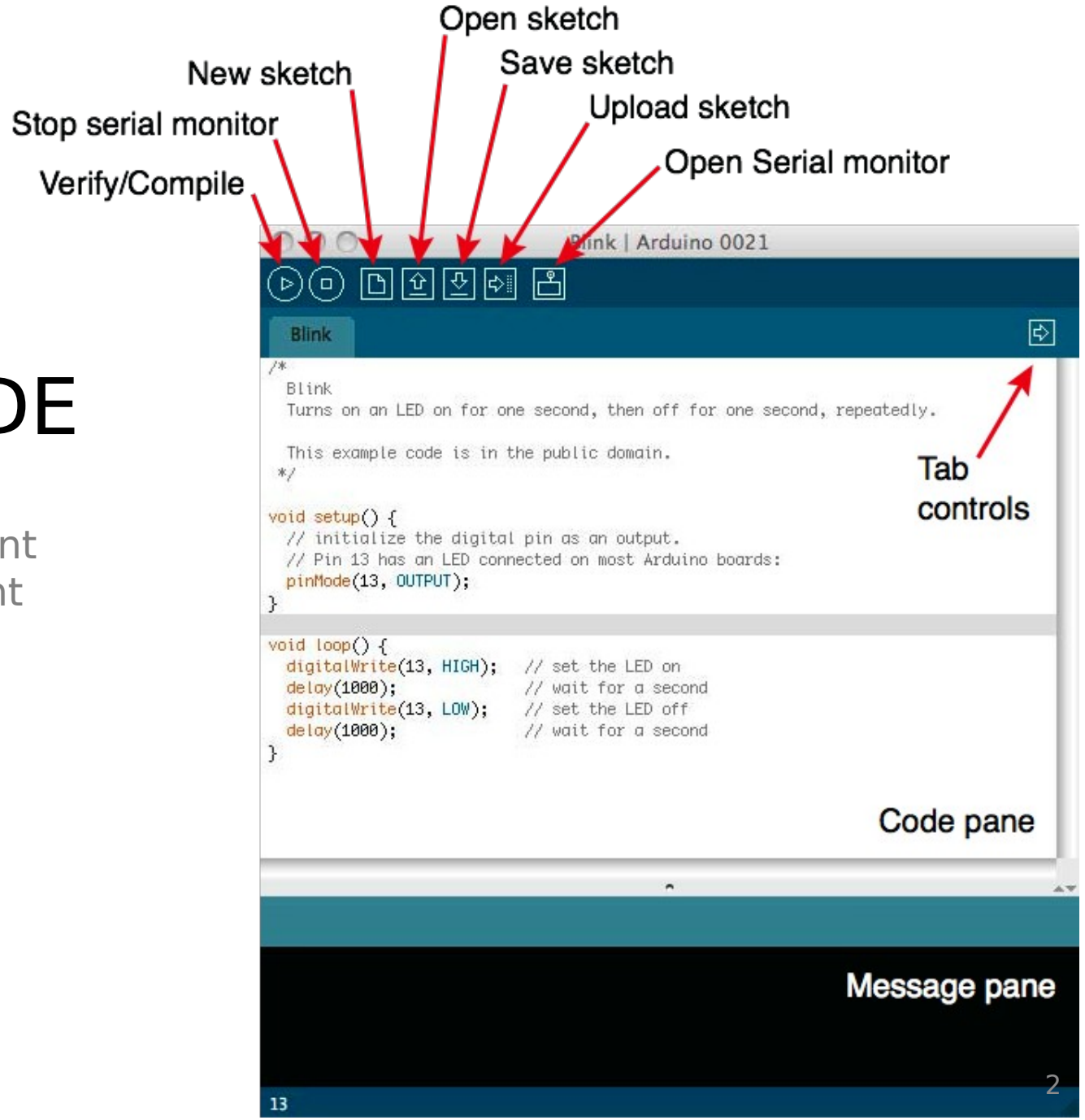
Programando nuestro arduino

Alberto Labarga – Experimental Serendipity S.L.

Laboratorio de Fabricación Digital, Mutilva, 21 de Febrero de 2014

Arduino IDE

IDE = Integrated Development Environment



http://arduino.cc/es/main/software

Programando nuestro arduino

// (single line comment)
It is often useful to write notes to yourself as you go along about what each line of code does. To do this type two back slashes and everything until the end of the line will be ignored by your program.

/* */ (multi line comment)
If you have a lot to say you can span several lines as a comment. Everything between these two symbols will be ignored in your program.

{ } (curly brackets)
Used to define when a block of code starts and ends (used in functions as well as loops)

; (semicolon)
Each line of code must be ended with a semicolon (a missing semicolon is often the reason for a programme refusing to compile)

Variables

Variables

A program is nothing more than instructions to move numbers around in an intelligent way. Variables are used to do the moving

int (integer)
The main workhorse, stores a number in 2 bytes (16 bits). Has no decimal places and will store a value between -32,768 and 32,768.

long (long)
Used when an integer is not large enough. Takes 4 bytes (32 bits) of RAM and has a range between -2,147,483,648 and 2,147,483,648.

boolean (boolean)
A simple True or False variable. Useful because it only uses one bit of RAM.

float (float)
Used for floating point math (decimals). Takes 4 bytes (32 bits) of RAM and has a range between -3.4028235E+38 and 3.4028235E+38.

char (character)
Stores one character using the ASCII code (ie 'A' = 65). Uses one byte (8 bits) of RAM. The Arduino handles strings as an array of char's

Operadores matemáticos

Maths Operators

Operators used for manipulating numbers. (they work like simple maths)

- **=** (assignment) makes something equal to something else (eg. x = 10 * 2 (x now equals 20))
- **%** (modulo) gives the remainder when one number is divided by another (ex. 12 % 10 (gives 2))
- **+** (addition)
- **-** (subtraction)
- ***** (multiplication)
- **/** (division)

Comparison Operators

Operators used for logical comparison

- **==** (equal to) (eg. 12 == 10 is FALSE or 12 == 12 is TRUE)
- **!=** (not equal to) (eg. 12 != 10 is TRUE or 12 != 12 is FALSE)
- **<** (less than) (eg. 12 < 10 is FALSE or 12 < 12 is FALSE or 12 < 14 is TRUE)
- **>** (greater than) (eg. 12 > 10 is TRUE or 12 > 12 is FALSE or 12 > 14 is FALSE)

Estructuras de control

Control Structure

Programs are reliant on controlling what runs next, here are the basic control elements (there are many more online)

```
if(condition){ }
else if( condition ){ }
else { }
```

This will execute the code between the curly brackets if the condition is true, and if not it will test the `else if` condition if that is also false the `else` code will execute.

```
for(int i = 0; i <
#repeats; i++){   }
```

Used when you would like to repeat a chunk of code a number of times (can count up i++ or down i-- or use any variable)

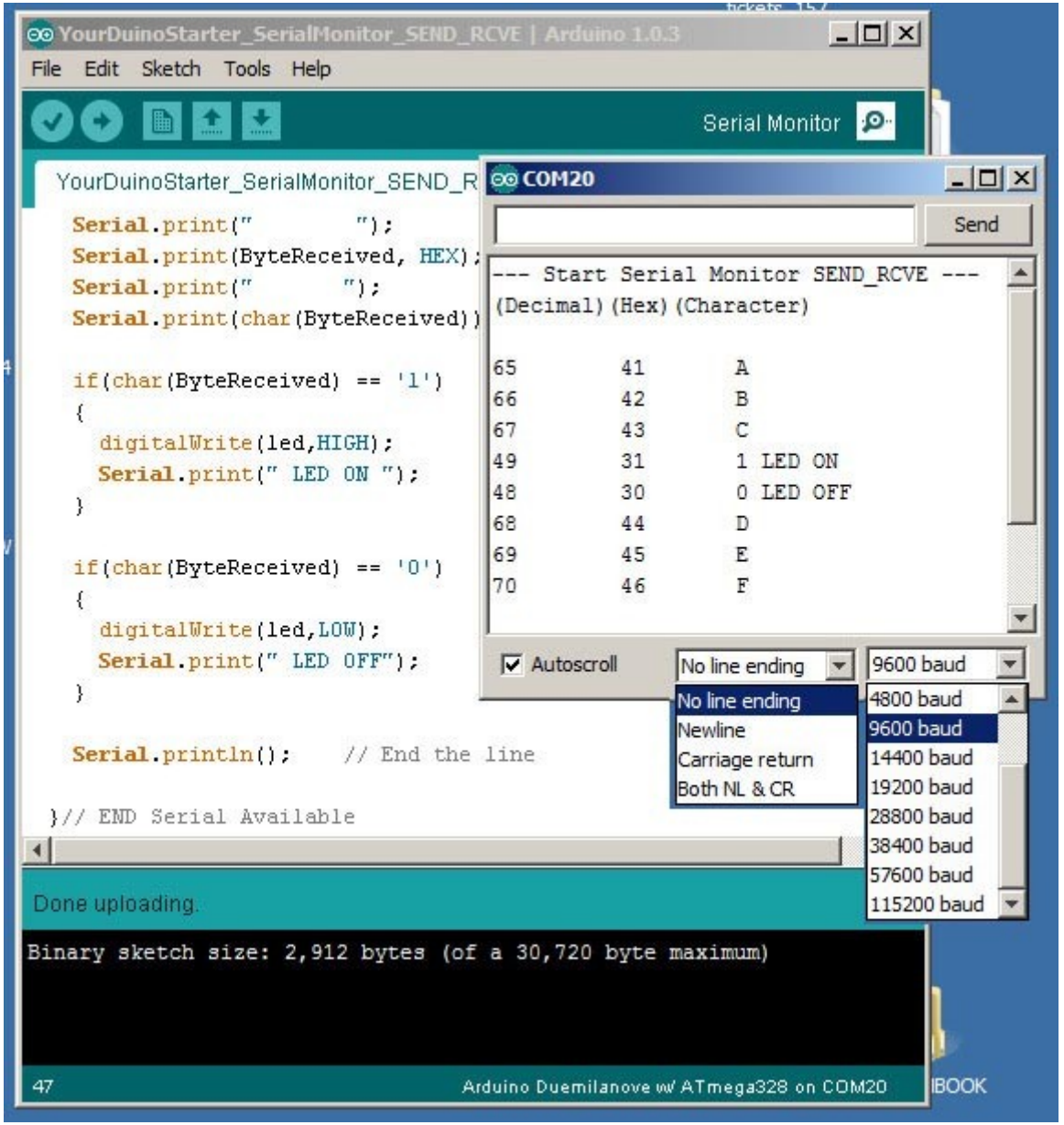
Podemos crear funciones

```
int mi_funcion(int param1, int param2)
{
//Código de nuestra función
}
```

Comunicación Serie

- Inicialización
  - Serial.begin(speed)
  - Habitualmente se hace en setup()
- Leer
  - Serial.available()
  - Serial.read()
- Escribir
  - Serial.write(val)
  - Serial.print(val)
  - Serial.println(val)
  - Donde val puede ser un número, una cadena o una variable

Comunicación Serie



Código binario

000 = 0

001 = 1

010 = 2

011 = 3

100 = 4

101 = 5

110 = 6

111 = 7

Podemos representar 2^n

El código ASCII

sigla en inglés de American Standard Code for Information Interchange
(Código Estadounidense Estándar para el Intercambio de Información)

www.elcodigoascii.com.ar

Caracteres de control ASCII

DEC	HEX	Simbolo ASCII	
00	00h	NULL	(carácter nulo)
01	01h	SOH	(inicio encabezado)
02	02h	STX	(inicio texto)
03	03h	ETX	(fin de texto)
04	04h	EOT	(fin transmisión)
05	05h	ENQ	(enquiry)
06	06h	ACK	(acknowledgement)
07	07h	BEL	(timbre)
08	08h	BS	(retroceso)
09	09h	HT	(tab horizontal)
10	0Ah	LF	(salto de linea)
11	0Bh	VT	(tab vertical)
12	0Ch	FF	(form feed)
13	0Dh	CR	(retorno de carro)
14	0Eh	SO	(shift Out)
15	0Fh	SI	(shift In)
16	10h	DLE	(data link escape)
17	11h	DC1	(device control 1)
18	12h	DC2	(device control 2)
19	13h	DC3	(device control 3)
20	14h	DC4	(device control 4)
21	15h	NAK	(negative acknowle.)
22	16h	SYN	(synchronous idle)
23	17h	ETB	(end of trans. block)
24	18h	CAN	(cancel)
25	19h	EM	(end of medium)
26	1Ah	SUB	(substitute)
27	1Bh	ESC	(escape)
28	1Ch	FS	(file separator)
29	1Dh	GS	(group separator)
30	1Eh	RS	(record separator)
31	1Fh	US	(unit separator)
127	20h	DEL	(delete)

Caracteres ASCII imprimibles

DEC	HEX	Simbolo	DEC	HEX	Simbolo	DEC	HEX	Simbolo
32	20h	espacio	64	40h	@	96	60h	`
33	21h	!	65	41h	A	97	61h	a
34	22h	"	66	42h	B	98	62h	b
35	23h	#	67	43h	C	99	63h	c
36	24h	$	68	44h	D	100	64h	d
37	25h	%	69	45h	E	101	65h	e
38	26h	&	70	46h	F	102	66h	f
39	27h	'	71	47h	G	103	67h	g
40	28h	(	72	48h	H	104	68h	h
41	29h	)	73	49h	I	105	69h	i
42	2Ah	*	74	4Ah	J	106	6Ah	j
43	2Bh	+	75	4Bh	K	107	6Bh	k
44	2Ch	,	76	4Ch	L	108	6Ch	l
45	2Dh	-	77	4Dh	M	109	6Dh	m
46	2Eh	.	78	4Eh	N	110	6Eh	n
47	2Fh	/	79	4Fh	O	111	6Fh	o
48	30h	0	80	50h	P	112	70h	p
49	31h	1	81	51h	Q	113	71h	q
50	32h	2	82	52h	R	114	72h	r
51	33h	3	83	53h	S	115	73h	s
52	34h	4	84	54h	T	116	74h	t
53	35h	5	85	55h	U	117	75h	u
54	36h	6	86	56h	V	118	76h	v
55	37h	7	87	57h	W	119	77h	w
56	38h	8	88	58h	X	120	78h	x
57	39h	9	89	59h	Y	121	79h	y
58	3Ah	:	90	5Ah	Z	122	7Ah	z
59	3Bh	;	91	5Bh	[	123	7Bh	{
60	3Ch	<	92	5Ch	\	124	7Ch	|
61	3Dh	=	93	5Dh	]	125	7Dh	}
62	3Eh	>	94	5Eh	^	126	7Eh	~
63	3Fh	?	95	5Fh	_			

elCodigoASCII.com.ar

ASCII extendido

DEC	HEX	Simbolo	DEC	HEX	Simbolo	DEC	HEX	Simbolo	DEC	HEX	Simbolo
128	80h	Ç	160	A0h	á	192	C0h	└	224	E0h	Ó
129	81h	ü	161	A1h	í	193	C1h	┴	225	E1h	ß
130	82h	é	162	A2h	ó	194	C2h	┬	226	E2h	Ô
131	83h	â	163	A3h	ú	195	C3h	├	227	E3h	Ò
132	84h	ä	164	A4h	ñ	196	C4h	─	228	E4h	õ
133	85h	à	165	A5h	Ñ	197	C5h	┼	229	E5h	Õ
134	86h	å	166	A6h	ª	198	C6h	ã	230	E6h	µ
135	87h	ç	167	A7h	º	199	C7h	Ã	231	E7h	þ
136	88h	ê	168	A8h	¿	200	C8h	╚	232	E8h	Þ
137	89h	ë	169	A9h	®	201	C9h	╔	233	E9h	Ú
138	8Ah	è	170	AAh	¬	202	CAh	╩	234	EAh	Û
139	8Bh	ï	171	ABh	½	203	CBh	╦	235	EBh	Ù
140	8Ch	î	172	ACh	¼	204	CCh	╠	236	ECh	ý
141	8Dh	ì	173	ADh	¡	205	CDh	═	237	EDh	Ý
142	8Eh	Ä	174	AEh	«	206	CEh	╬	238	EEh	¯
143	8Fh	Å	175	AFh	»	207	CFh	¤	239	EFh	´
144	90h	É	176	B0h	░	208	D0h	ð	240	F0h	
145	91h	æ	177	B1h	▒	209	D1h	Ð	241	F1h	±
146	92h	Æ	178	B2h	▓	210	D2h	Ê	242	F2h	‗
147	93h	ô	179	B3h	│	211	D3h	Ë	243	F3h	¾
148	94h	ò	180	B4h	┤	212	D4h	È	244	F4h	¶
149	95h	ò	181	B5h	Á	213	D5h	ı	245	F5h	§
150	96h	û	182	B6h	Â	214	D6h	Í	246	F6h	÷
151	97h	ù	183	B7h	À	215	D7h	Î	247	F7h	¸
152	98h	ÿ	184	B8h	©	216	D8h	Ï	248	F8h	°
153	99h	Ö	185	B9h	╣	217	D9h	┘	249	F9h	¨
154	9Ah	Ü	186	BAh	║	218	DAh	┌	250	FAh	·
155	9Bh	ø	187	BBh	╗	219	DBh	█	251	FBh	¹
156	9Ch	£	188	BCh	╝	220	DCh	▄	252	FCh	³
157	9Dh	Ø	189	BDh	¢	221	DDh	¦	253	FDh	²
158	9Eh	×	190	BEh	¥	222	DEh	Ì	254	FEh	■
159	9Fh	ƒ	191	BFh	┐	223	DFh	▀	255	FFh	

Esqueleto básico

```
void setup()
{
//Se ejecuta al encender
}
void loop()
{
//Se ejecuta tras setup()
//Su ejecución se repite indefinidamente mientras
//la placa esté alimentada
}
```

Empezamos

- Hola mundo
- Echo
- Calculadora

Jugamos

- Adivina el número
- Piedra, papel o tijera

Números aleatorios

- randomSeed(analogRead(0));
- long numAleatorio = random(0, 100);

Tarea

- Adivina el número
  - Del uno al cien
  - Y si el que adivina es nuestro arduino?

Wifi

WLAN_5B44
X0C8OH1SQO8RH5L2OLGC

http://www.apptivismo.org/laboratorio-fabricacion-digital/