Input Technology

http://wiki.arcadecontrols.com/wiki/Main_Page

Topics

Keys and keyboards

Pointing

- **Digital joystick**
- **D-pad**
- **Trackball**
- **Mouse**
- **Optical mouse**
- **Analog joystick**

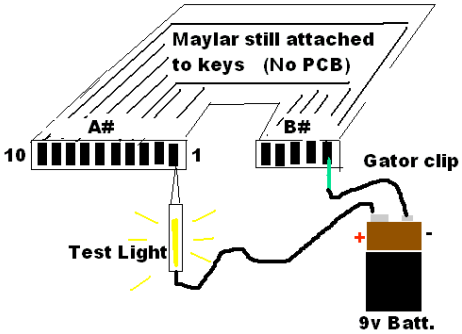
Gamepads

Keyboards

Reverse Engineering a Keyboard

http://pupp.edgeemu.com/kbhack.htm

Matrix



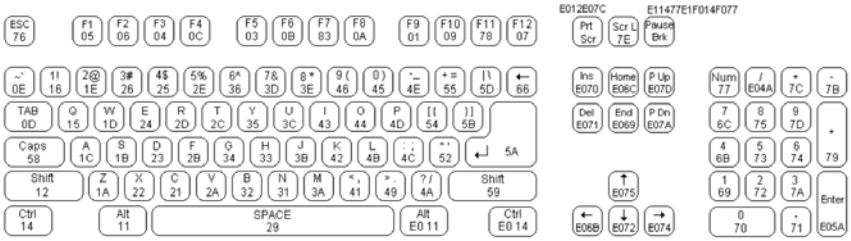
http://pupp.edgeemu.com/kbhack.htm

Keyboard Matrix

16 X 8 IBM Keyboard Matrix (columns are marked 'a' to 'p' and rows are marked '1' to '8')

	a1	a2	a3	a4	a5	a6	a7	a8	a9	a10	a11	a12	a13	a14	a15	a16
b1			esc		F4	G	F5	H	F6	"			#0	#.	Arrow up	L Alt
b2		L Shift	Tab	Cap Lock	F3	T	Bk Space	Y	[	F7	#4	#5	#6			
b3	L Ctrl		~	F1	F2	5	F9	6	=	-	F8	Del	Ins	Page Up	Home	
b4			1	2	3	4	F10	7	8	0	9	F11	F12	Page Down	End	Prnt Scrn
b5			Q	W	E	R		U	I	P	O	#7	#8	#9	#+	Scrol Lock
b6			A	S	D	F	\	J	K	;	L	#1	#2	#3	#Enter	
b7	R Ctrl	R Shift	Z	X	C	V	Enter	M	,	\	.	#num Loc	#/	#*	Pause	
b8						B	Space	N	/			Arrow Down	Arrow Right		Arrow Left	R Alt

Scan Codes



Make (onPress) and Break (onRelease) codes

http://www.computer-engineering.org/ps2keyboard/

Keys and Characters are not the Same

Modifier keys

- **[Shift] [Ctrl] [Alt/Option] [Cmd] [Fn]**
- **CapsLock and NumLock**

Special keys

- **F1 .. F12, Insert, Delete, Home, …**

Duplicated keys

- **Numbers on keypad vs keyboard**
- **Left-Shift, Right-Shift, Left-Cmd, Right-Cmd, …**

Typical Keyboard Interface (Flash)

Key class

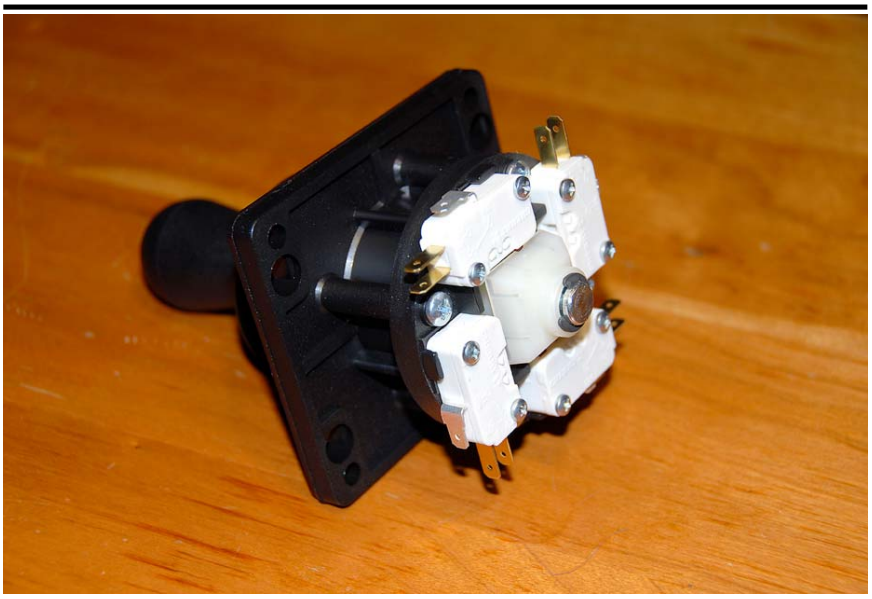
- **addListener(proc) - call onUp and onDown**
- **getAscii() - return ascii for the last key pressed**
- **getCode() - return virtual key code for the last key**
- **isDown(key) - return state of given key**
- **isToggled(key) - return state of NumLock/CapsLock**

Note difference between

state (Up, Down) vs transition (onDown, onUp)

Position

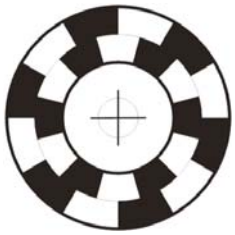
4-way and 8-way Joystick

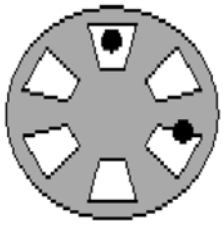


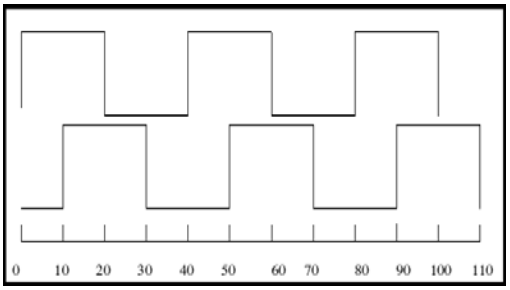
D-pad

Famicom Controller (1983)

Quadrature Encoder



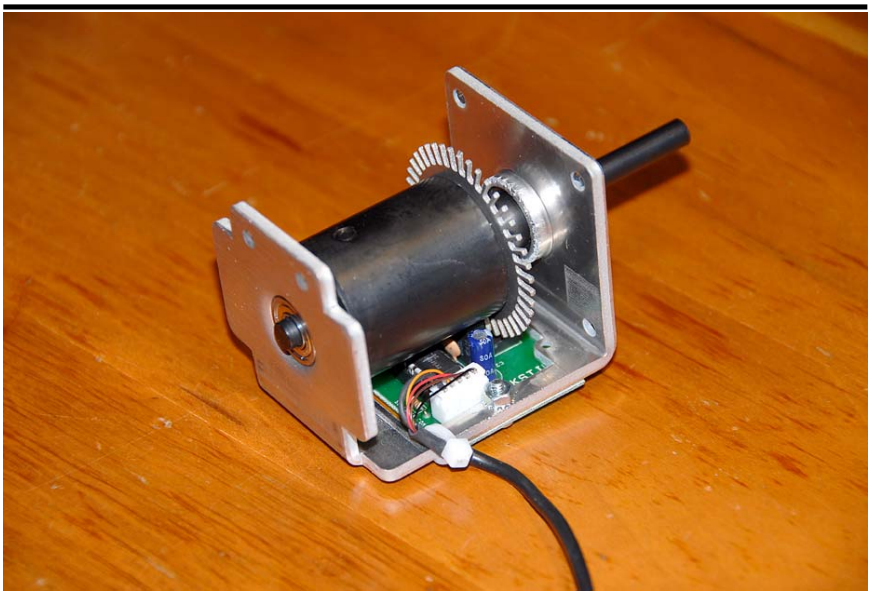




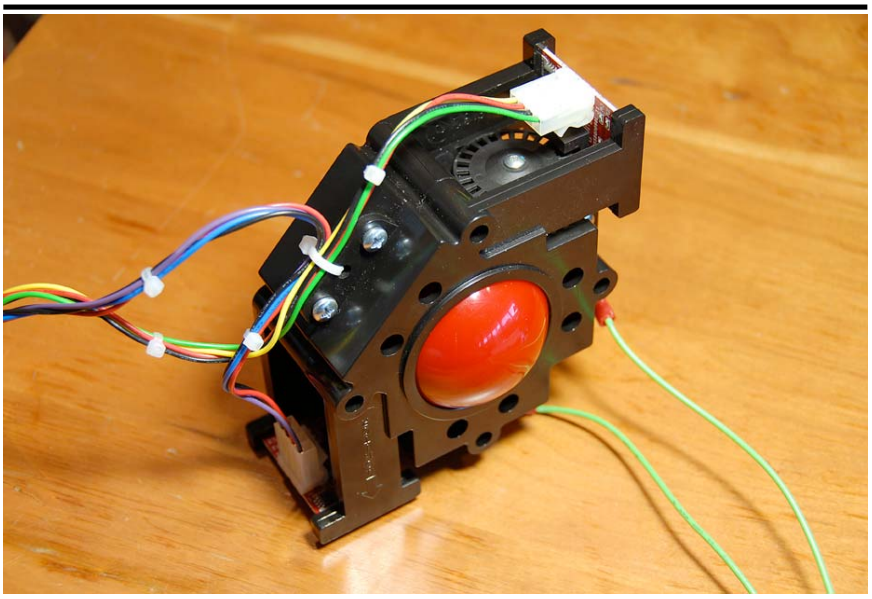
Gray Code

0	0
1	0
1	1
0	1

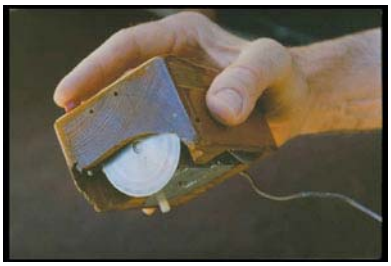
Spinner



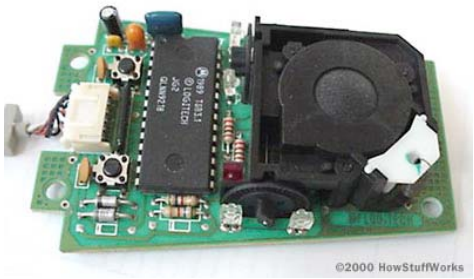
Trackball



Douglas Engelbart Mouse (1964)



Mechanical Mouse



http://computer.howstuffworks.com/mouse2.htm

Mouse Interface (PS/2)

Encoding method (microcontroller sums movement)

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	Y overflow	X overflow	Y sign bit	X sign bit	Always 1	Middle Btn	Right Btn	Left Btn
Byte 2	X Movement							
Byte 3	Y Movement							

Specifications

- **Rate: 100 samples per second**
- **Resolution: 4 counts per mm**

http://www.computer-engineering.org/ps2mouse/

Optical Mouse

1st generation (Xerox)

LED + photosensor over grid of lines

2nd generation (Agilent)

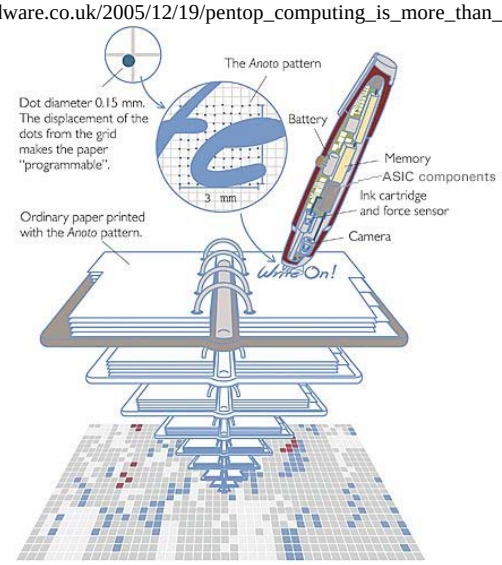
CMOS imager + dsp

- 1500 frames per second
- 16x16 pixel resolution
- 300 count per inch (cpi)

Analog Joystick

Anoto Pen

http://www.tomshardware.co.uk/2005/12/19/pentop_computing_is_more_than_a_kidsuk/page2.html



Gamepads

SONY Playstation 3

XBOX 360

Wii Controller

Sensors

- **3 dof translation**
- **3 dof rotation**
- **pointing**