Web Cam

By Group 15

Introduction

A webcam is a compact digital camera you can hook up to your computer to broadcast video images in real time.

It captures light through a small lens at the front using a tiny grid of microscopic light-detectors built into an image-sensing microchip [either a charge-coupled device (CCD) or a CMOS image sensor]

Introduction (Cont.)

The image sensor and its circuitry converts the picture in front of the camera into digital format—a string of zeros and ones .

It doesn't need to "remember" pictures (no need of of memory chip) because it's designed to capture and transmit them immediately to a computer.

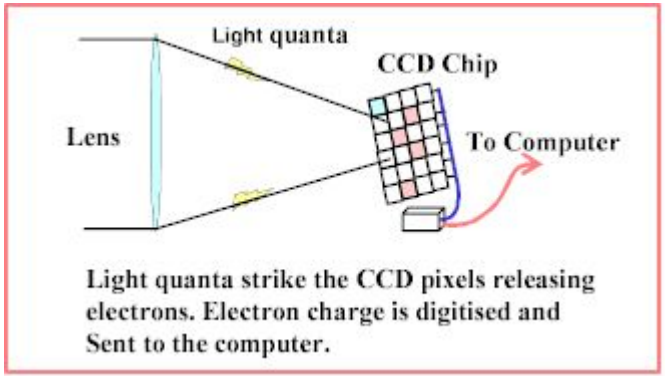
In case of an external webcam, the USB cable is responsible for the supply of power and transmission of digital information captured by the webcam 's image sensor.

Working of Image sensor chip

As light zooms into the lens, the image sensor inside the camera splits the image up into millions of pixels (squares) and convert them into streams of digits, 0 and 1.

An LCD display on the back of the camera shows us the image that the sensor is capturing.

The sensor measures the color and brightness of each pixel which are stored as binary numbers (patterns of zeros and ones).



Light quanta strike the CCD pixels releasing electrons. Electron charge is digitised and Sent to the computer.

Differences in working of CCD and CMOS

Both CCD and CMOS initially convert incoming light rays into electricity, much like photoelectric cells

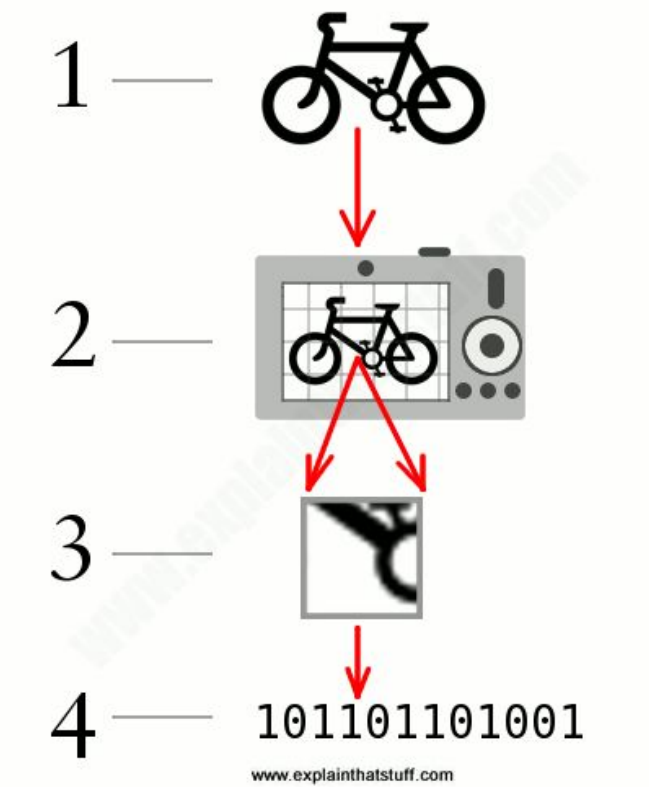
A CCD is essentially an analog optical chip that converts light into varying electrical signals, which are then passed on to one or more other chips where they're digitized (turned into numbers).

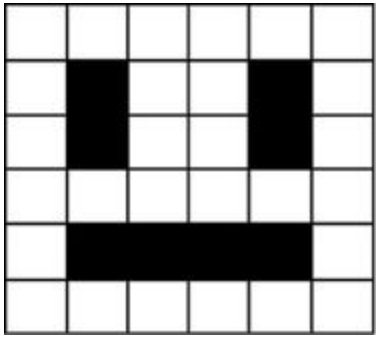
By contrast, a CMOS chip does everything in one place: it captures light rays and turns them into digital signals all on the one chip.

So it's essentially a digital device where a CCD is an analog one.

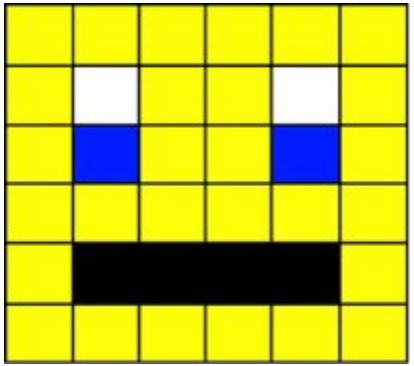
CMOS chips work faster and are cheaper to make in high volume than CCDs

How does an image sensor convert a picture into digital form?





0	0	0	0	0	0	000000
0	1	0	0	1	0	010010
0	1	0	0	1	0	010010
0	0	0	0	0	0	000000
0	1	1	1	1	0	011110
0	0	0	0	0	0	000000



10	10	10	10	10	10	101010101010
10	00	10	10	00	10	100010100010
10	11	10	10	11	10	101110101110
10	10	10	10	10	10	101010101010
10	01	01	01	01	10	100101010110
10	10	10	10	10	10	101010101010

Science behind the CCD

(turning light energy into electrical energy)

Photoelectric effect

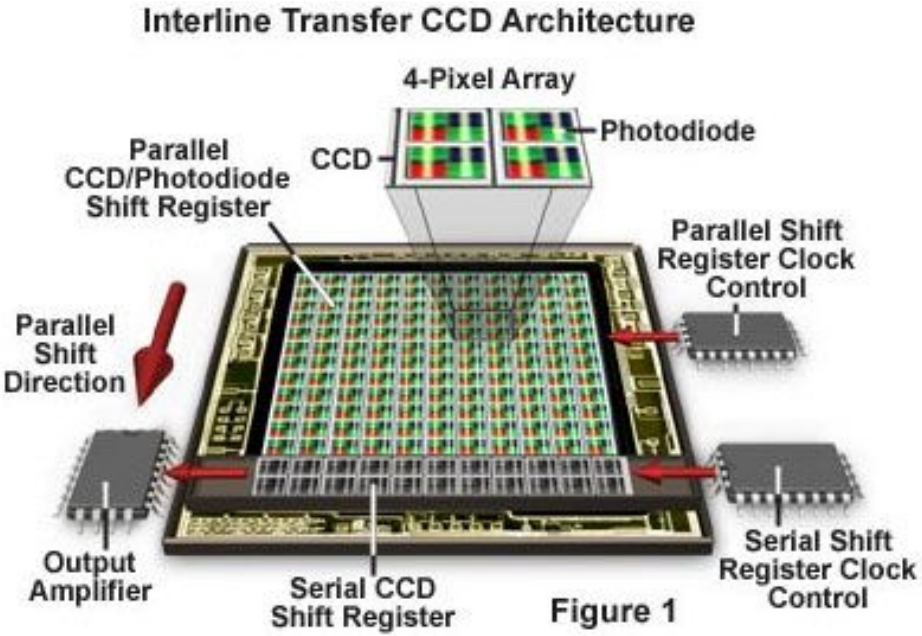
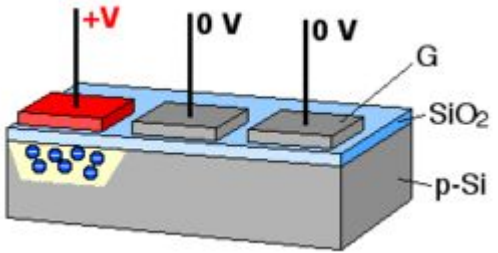
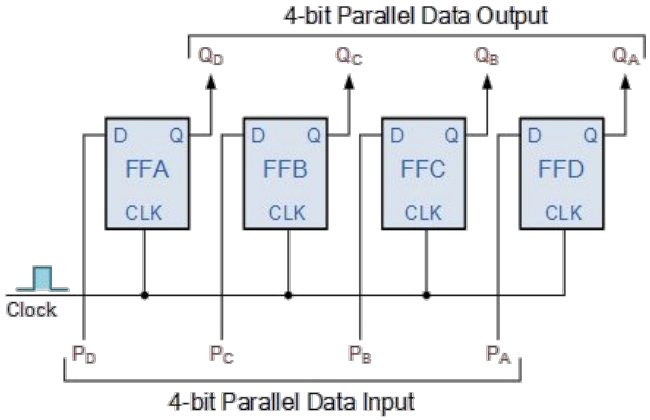
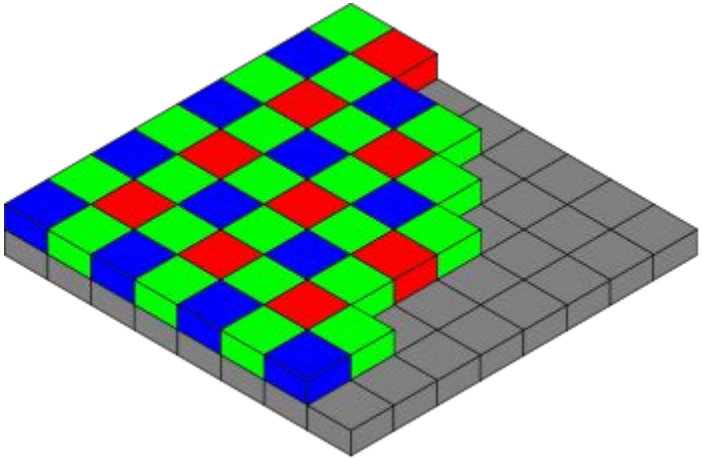


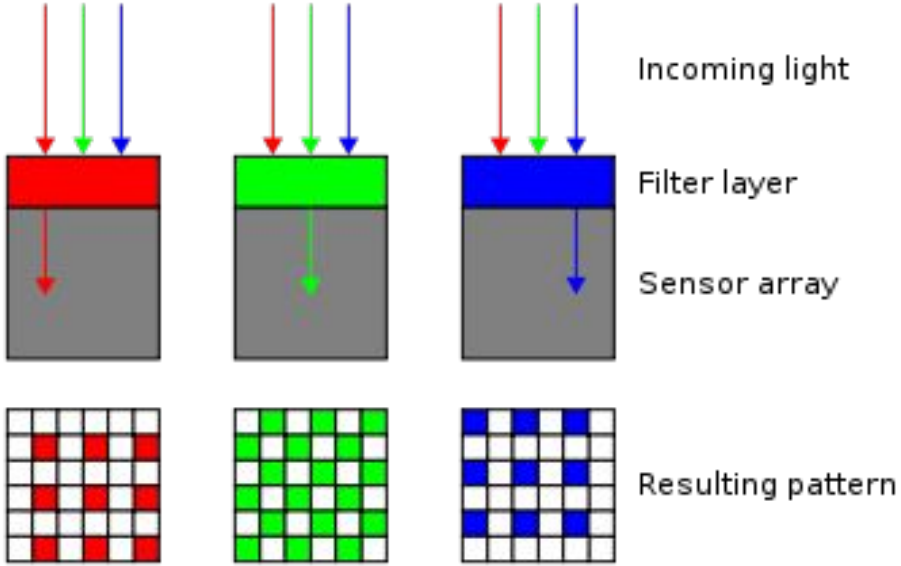
Figure 1





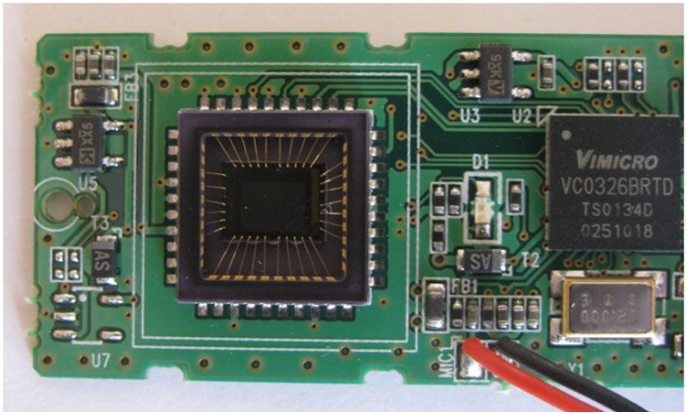
Bayer Filter





CMOS

(Complementary metal–oxide–semiconductor)



CMOS circuits use a combination of p-type and n-type metal–oxide–semiconductor field-effect transistor (MOSFETs) to implement logic gates and other digital circuits