IJERMT
International Journal Of Engineering Research & Management Technology
ISSN: 2348-4039
Email: editor@ijermt.org March 2014 Volume 1, Issue 2 Website: ijermt.org

DEVELOPMENT OF HIGH-TECH COLOUR CHANGING DEVICE

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ABSTRACT:
Chamaeleo Pardalis can produce wide range of colors on their skin depending upon the surrounding. These animals have collection of chromatophores which help them to change their color. In this project we show application of color sensor to show a color changing device according to a surface. With the help of color sensor we get the color and produce the same on multicolor Led (RGB). Our innovation related to this project is to develop a electronics device and it is possible in future to develop a color changing object as per our requirement. So our project is inspired by the nature.

Keywords: Chamaeleo Pardalis, chromatophores, color sensor, Led.

INTRODUCTION:
Some animals, such as various cuttlefish [1] species, can manipulate their chromatophores to change their overall skin color. These animals have a collection of chromatophores, each of which contains a single pigment. An individual chromatophore is surrounded by a circular muscle that can constrict and expand. When the cuttlefish constrict the muscle, all the pigment is squeezed to the top of the chromatophore. At the top, the cell is flattened out into a wide disc. When the muscle relaxes, the cell returns to its natural shape. By constricting all the chromatophores with the certain pigment and relaxing all the ones with other pigments, the animal can change the overall color of its body. Cuttlefish with this ability can generate a wide range of colors and many interesting patterns. By perceiving the color of a backdrop and constricting the right combination of chromatophores, the animal can blend in with all sorts of surroundings. Cuttlefish may also use this ability to communicate with each other. The most famous color-changer, the chameleon, alters its skin color using a similar mechanism, but not usually for camouflaging purposes.
In this project we use one 9 volt battery for the circuit. 9 volt battery is connected to the 7805 regulator with capacitor circuit Capacitor reduces the ripples and noise of the circuit. In this project we use 7805 regulator [2] to make a perfect 5 volt dc to electronics circuit. Regulated 5 volt supply is connected to the Pin no 40 of controller. IC 7805 is a three pin regulator. Pin no 1 is input pin, pin no 2 is ground pin and pin no 3 is output pin. Here 78 mean positive voltage and 5 means 5volt. 79 mean negative voltage. There are so many regulators available from 7805 to 7818 volt, here 18 means 18 volt. Pin no 20 of the controller is connected to ground pin. Pin no 1 to 8 is for the port 1. Pin no 9 is for the reset pin. On this pin we connect one resistor and one capacitor with positive and resistance is to be ground. With the help of this circuit controller is automatic reset when power is on. Pin no 10 to 17 is for the port p3. Pin no 18, 19 is the pin for crystal pins. On this pin we connect a crystal to provide a proper clock to the controller. In this project we use 12 MHz crystal to pin no 18, 19. Pin no 20 of the controller is connected to the ground pin. Pin no 21 to 28 is for the port p2 and pin no 39 to 32 is for the port p0. Pin no 30 is ale pin, pin no 29 is Psen and pin no 31 is excess enable. We use these three pin when we require a extra memory for controller. If not required then we connect a pin no 31 to the positive supply. In this project there is no need of extra memory so we connect pin no 31 to the positive supply.

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The AT89C51 [3] is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash Programmable and Erasable Read Only Memory (PEROM). The device is manufactured using Atmel's high density nonvolatile memory technology and is compatible with the industry standard MCS-51™ instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly flexible and cost effective solution to many embedded control applications. The AT89C51 provides the following standard features: 4K bytes of Flash, 128 bytes of RAM, 32 I/O lines, two 16-bit timer/counters, five vector two-level interrupt architecture, a full duplex serial port, and on-chip oscillator.

COLOR SENSOR CIRCUITORY AND DESCRIPTION:

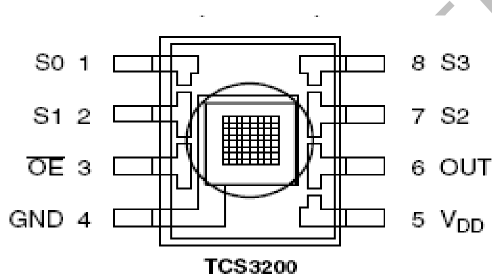

Fig 1: color sensor with photodiode array

The TCS3200 and TCS3210 programmable color light-to-frequency converters that combine configurable silicon photodiodes and a current-to-frequency converter on a single monolithic CMOS integrated circuit. The output is a square wave (50% duty cycle) with frequency directly proportional to light intensity (irradiance) the full-scale output frequency can be scaled by one of three preset values via two control input pins. Digital inputs and digital output allow direct interface to a microcontroller or other logic circuitry. Output enable (OE) places the output in the high-impedance state for multiple-unit sharing of a microcontroller input line. In the CS3200, the light-to-frequency converter reads an 8 x 8 array of photodiodes [4]. Sixteen photodiodes have blue filters, 16 photodiodes have green filters, 16 photodiodes have red filters, and 16 photodiodes are clear with no filters. In the TCS3210, the light-to-frequency converter reads a 4 x 6 array of photodiodes. Six photodiodes have blue filters, 6 photodiodes have green filters, 6 photodiodes have red filters, and 6 photodiodes are clear with no filters.

The four types (colors) of photodiodes are inter digitized to minimize the effect of non-uniformity of incident irradiance. All photodiodes of the same color are connected in parallel. Pins S2 and S3 are used to select which group of photodiodes (red, green, blue, clear) are active.

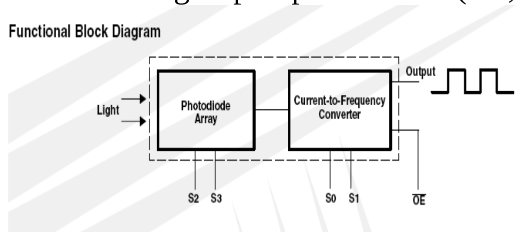

Fig 2: block diagram of the color sensor

TERMINAL NAME	TERMINAL NO.	I/O	DESCRIPTION
GND	4		Power supply ground
OE(active low)	3	I	Enable for f0
OUT	6	O	Output frequency
S0, S1	1,2	I	Output frequency scaling selection inputs
S2, S3	7,8	I	Photodiode type selection inputs
Vdd	5		Supply voltage

Fig 3: table of terminal functions

S0	S1	OUTPUT FREQUENCY SCALING
L	L	Power down
L	H	2%
H	L	20%
H	H	100%

S2	S3	PHOTODIODE TYPE
L	L	Red
L	H	Blue
H	L	Clear
H	H	green

Fig 4: table of selectable options

POWER SUPPLY CONSIDERATION:

a) Input Interface: A low-impedance electrical connection between the device OE pin and the device GND pin is required for improved noise immunity.

b) Output interface: A high state on Output Enable (OE) places the output in a high-impedance state for multiple-unit sharing of a
Microcontroller input line.

c) Power down: Powering down the sensor using S0/S1 (L/L) will cause the output to be held in a high-impedance state. This is similar to the behavior of the output enable pin, however powering down the sensor saves significantly more power than disabling the sensor with the output enable pin.

d) Photodiode type (color) selection: The type of photodiode (blue, green, red, or clear) used by the device is controlled by two logic inputs, S2 and S3.

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APPLICATION:

This device can be implemented in the defence system of different countries to protect them from outside attacks.

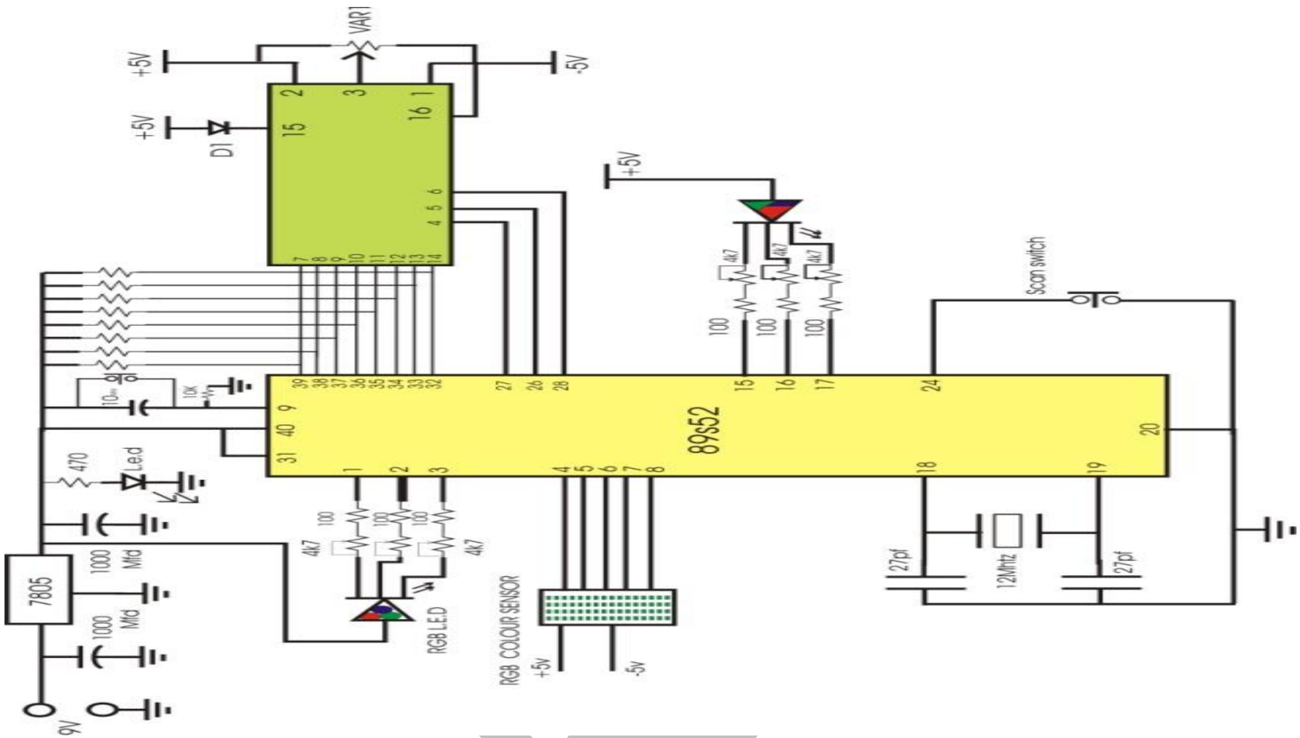

Fig 4: overall circuit diagram

CONCLUSION:

The sensor and the network architecture readily accomplish the need of developing a color changing device in a similar way as done by chromatophores in certain animals like chamaeleon and cuttle fish. The size of the array is not fixed and can extend to larger arrays. However the device's performance is sometimes limited by the reflectivity of the surface. Future works will progress towards implementation in defence like fighter planes, submarines etc and also for security in our day to day lives.

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