

Project Number:A3725

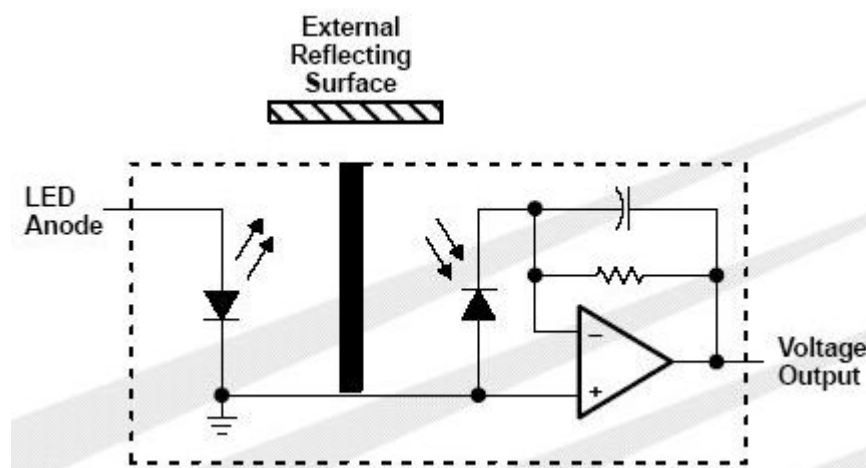
The aim of creation of this device is to help blind people, or people with a problem of chromates, who differ colors with difficulties or wrongly. This device analyzes the color of a surface. When it determines the color, it pronounces by the speaker.

The device is portable and consists of the next important parts:

1. Three color sensors (TRS17xx), using primary colors (red, green, blue) and three LEDs (for lightening of a surface) placing inside the same IC.



When reflecting light varies, then voltage changes at the output of (TRS17xx), because every color reflects specific ray. See the Functional Block Diagram below:



2. Microcontroller Atmega128 is converting analog voltage from the outputs TRS17xx in digital hexadecimal number using internal ADC Converter. Then, using

an algorithm (Equation 1), it calculates and at the end of the process produces a wave (that it is stored in FLASH memory).

Using one-resister 10K, which goes into PORTA0, the device calculates the battery voltage. When the battery is low it pronounces the message “recharge battery”.

There are 29 sounds of the names of colors in this device. These voices are in Greek language, but they can be in any language and changeable (it depends on FLASH memory size).

$$|\overline{AB}| = \sqrt{|R_a - R_b|^2 + |G_a - G_b|^2 + |B_a - B_b|^2} \quad (\text{Equation 1})$$

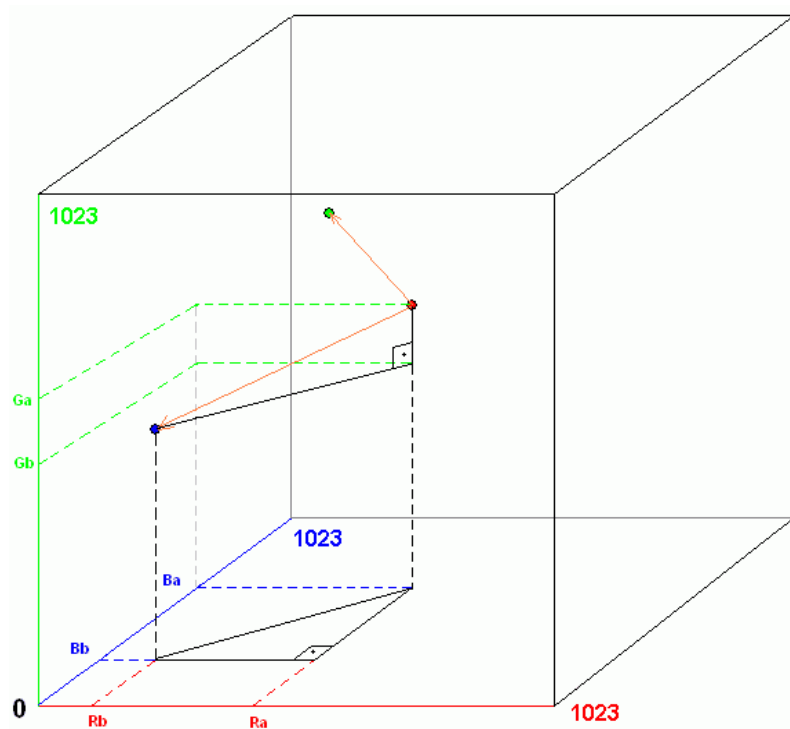


Fig.5

To detect the correct color it is utilizing above-stated algorithm and original database of 29 colors (stored in EEPROM memory). That vector with most small value in the indicated (Fig.5) is between points of green and red dots. The color that we need to recognize from surface is the most eligible to the color applicable to the green dot.

Files of sounds was created using the program Adobe Audition with next settings: Format PCM, Mono, 8bit, 16kHz, final had done Normalize with 70% in all files.

The program “wave2avr.exe” is Freeware and converts files from WAV into ASM (that contents specific digital information for reproducing a voice) for more information see at site www.avrfreaks.com

3. I used DC/DC Converter, that doubles the input voltage, and one 5V regulator with maximum current output 100mA (Fig.6).

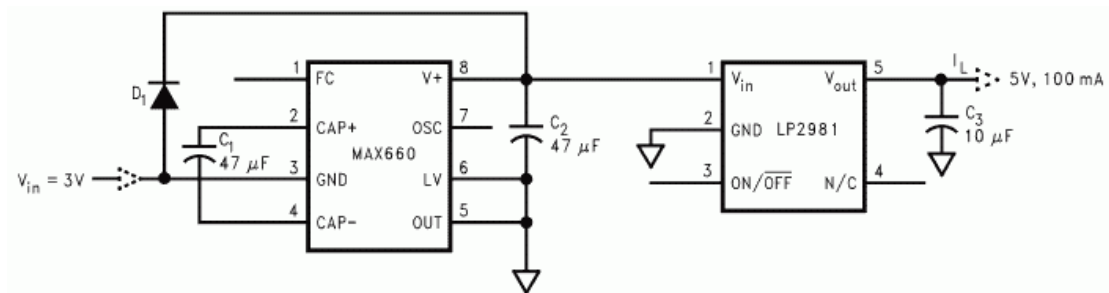


Fig.6

4. One audio amplifier LM386 was used, to provide maximum volume (gain 20) to the speaker.

5. One MOSFET, for disable some IC, when they not used.

6. Rechargeable batteries (4) of 1,2V (NiMH) with capacity “C” 1200mAh.

For more information see Block Diagram and Schematic.

First it was programmed FLASH memory with a code “one”, after executing of a code “one” the result of EEPROM memory was stored in the file (eeprom.hex). After that FLASH memory it was programmed with code “two”. When programming FLASH memory the data from EEPROM memory is loosing, that’s why the file (eeprom.hex) was uploaded in the EEPROM memory (it is library of original colors).

Two codes compiled in hex files with the program AVR Studio v4.08. For Programming used Programmer (Fig.7) with the Ponyprog2000 software.

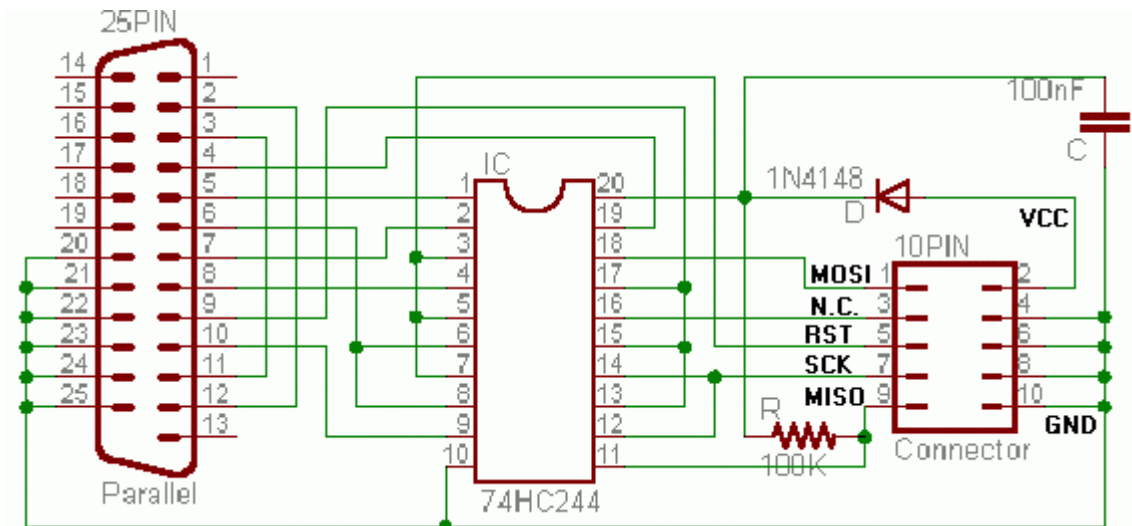


Fig.7