International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 2 Issue 3, March - 2013

Colour Detection For Blind Using Zigbee

Mr. Vishal Pande* Ms. Pooja Pandya** Ms. Pranali Nile*** Ms. Vanila Kokkula****
*Prof. of Vidyavardhini college of Engineering and Technology
Vasai, Thane.
**Student, Vidyavardhini college of Engineering and Technology
Vasai, Thane.
***Student, Vidyavardhini college of Engineering and Technology
Vasai, Thane.
****Student, Vidyavardhini college of Engineering and Technology
Vasai, Thane.

Abstract

This system tries to identify the possibility of converting colour in accordance with sound. It is an effort to deal with the psychological challenges of blind people & their emotions. This system tries to explore different colours the blind person could not see or they have lost the possibility of seeing it. The system is based on synesthesia which means "stimulation of one sensory pathway leads to automatic experience in second pathway. This system represents new way of understanding & self development through music therapy for mainly blind children below 12years. This portable system will be capable of detecting colour & transforming it into sound. The concept of this system is a colour sensor that identifies colour & transform this data into musical note. This system is flexible enough which means the user can choose the best combination between colour & sound in order to improve their communication with the environment. This paper focuses on the use of low cost colour sensors. The system is applying the technique of synesthesia to mend the extrusions brought about to the people suffering from color blindness. The system is using the perceptional strength of sound to overcome the difficulties of sight. Hence, the user will be able to perceive two senses simultaneously, where in along with sight the person will be accompanied with the sense of sound.

Keywords: *synesthesia, colour, music, sound, blind.*

1. Introduction

Synesthesia is a condition in which one sense (for example, hearing) is simultaneously perceived as if by one or more additional senses such as sight. Another form of synesthesia joins objects such as letters, shapes, numbers or people's names with a sensory perception such as smell, color or flavor. The word synesthesia comes from two Greek words, syn (together) and aesthesis (perception). Therefore, synesthesia literally means "joined perception."
Estimates for the number of people with synesthesia range from 1 in 200 to 1 in 100,000. Synesthesia can involve any of the senses. The most common form, colored letters and numbers, occurs when someone always sees a certain color in response to a certain letter of the alphabet or number. For example, a synesthete (a person with synesthesia) might see the word "plane" as mint green or the number "4" as dark brown. Synesthetic perceptions are specific to each person. Different people with synesthesia almost always disagree on their perceptions. In other words, if one synesthete thinks that the letter "q" is colored blue, another synesthete might see "q" as orange.

Synestetes tend to be, **Women**: in the U.S., studies show that three times as many women as men have synesthesia; in the U.K., eight times as many women have been reported to have it. The reason for this difference is not known. **Left-handed**: synesthetes are more likely to be left-handed than the general population. **Neurologically normal**: synesthetes are of normal (or possibly above average) intelligence and standard neurological exams are normal. **In the same family**: synesthesia appears to be inherited in some fashion; it seems to be a dominant trait and it may be on the X-chromosome.

2. Block diagram

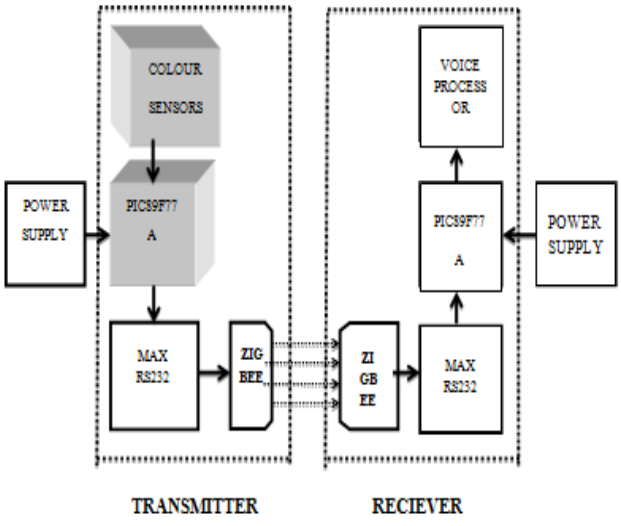

Figure 1: Synesthesia block diagram

IJERT

The basic block diagram for the Transmitter and Receiver system is as shown in the figure below. It consists of the following modules:

1. SENSOR
2.PIC16f877
3.TRANSMITTER
4.ANTENNA
5.POWER SUPPLY
6.LCD DISPLAY
7. VOICE PROCESSOR

Power supply is the first and the most important part of our project. For our project we require +5V regulated power supply with maximum current rating 500Ma. To step down the mains 230V A.C. step down transformer is required. Step down transformer gives out well regulated +5V output, output current capability of 100mA. Microcontroller **PIC16F877A** is the heart of the circuitry. It is the main block which takes the inputs and processes it and gives the output. All the other blocks work in accordance with the microcontroller. **MAX RS232**: The Serial communication is used to transfer data between the mobile device and the microcontroller. MAX RS232 is used for this purpose. **ZIGBEE TRANSNMITTER**: It transmits the signal which is connected to RS 232 interface. It works on 2.4 GHz frequency with the serial interface. **ZIGBEE RECEIVER**: It receives the signal which is connected to RS 232 interface. It works on 2.4 GHz frequency with the serial interface. **MAX RS232**: The Serial communication is used to transfer data between the mobile device and the microcontroller. MAX RS232 is used for this purpose. Microcontroller **PIC16F877A** is the heart of the circuitry. It is the main block which takes the inputs and processes it and gives the output. All the other blocks work in accordance with the microcontroller. **LCD** display can be interfaced with microcontroller to read the output directly. In our project we use a two line LCD display with 16 characters each. **VOICE PROCESSOR** (APR9600) device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds.

3. Colour sensors

Currently there are a number of colour sensors on the market, with prices ranging from low cost called light-to-frequency chips to sophisticated and very expensive spectrophotometers. Both the ColorPAL and TCS 3200 colour sensors are provided with some source code, making them amenable to integrating into our customized system.

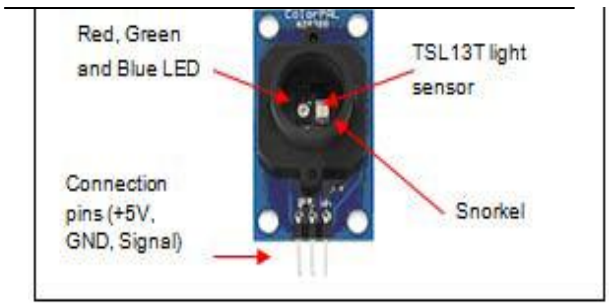

Figure 2: Parallax ColorPAL colour sensor

The **ColorPAL** sensor illuminates a sample using in-built red, green and blue LED light sources (one colour at a time) and records the quantity of light reflected back from the object. The ColorPAL makes use of a TAOS (Texas Advanced Optoelectronic Solutions) light-to-voltage chip. When light is reflected, the voltage, which is proportional to the light reflected, is used to determine the sample's R, G and B colour contents. The ColorPAL requires the sample to be illuminated using each of the red, green and blue LEDs, with a 'snorkel' to shield possible interference from external light sources. This requires the ColorPAL to be in direct contact with the object for an optimum reading without interfering.

Figure 3: Parallax TCS3200 colour sensor

The **TCS3200** Colour sensor makes use of a TAOS TCS3200 RGB light-to-frequency chip. The TCS3200 colour sensor operates by illuminating the object with two white LEDs, while an array of photo detectors (each with a red, green, blue and clear filter) interpret the colour being reflected by means of a square wave output whose frequency is proportional to the light reflected. The TSC3200 Colour sensor has a 5.6-mm lens, which is positioned to allow an area of 3.5 mm2 to be viewed. A USB4000 spectrometer (Ocean Optics Inc., FL and USA) was used to find the height at which the greatest intensity of light occurred when the RGB sensor was placed above a sample. As the two white LEDs are directed down at an angle, there is a point where the light intensity is the greatest. Since the TCS3200 is mounted 20 mm above the sample, and therefore not in direct contact with the sample, it was more suited for our application than the full contact required by the ColorPAL sensor.

3.1 Functional block diagram

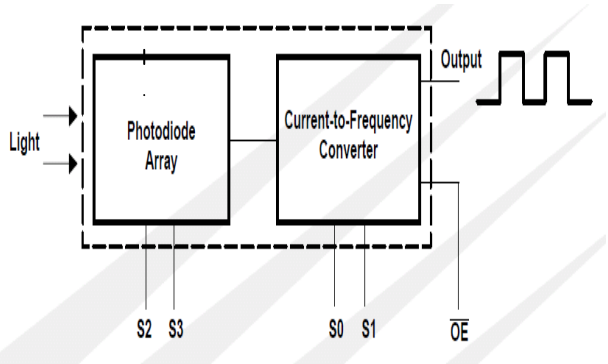

Figure 4: Functional block diagram

The TCS230 programmable color light-to-frequency converter combines configurable silicon photodiodes and a current-to-frequency converter on 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. The light-to-frequency converter reads an 8 x 8 array of photodiodes. Sixteen photodiodes have blue filters, 16 photodiodes have green filters, 16 photodiodes have red filters, and 16 photodiodes are clear with no filters. The four types (colors) of photodiodes are interred digitized to minimize the effect of non-uniformity of incident irradiance. All 16 photodiodes of the same color are connected in parallel and which type of photodiode the device uses during operation is pin-selectable. Photodiodes are 120 mm x 120 mm in size and are on 144-mm centers. To TCS3002D, when choose a color filter, it can allow only one particular color to get through and prevent other color. For example, when choose the red filter, only red incident light can get through, blue and green will be prevented. So we can get the red light intensity. Similarly, when choose other filters we can get blue or green light.

4. ZigBee

Figure 5: Zigbee module

ZigBee is a low-cost, low-power, wireless mesh networking proprietary standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications, the low power-usage allows longer life with smaller batteries, and the mesh networking provides high reliability and larger range. ZigBee operates in the industrial, scientific and medical (ISM) radio bands; 868 MHz in Europe, 915 MHz in the USA and Australia, and 2.4 GHz in most jurisdictions worldwide. The technology is intended to be simpler and less expensive than other WPANs such as Bluetooth. Because ZigBee can activate (go from sleep to active mode) in 15msec or less, the latency can be very low and devices can be very responsive — particularly compared to Bluetooth wake-up delays, which are typically around three seconds. Because ZigBees can sleep most of the time, average power consumption can be very low, resulting in long battery life. ZigBee protocols are intended for use in embedded applications requiring low data rates and low power consumption. ZigBee's current focus is to define a general-purpose, inexpensive, self-organizing mesh network that can be used for industrial control, embedded sensing, medical data collection, smoke and intruder warning, building automation, home automation, etc. The resulting network will use very small amounts of power – individual devices must have a battery life of at least two years to pass ZigBee certification. They are designed for high-throughput applications requiring low latency and predictable communication timing. Supported network Topologies: Point-to-point, Point-to-multipoint &Peer-to-peer. Given below is the comparison of ZigBee, Wi-Fi and Bluetooth.

	ZigBee	Wi-Fi	Bluetooth
Range	10-100 meters	50-100 meters	10 – 100 meters
Networking Topology	Ad-hoc, peer to peer, star, or mesh	Point to hub	Ad-hoc, very small networks
Operating Frequency	868 MHz (Europe) 900-928 MHz (NA), 2.4 GHz (worldwide)	2.4 and 5 GHz	2.4 GHz
Complexity (Device and application impact)	Low	High	High
Power Consumption (Battery option and life)	Very low (low power is a design goal)	High	Medium
Security	128 AES plus application layer security		64 and 128 bit encryption
Typical Applications	Industrial control and monitoring, sensor networks, building automation, home control and automation, toys, games	Wireless LAN connectivity, broadband Internet access	Wireless connectivity between devices such as phones, PDA, laptops, headsets

5. Pic16f877x microcontroller

Only 35 single word instructions to learn. All single-cycle instructions except for program branches, which are two-cycle. Operating speed: DC – 20 MHz clock input DC – 200 ns instruction cycle. Up to 8K x 14 words of Flash Program Memory, Up to 368 x 8 bytes of Data Memory (RAM), Up to 256 x 8 bytes of EEPROM Data Memory. This is the heart of the circuitry. It is the main block which takes the

IJERT

inputs and processes it and gives the output. All the other blocks work in accordance with microcontroller. All devices in the PIC16F87XA family share common architecture with the following differences: The PIC16F873A and PIC16F874A have one-half of the total on-chip memory of the PIC16F876A and PIC16F877A. The 28-pin devices have three I/O ports, while the 40/44-pin devices have five I/O ports. The 28-pin devices have fourteen interrupts, while the 40/44-pin devices have fifteen. The 28-pin devices have five A/D input channels, while the 40/44-pin devices have eight. The Parallel Slave Port is implemented only on the 40/44-pin devices.100, 000 erase/write cycles. Enhanced Flash program memory typical. 1,000,000 erase/write cycle Data EEPROM memory typical. Self reprogrammable under software control. It provides Single supply 5V in-circuit serial programming. It has inbuilt watchdog timer (WDT) with its own on-chip RC oscillator for reliable operation. It uses programmable code protection. It also has power saving sleep mode.

6. Voice processor

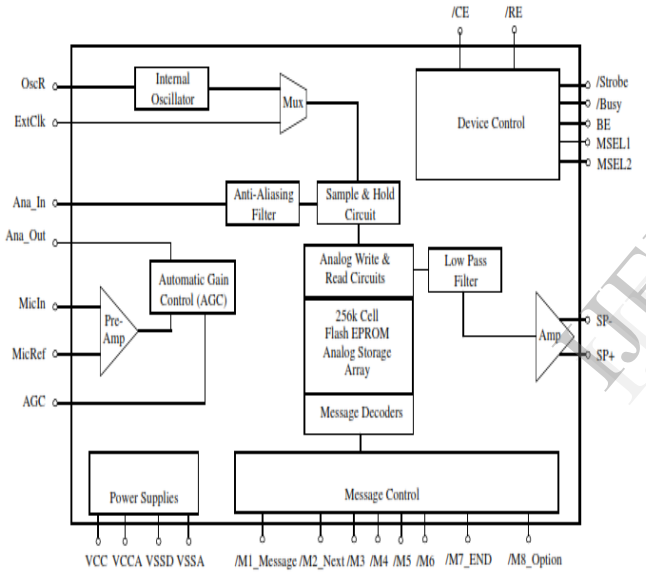

Figure 7. Block diagram of APR9600

The APR9600 device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. The device supports both random and sequential access of multiple messages. Sample rates are user-selectable, allowing designers to customize their design for unique quality and storage time needs. Integrated output amplifier, microphone amplifier, and AGC circuits greatly simplify system design. The device is ideal for use in portable voice recorders, toys, and many other consumer and industrial applications. APLUS integrated achieves these high levels of storage capability by using its proprietary analog/multilevel storage technology implemented in an advanced Flash non-volatile memory process, where each memory cell can store 256 voltage levels. This technology enables the APR9600 device to reproduce voice signals in their natural form. It eliminates the need for encoding and compression, which often introduce distortion.

7. Result

Serial No.	Distance (mm)	Detecting (yes or no)
1.	5	Yes
2.	10	Yes
3.	15	Yes
4.	17	Yes
5.	18	Yes

8. References

[1] Paper titled "transforming colour into melody and Implementing the result in colour sensor device" of IEEE by Jessica Rossi Francisco Jose Perales Javier Varona, Miquel Roca.

[2] Recommended Practices Guide For Securing ZigBee Wireless Networks in Process Control System Environments ,April 2007 by Author Ken Masica Lawrence Livermore National Laboratory.

[3] Wireless Technologies In Process Automation- Review And An Application Example: Marko Paavola, Report A No 33, December 2007.

[4] A ZigBee multi-powered wireless acquisition device for Remote sensing applications in precision viticulture Received 28 June 2007, Received in revised form 29 November 2007
Accepted 3 December 2007

[6] Application of Robot Formation Scheme for Screening Solar Energy in a Greenhouse

[7] Book titled "PIC Microcontroller – An introduction to software and hardware interfacing" by Han-way huanng.

[8] Book titled "Making of Pic Microcontroller Instrument and Controllers" by Harpit Singh Sandhu.

[9] Book titled "ZigBee Wireless Networking "by Drew Gislason.

[10]Book titled "Embedded system design 8051 microcontroller family" by Satish Shah.

[11] Book titled "Wireless communication and networks" by William Stallings..

[12] Book titled "Principals of wireless communication" by Kavesh Pahlavan.

IJERT