INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

e-ISSN : 2583-1062

Impact Factor: 5.725

www.ijprems.com
editor@ijprems.com

Vol. 04, Issue 04, April 2024, pp: 429-432

COLOUR DETECTOR USING ARDUINO UNO AND TCS3200 COLOUR SENSOR

Tania Teresa Meenattoor[1], Tessa Joise[2], Dr. Godwinraj D[3], Ranjitha Rajan[4]

[1,2]Student, Electronics and Communications, Amal Jyothi College of Engineering, Kanjirappally, Kerala, India.

[3]Associate Professor, Electronics and Communications, Amal Jyothi College of Engineering, Kanjirappally, Kerala, India.

[4]Assistant Professor, Electronics and Communications, Amal Jyothi College of Engineering, Kanjirappally, Kerala, India.

ABSTRACT

The project focuses on creating a versatile device capable of accurately identifying and categorizing colors in real time. Utilizing an Arduino Uno microcontroller and a TCS3200 color sensor, the system captures ambient light, processes the data and determines the corresponding color based on the predefined color libraries. The project combines hardware and software components to provide a user friendly interface, enabling users to identify colors effortlessly. This low-cost, efficient solution holds potential applications in fields such as quality control, art and accessibility.

Key Words: Arduino, TCS3200 Colour sensor

1. INTRODUCTION

The project introduces an innovative application of technology aimed at real-time color identification. Leveraging the capabilities of Arduino Uno microcontroller and TCS3200 color sensor, the system offers a practical solution for recognizing and categorizing colors in diverse environments. This project combines the versatility of Arduino programming with the precision of color sensing technology to create a user-friendly tool with a wide range of applications. The integration of hardware and software components makes this project accessible and valuable for enthusiasts and professionals alike. Color detection provides a versatile and efficient method for a wide range of applications, enhancing automation, accuracy, and efficiency across various industries and sectors. Some examples are; quality control in manufacturing, sorting and classification, identification and authentication, medical and biological applications, environmental monitoring, consumer electronics and gaming, traffic control and signaling, agriculture, art and design, home automation and many more. Using Arduino Uno and TCS3200 color sensor offers advantages like high speed sorting, reduced labour costs, high accuracy, consistent quality, flexible sorting criteria, multi-color sorting, affordable solutions, real time monitoring, low power consumption, scalable solution,quick setup, continuous operation, customizable solutions, innovative applications etc. Therefore, color sorting using Arduino Uno and TCS3200 color sensor offers a cost-effective, accurate, and versatile solution for automating sorting processes, enhancing efficiency and enabling innovative applications across different industries and sectors.

2. LITERATURE SURVEY

[1] The Colour Detector Tool using TCS3200 and Arduino Uno is designed to assist individuals with disabilities particularly the blind and early childhood. Through experiments and modifications, the tool aims to improve color detection accuracy and provide a user-friendly experience for its target users [2] Integration of robotic manipulation with computer vision algorithms for seamless object recognition. Automation of color sorting process using cutting-edge technology like computer vision, machine learning, and robotics [3] Different methods of object sorting automation were proposed in the documents. PLC-based systems were developed to sort objects based on metal/non-metal characteristics and color assortment. The systems utilized sensors, actuators, and conveyor belts for efficient sorting. Proposed systems used PLC, sensors, actuators, and conveyor belts for object sorting. Systems aimed to improve efficiency, accuracy, and safety in industries. Future enhancements may include stepper motors and high precision sensors for better performance. [4] The device separates citrus fruits into three groups based on color: ripe orange, almost mature yellowish green, and immature green. The system involves components like TCS3200 color sensor, Arduino Uno, push button, servo motors, and LCD monitor. The color sensor plays a crucial role in detecting fruit color accurately, requiring automatic calibration for optimal performance. The device automates the sorting process, directing fruits to respective containers based on color, increasing efficiency in citrus fruit sorting [5] The research aims to design a peanut sorting machine using Arduino Uno microcontroller. The machine categorizes peanuts based on color into young, old, and rotten. Components include a funnel, channel pipes, and a servo motor for

sorting. Functional testing with local West Aceh peanuts successfully sorted them into three categories. [6] The system achieved a success rate of 90.67% in color recognition, surpassing previous image inspection systems. The project aimed to improve agricultural productivity in Africa by enhancing post-harvest processing through innovative technology. Pre-processing of digital images and automatic sorting using electronic components like servo motors and Arduino UNO microcontroller were key steps in the project. Geometric characteristics and Fourier descriptors were used for effective classification of cowpea grains. [7] Color sorting machines use optical sensors to separate items by color on production lines. The Colour Sorting Machine uses Node MCU, conveyor belt, color sensor, LCD display, IR sensor, and servo motor. Improves production efficiency, reduces errors, and requires less manpower. Hardware design involves identifying objects, uploading code, testing sensors, sorting mechanism, and fine-tuning. Proper sensors are crucial for small and large-scale industries. [8] Various research studies have been conducted using RGB-D visual feedback controllers, color sensors, and cameras for different applications. The implementation of a prototype system for strawberry maturity sorting based on RGB color using Arduino Uno and TCS3200 sensor was described. Testing of the TCS3200 sensor, LCD, and servo motor for sorting ripe and immature strawberries was conducted. The system successfully displayed information on ripe strawberries and the maturity of strawberry fruit. The research contributes to advancements in color detection and sorting technology for agricultural applications. [9] A high-speed rolling brush arrangement is designed to improve solar panel cleaning without water. Increasing color sensor sensitivity and combining multiple sensors may be necessary for better color variation identification. Components like Arduino, LDR, DHT22, TCS3200, SIM900, and L298N are used in the system. The system uses color measurement, calibration, threshold selection, comparison, and setting new reference calibration processes for dirt detection. Evaluation of color variation is done using a mathematical expression to analyze correlation coefficients [10] Breath Acetone as a Biomarker of Diabetes Historical review on breath acetone measurement. Measurement of Non-Invasive Blood Glucose Level Utilises Sensor Colour TCS3200 and Arduino for glucose level measurement. Utilizes fasting urine, Sensor TCS3200, Arduino UNO, and LCD 16x4 for data processing.

3. COMPONENTS AND SOFTWARE USED

Arduino UNO, TCS3200 color sensor, 10k variable resistor, 16*2 LCD display, 100R resistor, Battery 9v & Jumper wires

3.1. ARDUINO UNO BOARD

The Arduino UNO is an open-source, programmable microcontroller board that is inexpensive, versatile, and simple to use. It may be used in a wide range of electronic projects. This board can control relays, LEDs, servos, and motors as an output and can be interfaced with other Arduino boards, Arduino shields, and Raspberry Pi boards. The ATmega328P is the basis for the Arduino Uno microcontroller board (datasheet). It features a 16 MHz ceramic resonator (CSTCE16M0V53-R0), 6 analog inputs, 14 digital input/output pins (six of which can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button. The majority of Arduino boards are made with the microcontroller configured to run just one software. An LED blinking is one solitary action that this program can be made to do. It can also be made to carry out hundreds of operations in a row. Programs differ from one another in terms of scope. The USB port can provide sufficient power for Arduino boards to function properly. It can be powered by a portable power bank, wall socket adaptor, or PC port and produces 5V DC voltage. The name Arduino Software (IDE) 1.0 was chosen with the meaning of "uno," which is one in Italian. The reference versions of Arduino, which have now developed to newer releases, were the UNO board and version 1.0 of the Arduino Software (IDE).

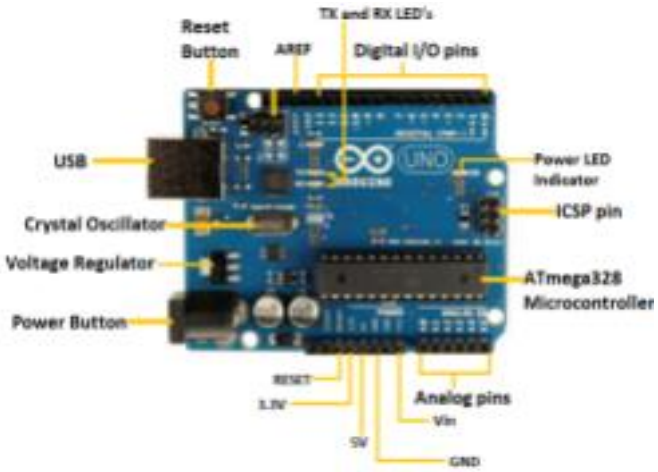

Fig 1: Arduino Uno

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

e-ISSN : 2583-1062

Impact Factor: 5.725

www.ijprems.com
editor@ijprems.com

Vol. 04, Issue 04, April 2024, pp: 429-432

3.2. TCS3200 Colour Sensor

Depending on their wavelength, a large range of colors can be detected by the TCS3200 color sensor. Projects involving color recognition, such as test strip reading, color matching and sorting, benefit greatly from the usage of this sensor. By combining Red, Green and Blue, the TCS3200 Colour Recognition Sensor Module for MCU Arduino senses any color using an excellent light sensor . The TCS3200 is equipped with white LEDs to illuminate the surface of the object whose color needs to be identified. It is calculated how much light the thing reflects back. The converter generates a frequency proportionate to the intensity, which the microcontroller uses to estimate the object's color.The surface is lit with a white light emitter. Subsequently, the sensor turns on three filters, each having a wavelength sensitivity of three, to measure the RGB color wavelengths. The material's color is established based on these three hues.Four arrays of 16 photodiodes total—one for each of the major colors and an unfiltered array—make up the TCS230 sensor. As a result, the sensing element has 64 sensing points in total. Every array is chosen on its own. The gadget produces a square wave, the frequency of which varies with light intensity.

Fig 2: TCS3200 Colour sensor

3.3. 16*2 LCD DISPLAY

Compact screens with 16 characters on 2 lines are called 16x2 LCDs. Each character is made up of a matrix of 5 by 7 pixels. They are extensively utilized in embedded systems, robotics, and electronics to handle text-based data. They interact with microcontrollers and run at 4.7–5.3V. This LCD screen has an I2C interface and measures 16 by 2 characters. It has two text display rows, each of which may hold up to 16 characters for text. The blue background will contrast with the white text to create a readable and eye-catching display. The LCD 16x2 operates on the idea of blocking light instead of dissipating it.LCD is an abbreviation for liquid crystal display. This particular type of electronic display module is utilized in a wide range of circuits and gadgets, including TV sets, computers, calculators, cell phones, and more. Seven segments and multi-segment light-emitting diodes are the major applications for these displays. The primary advantages of utilizing this module are its low cost, easy programming, animations, and limitless display options for unique characters, special effects, and animations.

Fig 3:LCD Display

3.4. 10K VARIABLE RESISTOR

This three-terminal, PCB-mountable variable resistor is adjustable. As the preset is turned, there is a change in voltage between the terminals. In a circuit, variable resistors are used to change the voltage as needed. Potentiometers are frequently used to regulate electrical equipment, such as audio equipment volume controls. It is also utilized for fan speed control. For instance, position transducers in a joystick can be made using potentiometers that are mechanism-operated.

Fig4 : 10k variable resistor

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

e-ISSN : 2583-1062

Impact Factor: 5.725

www.ijprems.com
editor@ijprems.com

Vol. 04, Issue 04, April 2024, pp: 429-432

3.5. 100R RESISTOR

They resist the electrical current from flowing across a circuit and are passive electronic parts. The color code of 100R resistor is brown, black, brown , gold.

Fig 5: Resistor

3.6. 9V Battery

4. EXPECTED CONCLUSION

In conclusion, the color detector project using Arduino Uno and the TCS3200 color sensor has demonstrated the successful integration of hardware and software components to accurately identify and classify colors. Through careful calibration and programming, the sensor's RGB readings were translated into meaningful color information. The Arduino Uno served as a reliable microcontroller, providing the necessary processing power to handle sensor data and execute the color interpretation algorithm. The TCS3200 color sensor, with its simplicity and effectiveness, contributed to the project's success by providing precise RGB values for different colors. Throughout the project, various challenges were addressed, including calibration adjustments for different lighting conditions and the fine-tuning of color interpretation thresholds. Through extensive testing with different colors, the system demonstrated a high degree of accuracy in color detection and sorting. The implementation effectively showcased the potential of using Arduino-based systems in practical applications like automated sorting processes. With further refinement and optimization, the system could be developed into a more robust and efficient color sorting solution for various applications.

5. REFERENCE

[1] Mohammad Habeeb Hasan, Arief Marwanto,Agus Suprajitno, “Colour Detector Tool Using TCS3200 and Arduino Uno for Blind and Child”, Vol.6, No.1, March 2018

[2] Prince Mary, S.Lakshmi, Sareddi Vijaya,Anuhya, Seemakurt “,Color Detection and Sorting Using Internet of Things Machine”, Volume 16, Number 8, August 2019

[3] Rajitha Rayala, Vimala Kumari Jonnalagadda. Venkata Sai Sriya Vempati; Geetha Sravani Tumuluri,Jyothishri Tedla,” Colour Detection And Sorting Of Objects Using IoT”, 30 March 2023

[4] Poltak Sihombing1, Faddly Tommy1, Sajadin Sembiring1 and Nogar Silitonga,” The Citrus Fruit Sorting Device Automatically Based On Color Method By Using Tcs320 Color Sensor And Arduino Uno Microcontroller”,2019

[5] Herdi Susanto , Nana Ariska , TM Azis Pantria , Nuzuli Fitriadi, “Design of a Quality Sorter Machine for Peanuts Based on Arduino”, Vol. 44, No. 11,2021

[6] Ifeoluwa E. Elemure, James O. Akinyoola, Aderinsola M. Olawumi, Abiodun E.Amoran, Edwin A. Oshin, Temitope V. Adebanwo,” Smart sorting method of grains using a color sensor”, Volume 5, Issue 3, May-June-2019

[7] Sunita Kheman1, Priyanka S.Ramthirth2*, Sanjeev Chavan3, Shashank D.Kaddaragi4, Varuni R.Kulkarni, “Design and Development of an Automatic Color Sorting Machine on Belt Conveyor”r, Volume 6, Issue 6, June 2023

[8] Ariagi Juliano , Ade Hendri Hendrawan , Ritzkal, “Information System Prototyping of Strawberry Maturity Stages using Arduino Uno and TCS3200”, Vol. 1, No.3, May 2020

[9] Olorunfemi BO 1, Nwulu NI 1, Ogbolumani OA,” Solar panel surface dirt detection and removal based on arduino color recognition”, 13 Dec 2022

[10] Humaidillah Kurniadi Wardana1, Elly Indahwati1 and Lina Arifah Fitriyah “,Measurement of Non-Invasive Blood Glucose Level Based Sensor Color TCS3200 and Arduino”,2019