Faculty of Computer Applications & Information Technology

BCA PROGRAMME

Semester III Project

Report for

240301306 Introduction to Embedded Systems Project

Definition

" Automated Dispenser For Harmful Chamicals"

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PROJECT TITLE

Project Title – AUTOMATED DISPENSER FOR HARMFUL CHAMICALS

GROUP MEMBERS

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ABSTRACT

• This project presents an automated, touchless dispenser system specifically designed for harmful chemicals and liquids that are unsafe for direct human handling. The system integrates Arduino Uno, Ultrasonic Sensor, Relay Module, Air Pump, LCD Display, and a Color Sensor.

• When an object (like a beaker or container) is detected by the ultrasonic sensor, the Arduino activates the relay-controlled air pump to dispense a fixed quantity of liquid. During the process, the LCD displays real-time messages such as “DISPENSING…”. After dispensing, the Color Sensor detects the color of the liquid and displays it on the LCD screen, ensuring clarity and confirmation for the user.

• This system ensures safety, hygiene, and automation in handling harmful liquids, preventing human contact, contamination, and accidents.

OBJECTIVE

• To design a touchless, automated chemical dispenser.

• To ensure safety by eliminating direct contact with harmful chemicals.

• To integrate a Color Sensor for identifying the dispensed liquid’s color.

• To provide real-time LCD display messages (Project name, dispensing process, detected color).

• To make a low-cost, scalable, and safe solution for laboratories and industries

COMPONENTS

1. Hardware Components:
   - Arduino Uno
   - Ultrasonic Sensor (HC-SR04)
   - Relay Module (HC-05)
   - Air Pump
   - LCD (16x2)
   - Color Sensor
   - Battery
   - Liquid Container, Tubes, and Nozzles

2. Software Components:
   - Arduino IDE
   - Embedded C code

COMPONENTS FUNCTIONALITY

1. **Hardware Components Functionality:**
   - Ultrasonic Sensor: Detects object/container.
   - Arduino Uno: Processes data and controls output.
   - Relay Module: Acts as a switch to control the pump.
   - Air Pump: Dispenses liquid safely.
   - LCD Display: Shows project name, process ("Dispensing…"), and detected color.
   - Color Sensor: Detects and identifies liquid color.
   - Battery: Provides required power supply.

2. **Software Components Functionality:**
   - Arduino IDE: Code development and uploading.
   - Embedded C/C++: Logic for sensing, control, and display.

WORKING OF SYSTEM

- The ultrasonic sensor continuously monitors distance.
- When an object comes within the threshold range, the Arduino activates the relay-controlled air pump.
- The LCD displays “DISPENSING…” during the process.
- After dispensing, the color sensor detects the liquid’s color and shows the detected color on the LCD screen.
- The system resets and waits for the next object.

FUNCTIONALITY OF SYSTEM

- Touchless detection and dispensing.
- Real-time LCD display for process and output.

- Color detection of the liquid.
- Safe handling of harmful chemicals.
- Adjustable detection range and dispensing time.
- Portable and battery-powered.
- Cost-effective and reliable solution for labs, industries, and sanitation purposes.