LCD Display Overview

The **CoffeeTime** project uses an **I2C LCD Display** for **user interaction and real-time feedback**. It provides status updates, menu options, and animations for an improved user experience.

Components & Pin Configuration

Component	Pin(s)	Function
LCD I2C Display	SDA (4), SCL (5)	User interface for feedback and settings

LCD Commands & Initialization

Key Commands:

0x28 → 4-bit mode, 2-line display

0x08 → Display OFF

0x0C → Display ON, cursor OFF

0x01 → Clear display

0x06 → Increment cursor (shift right)

Initialization Sequence:

lcd_init() → Initializes the LCD in 4-bit mode.

init_i2c_lcd() → Configures I2C communication and starts the LCD.

Text Handling Functions

Function	Description
lcd_clear()	Clears the entire display.
lcd_set_cursor(row, col)	Positions cursor at specified row and column.
lcd_print(str)	Prints a string on the LCD.

Custom Characters & Special Effects

Function	Description
create_custom_char(location, charmap[])	Creates a new character for the LCD (up to 8).
display_custom_char(location, row, col)	Displays a custom character at a specified position.

Display Animations

Animation Type	Function	Description
Scrolling Text	scroll_text(msg, row, delay)	Moves text across the display.
Typing Effect	type_effect(msg, row, delay)	Simulates typing effect.
Progress Bar	progress_bar(percentage, row)	Displays a bar indicating progress.
Blinking Alert	blink_text(msg, row, col, times, delay)	Flashes text to indicate an alert.
Fade Transition	fade_text(msg1, msg2, row, delay)	Fades out one message before showing another.
Clock Simulation	simple_clock()	Displays a basic countdown timer.

This section describes the **LCD display integration** in **CoffeeTime**, allowing for real-time interaction, feedback, and dynamic animations to enhance user experience.