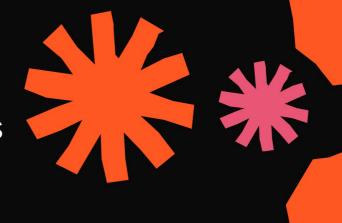


Advanced Clock-Based Real-Time Display System



Team members

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Components used





BH1750 (Light Sensor)

This component measures ambient light levels to provide realtime lighting data.



MAX4466 (Noise Sensor)

This sensor captures sound levels, allowing for noise monitoring in real-time.



DHT11 (Temperature and Humidity Sensor)

Utilized for measuring temperature and humidity levels. providing crucial environmental data.



OLED Display (128x64) SSD1306

A display module that shows real-time data visually, enhancing user interaction.



STM32F401CCU6 Board

A microcontroller board that processes data from all sensors and drives the display.



Bread Board (800 Pins)

Utilized for prototyping and connecting various components without soldering.



Jumper Wires

Flexible wires used to make connections between the components on the breadboard.



Concepts: I2C, SPI, ADC, Interrupt

Key communication protocols and modes that facilitate interaction between components.

Project Description



System Features

Real-Time Clock

Accurate time display
24-hour format
Battery backup capability

Environmental Monitoring

Temperature: 0-50°C (±2°C) Humidity: 20-90% RH Light intensity: 1-65535 lux Noise level: 30-130 dB

Smart Display

Dynamic emoji display based on environmental conditions Auto-brightness adjustment Multi-screen information cycling

Technical Challenges & Solutions

I2C Bus Management

Challenge: Multiple devices on same bus Solution: Implemented device addressing and bus arbitration

Power Optimization

Challenge: Battery life constraints Solution: Implemented sleep modes and adaptive sampling

Display Refresh

Challenge: Screen tearing during updates
Solution: Double buffering

implementation

Results and Performance

Power consumption: ~100mA at 3.3V

System Performance

Display refresh rate: 1 Hz Sensor sampling rate: 0.2 Hz

Accuracy Metrics

Time drift: <1 second/day
Temperature accuracy: ±0.5°C
Light sensing resolution: 1 lux

Future Enhancements

Hardware Upgrades

WiFi module integration Additional environmental sensors Expanded display capabilities

Software Features

Weather prediction Data logging capability Mobile app integration

Conclusion

Successfully implemented real-time environmental monitoring Achieved reliable sensor integration Created intuitive user interface with emoji feedback Established foundation for future enhancements

Thank You



