ENG20009

Project Report

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Abstract:

The "Environmental Sensor Data Logger with SDI-12 Interface" project represents a comprehensive undertaking in the realm of environmental monitoring and data logging. This report encapsulates the objectives, methodologies, achievements, and significance of this innovative project.

The project's core goal is the development of a versatile environmental data logging system, enabled by the integration of the BME680 and BH1750FVI sensors, under the control of an Arduino Due microcontroller. These sensors collectively provide essential environmental parameters, including temperature, humidity, pressure, gas composition, and light intensity. Data retrieval and control are facilitated through the standardized SDI-12 communication protocol.

The project encompasses a wide range of features and functionalities, including a user-friendly menu system with graphical representation for data visualization. Crucially, the system logs sensor data onto an SD card, ensuring data retention and enabling long-term data analysis. The project's significance extends to academic, research, industrial, and educational domains, providing a practical and educational tool for monitoring and studying the environment.

This report outlines the project's detailed scope, the conditions for an ideal workplace, safety measures, risks, and an overview of the workplace environment. Additionally, it delves into the risk assessment and details the features and objectives of the project. The inclusion of a table describing the project's budget and timeline is intended to provide comprehensive insight into the project's management.

Overall, the "Environmental Sensor Data Logger with SDI-12 Interface" project exemplifies an exemplary amalgamation of innovation, technology, and environmental stewardship. It serves as a testament to the capabilities of modern sensor technology, data communication, and workplace efficiency. This report offers a comprehensive overview of the project's journey, objectives, and achievements, serving as a valuable resource for those interested in environmental monitoring, sensor technology, and project management.

Pseudocode:

```
# Include necessary libraries

Include SdFat, DueTimer, Adafruit_GFX, Adafruit_ST7735, Adafruit_SSD1306, SPI, RTClib, BH1750, Wire, Adafruit_Sensor, and Adafruit_BME680 libraries


# Define pins and configure components

Define SD_CS_PIN, SOFT_MISO_PIN, SOFT_MOSI_PIN, SOFT_SCK_PIN, TFT_CS, TFT_RST, TFT_DC, TFT_SCLK, BME_SCK, BME_MISO, BME_MOSI, BME_CS, SEALEVELPRESSURE_HPA

Configure SD card, SPI, RTC, BH1750 light sensor, BME680 sensor, and other pins


# Initialize variables
```

Initialize global variables including a, temp, humid, gas, press, light, mn, preval, Select, Confirm, Cancel, Disable_stepper, BME680menu, BH1750menu, Main_Menu

Create an array of menu options (menuls)

Setup function

Setup serial communication, RTC, TFT display, SD card, SDI-12 communication, and sensor configuration

Attach interrupts for menu navigation and data writing

Loop function

Continuously run the main program loop

Handle 'D' command

If the received character is 'D' via Serial1:

    Read the next character

    If the character is '1':

        Read the next character

        If the character is '!', proceed

            Set mn to true

            Call senval(1) to read sensor values

            Display temperature graph

            Create a data message and send it via sdiout

            Write the data to the SD card and read it

            Delay and display pressure, humidity, and gas graphs

    If the character is '0':

        Read the next character

        If the character is '!', proceed

            Set mn to true

            Call senval(1) to read sensor values

            Display temperature graph

            Create a data message including light data

            Send the message via sdiout

            Write the data to the SD card and read it

Delay and display pressure, humidity, and gas graphs

If the character is '2':

Call senval(1) to read light sensor data

Create a data message with light data and send it via sdiout

Write the data to the SD card and read it

Display the light graph

senval function

Read sensor data from the BME680 sensor and BH1750 light sensor

Store temperature, pressure, humidity, gas resistance, and light level data in global variables

Calculate and store the elapsed time since the function was called

sdiout function

Send data via Serial1

Set a control pin to LOW, send data, delay, and set the control pin back to HIGH

tempgraph2, pressgraph, humidgraph, gasgraph, lightgraph functions

Display a graph on the TFT display with specific labels and data

Graph shows time vs. sensor data (temperature, pressure, humidity, gas resistance, or light level)

The above pseudocode provide a brief description of the codes that I have written for the project.