**Integration of Touchscreen Interface for Real-time Monitoring of Moborobot**

**Abstract**

This project, aimed to enhance the robot's interactivity and user feedback mechanisms by integrating a touchscreen interface. This interface provides real-time data on the robot's battery level and WiFi connectivity status. The project involved the use of an Arduino Uno, a 2.8” TFT touchscreen LCD, and a voltage divider circuit to accommodate the system's high operating voltage.

**Introduction**

The Moborobot project represents a significant step in the field of robotics, offering a versatile platform for various applications. However, the lack of real-time monitoring capabilities for critical system parameters such as battery level and WiFi status posed a challenge for users. To address this, a touchscreen interface was proposed to deliver instant feedback and control. This report details the design, implementation, and testing of the touchscreen interface, highlighting the project's success in enhancing the Moborobot's functionality.

**System Overview**

The Moborobot is designed to operate on a 22.4V – 28.8V power system, which exceeds the 5V limit of the Arduino Uno's analog inputs. To resolve this, a voltage divider was implemented to scale down the voltage to a safe level for monitoring. The system's WiFi connectivity is managed through the Arduino, which communicates with an onboard module to establish connections and relay status information to the user via the touchscreen.

**Methodology**

1. **Hardware Setup:**
   * An Arduino Uno serves as the central processing unit.
   * A 2.8” TFT touchscreen LCD provides the user interface.
   * Jumper wires establish connections between components.
   * A voltage divider circuit scales the 28.7V system voltage to a 5V range.

devre bileşeni, elektronik mühendisliği, elektronik bileşen, pasif devre bileşeni içeren bir resim

Açıklama otomatik olarak oluşturuldu

diyagram, metin, çizgi, öykü gelişim çizgisi; kumpas; grafiğini çıkarma içeren bir resim

Açıklama otomatik olarak oluşturuldu

1. **Software Development:**
   * The Arduino sketch includes libraries for the LCD and touchscreen.
   * Functions were written to read the battery level and display it on the screen.
   * A WiFi connection routine was implemented, triggered by a touchscreen button.
2. **Testing and Validation:**
   * The touchscreen's responsiveness and accuracy were tested.
   * The voltage divider's output was verified against a multimeter.
   * WiFi connectivity was tested by attempting to connect to a network and observing the status update on the display.

**Code Snippets:**

|  |  |
| --- | --- |
| // Include necessary libraries  #include <Adafruit\_GFX.h>  #include <Adafruit\_TFTLCD.h>  #include <TouchScreen.h>  // Define touch screen pins and calibration values  // ... (abbreviated for brevity)  // Define LCD pins  // ... (abbreviated for brevity)  // Define color definitions  // ... (abbreviated for brevity)  // Initialize TouchScreen and TFTLCD objects  // ... (abbreviated for brevity)  // Variables for battery level calculation  // ... (abbreviated for brevity)  // Function prototypes  void showBatteryLevel();  void checkTouch(); | // Setup function initializes the system  void setup(void) {  // ... (abbreviated for brevity)  }  // Main loop function  void loop() {  // ... (abbreviated for brevity)  }  // Function to display the battery level  void showBatteryLevel() {  // ... (abbreviated for brevity)  }  // Function to check for touch input and update WiFi status  void checkTouch() {  // ... (abbreviated for brevity)  } |

**Results**

The integration of the touchscreen interface was successful. The battery level is displayed accurately, updating every changing on battery level, and the WiFi status reflects the current connection state, updating upon user interaction with the connection button. The touchscreen's interactivity was well-received, providing a user-friendly means of engaging with the Moborobot.

**Discussion**

The project faced challenges, particularly in scaling the voltage and ensuring stable WiFi connectivity. The voltage divider required careful selection of resistors to achieve the desired voltage range without compromising accuracy. WiFi connectivity was initially unreliable, but adjustments to the connection routine improved stability.

**Conclusion**

The addition of the touchscreen interface to the Moborobot has significantly improved the user experience by providing real-time data on battery level and WiFi status. This enhancement not only aids in the maintenance and operation of the robot but also serves as an educational tool within the Embedded Systems course, demonstrating practical applications of embedded programming and circuit design.

**Future Work**

Future enhancements could include the integration of additional sensors for environmental monitoring, the implementation of a graphical user interface (GUI) for more intuitive control, and the development of a custom PCB to reduce wiring complexity and improve reliability.

**References**

* Adafruit Industries. (n.d.). Adafruit GFX Graphics Library. Retrieved from <https://github.com/adafruit/Adafruit-GFX-Library>
* Adafruit Industries. (n.d.). Adafruit TFTLCD Library. Retrieved from <https://github.com/adafruit/TFTLCD-Library>

elektronik donanım, kablo, metin, elektronik mühendisliği içeren bir resim

Açıklama otomatik olarak oluşturuldu metin, kişi, şahıs, elektronik donanım, elektronik cihaz içeren bir resim

Açıklama otomatik olarak oluşturuldu

metin, elektronik cihaz, elektronik donanım, küçük alet içeren bir resim

Açıklama otomatik olarak oluşturuldu

kablo, elektronik donanım, Elektrik kabloları, elektronik mühendisliği içeren bir resim

Açıklama otomatik olarak oluşturuldu