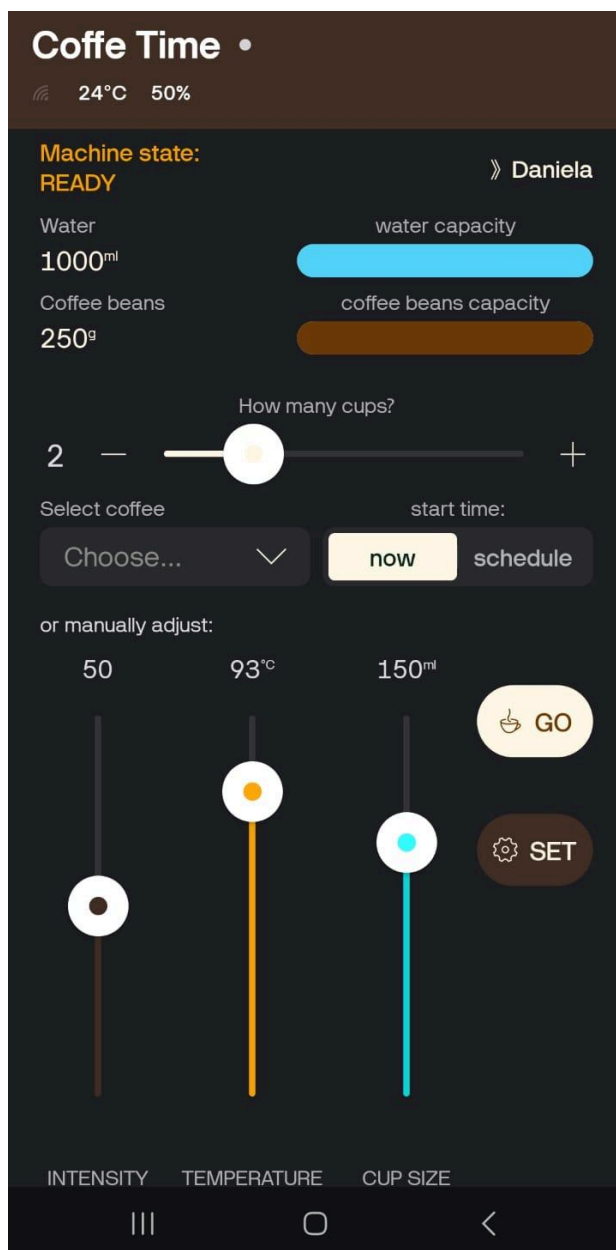


Future Enhancements

The **CoffeeTime** project successfully simulates an intelligent coffee machine with **infrared control and real-time monitoring**. However, future improvements could elevate it to a **fully integrated IoT device** with remote access and enhanced automation.



Wi-Fi Connectivity & IoT Integration

→ Implementing Wi-Fi communication via MQTT protocol to allow remote control and monitoring through a mobile app.

→ Enabling real-time status updates, allowing users to check temperature, water level, and coffee bean availability.

→ Remote coffee scheduling.

Mobile App & User Profiles

→ Developing an **intuitive mobile interface** using platforms like Blynk IoT.

→ Storing **user preferences** for coffee strength, temperature, and quantity.

→ Creating **custom coffee profiles** for different brewing styles (Espresso, Americano, etc.).

Enhanced Machine Intelligence

- **Automatic resource detection:** Using sensors to monitor coffee beans and water levels, triggering alerts when refilling is needed.
- **Smart decision-making:** If resources are insufficient, the system could suggest adjustments (e.g., reducing cup quantity).
- **Multi-user operation:** Different users could control and personalize coffee settings remotely.

Software Architecture Improvements

- **Combining IR & Wi-Fi commands:** The system should **prioritize IR commands** while managing **MQTT messages asynchronously** in a queue.
- **State management optimization:** Ensuring smooth transitions between states, such as brewing, monitoring, and error handling.

Research & Development

- Evaluating **energy efficiency optimizations** to reduce power consumption.
- Exploring **advanced brewing algorithms** based on pressure control.
- Investigating **voice control integration** (e.g., Google Assistant, Alexa).

These improvements aim to transform **CoffeeTime** into a **fully functional IoT-based coffee machine**, offering seamless automation, smart decision-making, and personalized experiences for users.