Smart Hydration System with Integrated Electrolyte Monitoring

TEAM M036

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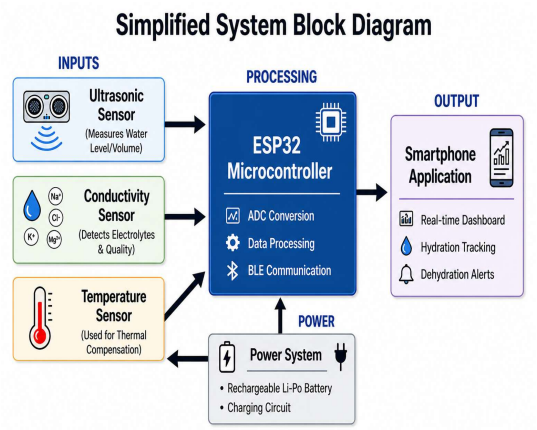
ICS EE 3 CHE

Overview

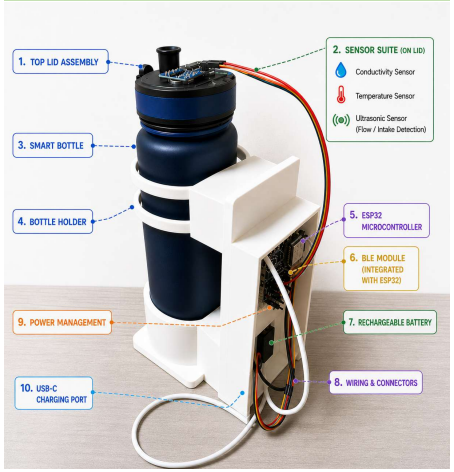
Current smart bottles rely on fixed tracking and reminders, with limited real-time sensing and no adaptation to user behavior or water quality.

To address this issue, our system pairs a smart bottle and iOS app to track each drink event, monitor electrolyte trends, and provide adaptive reminders that adjust to the user's daily progress and context.

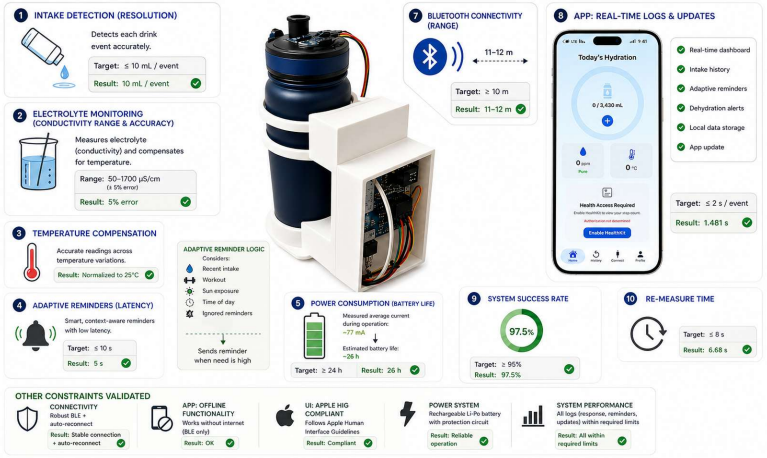
System Overview



Prototype Development



Testing & Validation



System Constraints & Specifications

Connectivity: Robust BLE + auto-reconnect	✓
App: Full offline functionality (BLE)	✓
UI: Apple HIG compliant	✓
Intake error: ≤ 5%	5%
Resolution: ≤ 10 mL/event	10 mL/event
Conductivity: 50–1700 µS/cm (≤5%)	5%
Reminder latency: ≤ 10 s	5 s
Battery: ≥ 24 h	26 h
BLE range: ≥ 10 m	11-12 m
App update: ≤ 2 s/event	1.481 s
System success: ≥ 95%	97.5%
Re-measure: ≤ 8 s	6.68 s

Conclusion

- We successfully integrated a sensor-enabled bottle and iOS app into a single closed-loop system that measures intake and electrolyte-related conductivity in real time
- Prototype testing confirms the system meets the key performance targets for accuracy, responsiveness, wireless reliability, and battery life, showing it is practical for daily use.
- The adaptive reminder approach adjusts to user progress and context, helping users stay consistently hydrated instead of relying on generic time-based alerts.