AURICLEGUARD

Smart Early-Warning Wearable System for Ear Health Monitoring (Headset-integrated Edition)

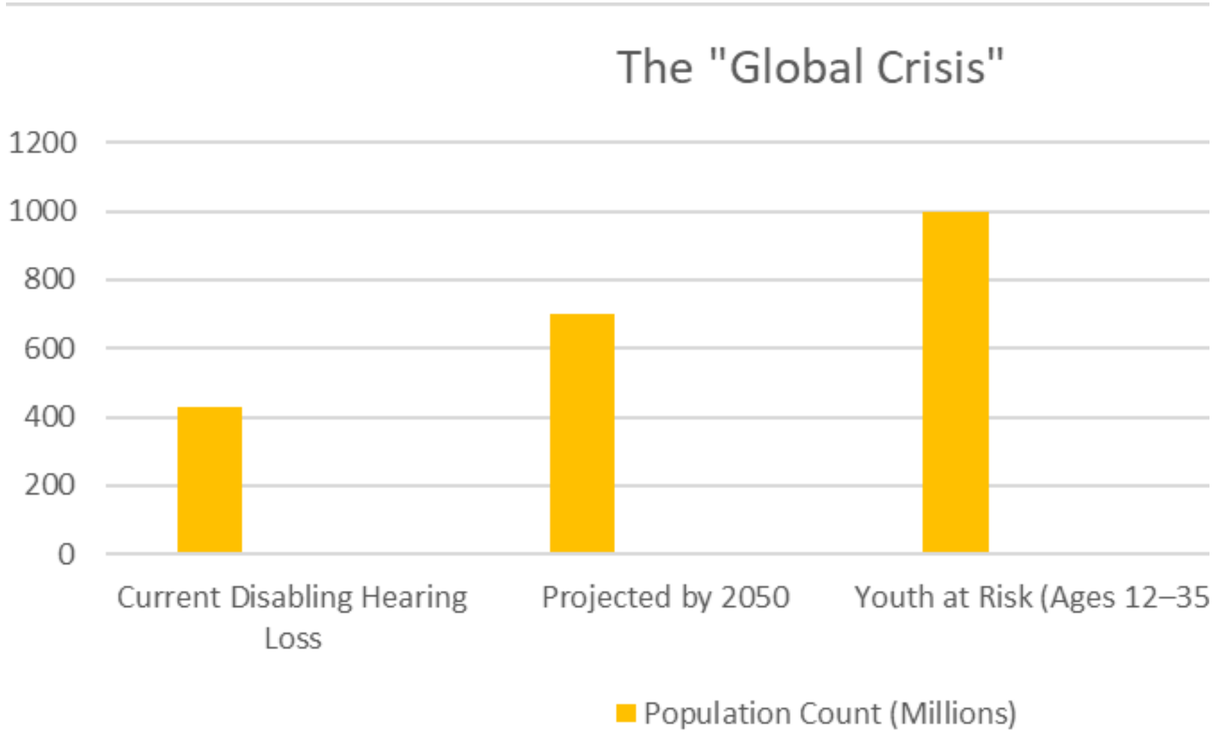
PRESENTED BY

KOLAWOLE AYOMIDE HENRY

SUPERVISED BY

ENGR. I.V DIWE





(WH0, 2021)

Figure 2

INTRODUCTION

According to the World Health Organisation (WHO)

- Over 430 million globally live with disabling hearing loss.
- By 2050, nearly 700 million people may be affected.
- 1 billion young people are at risk due to unsafe listening practices.

Problem Statement

Most ear diagnostic tools are :







Clinic-based

Expensive

Reactive

Figure 3

https://g.co/gemini/share/2828c9902ec9

Aim of The Study

Development of a non-invasive, headset- integrated smart system capable of continuously monitoring ear- canal microclimate conditions and acoustic reflection patterns

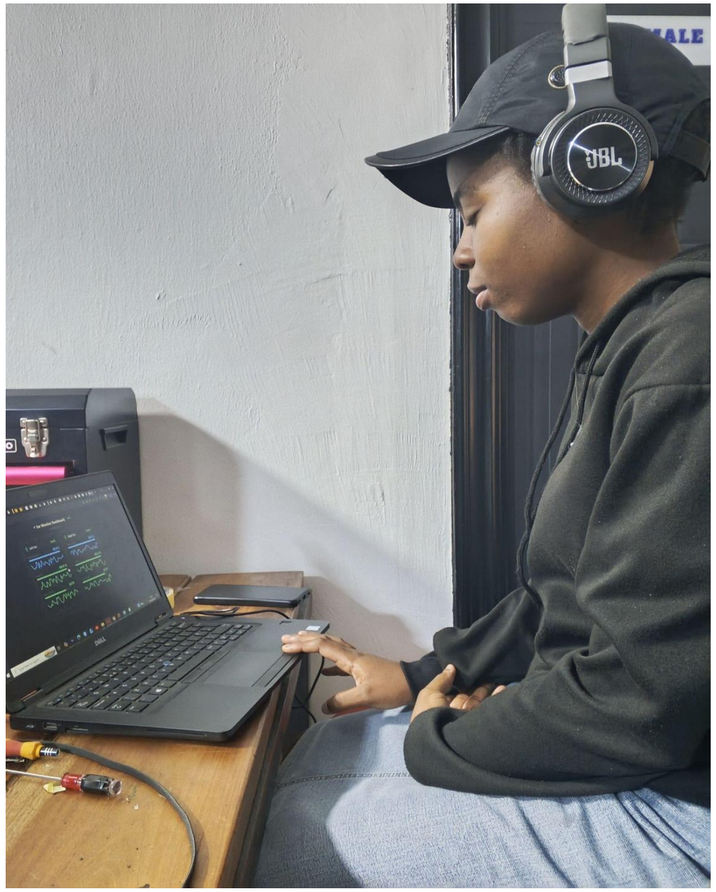


Figure 4

User Set-up for AuricleGuard

Methodology (System Design)

RESEARCH APPROACH: Prototype Development

Hardware Components

- Low intensity audio emitter(<40db)
- MEMS Microphone
- Temperature & humidity sensor
- ESP32 Microcontroller
- BLE Communication
- Modified over-ear headset.

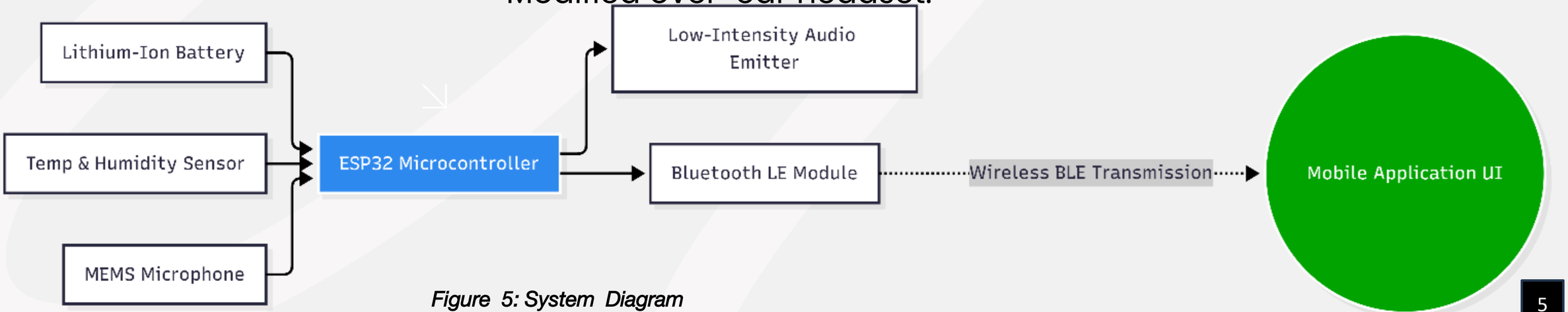
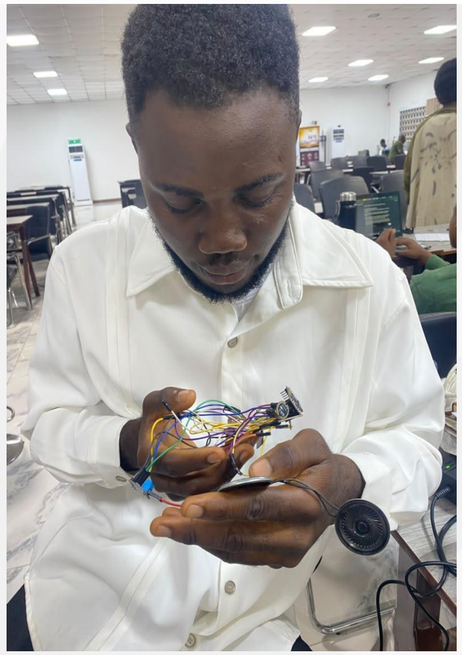
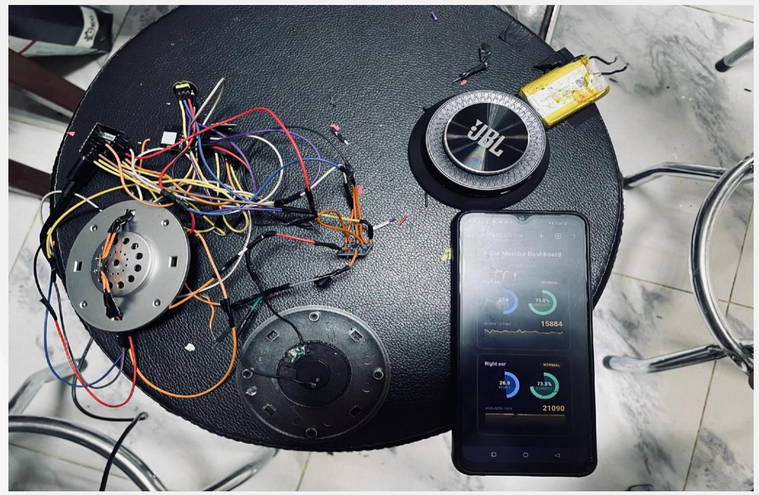
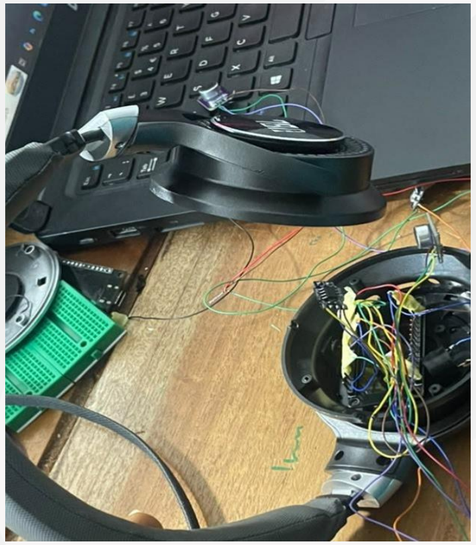


Figure 5: System Diagram









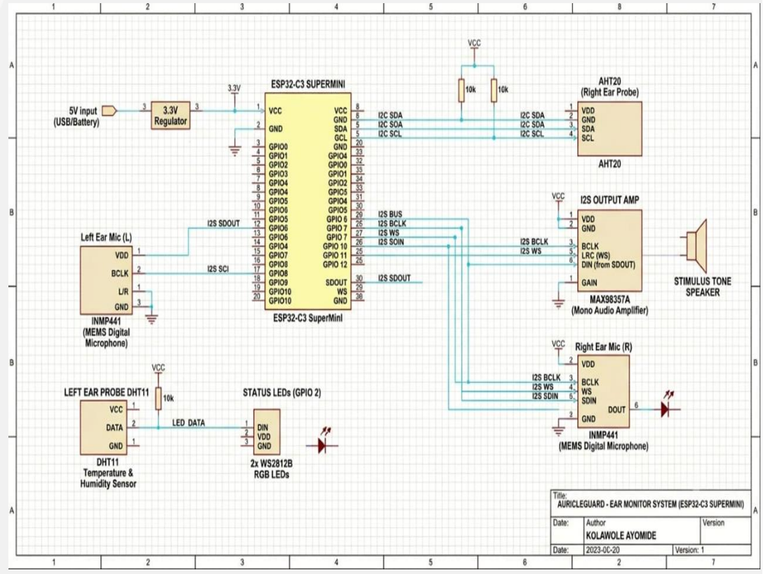


Figure 6

Assembly and Wiring of AuricleGuard Prototype

RESULTS

S/N	Relative Humidity (%)	Classification	Alert Colour
1	36	Below normal range	Yellow
2	42	Normal	Green
3	48	Normal	Green
4	60	Normal	Green
5	72	Above normal range	Yellow
6	80	Elevated / risk of microbial growth	Red

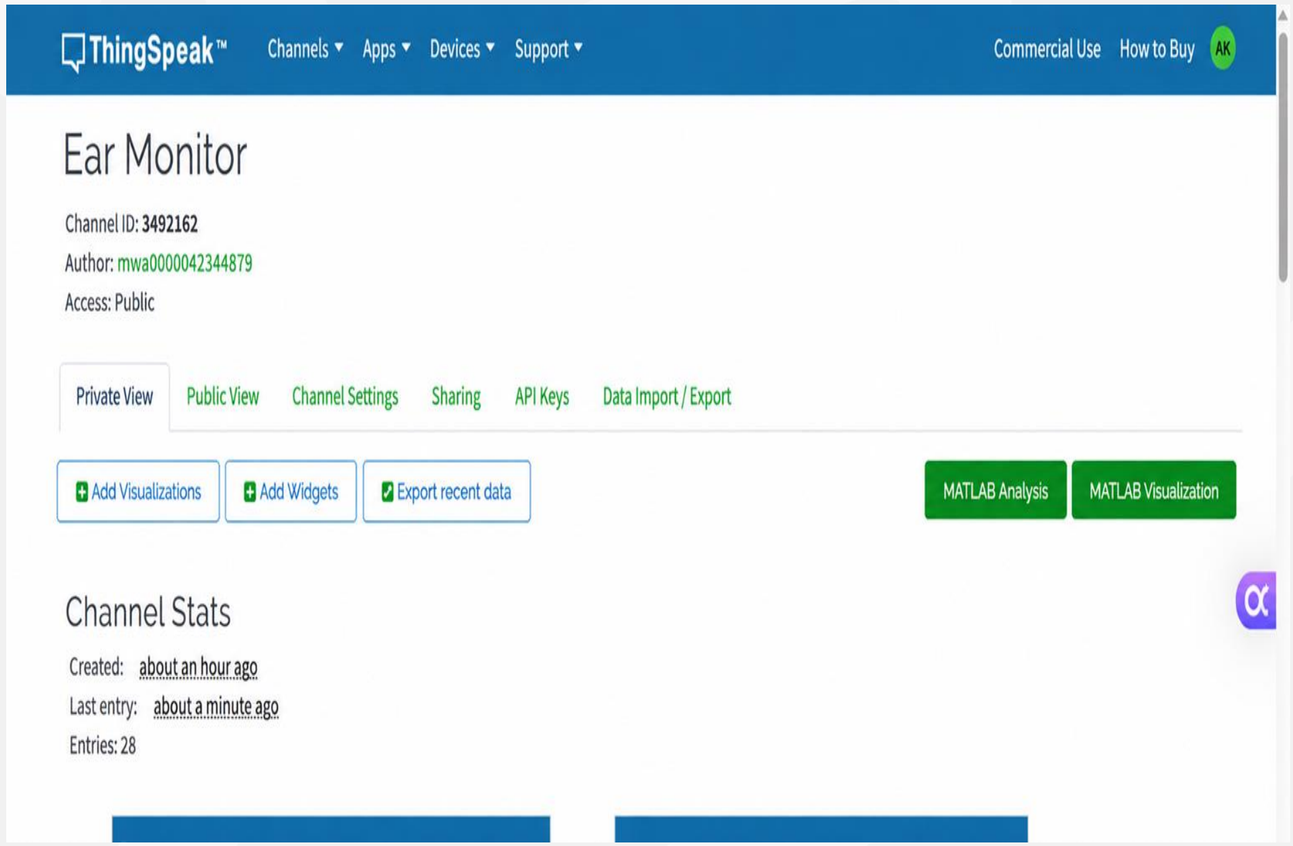


S/N	Temperature (°C)	Classification	Alert Colour
1	32.0	Below normal range	Yellow
2	33.5	Below normal range	Yellow
3	36.0	Normal	Green
4	36.5	Normal	Green
5	37.0	Normal	Green
6	38.2	Above normal range	Yellow
7	48.8	Elevated / possible inflammation	Red

Figure 7

AuricleGuard Dashboard

RESULTS



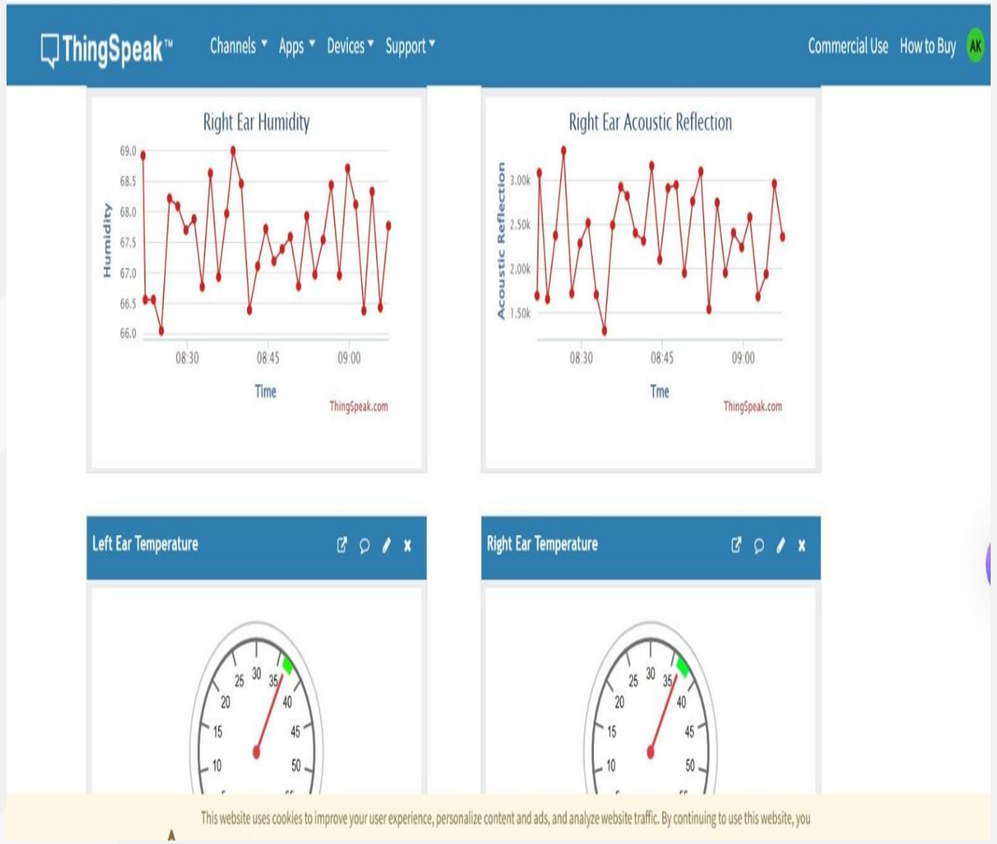


Figure 8

AuricleGuard Dashboard

RECOMMENDATION

AI Powered Diagnosis: Check probability of disease

Ear Digital Twin: Personalized baseline.

Longitudinal Monitoring: Monitor Trends over months/years.

Dust and debris protection: Ear cushion cover



Figure 9: Proposed image of AuricleGuard

References

- - Bhatia, S., et al. (2024). Investigate barriers to routine ear screening in low-income settings. Economic Analysis of Diagnostic Costs.
- - Chodankar, A., & Rane, S. (2025). The impact of prolonged earphone use on ear canal microflora. Journal of Preventive Medicine.
- - Fang, L., et al. (2024). Wearable and real-time ear monitoring systems: A review of current technologies. Healthcare Technology Letters.
- - Jin, Z., et al. (2022). EarHealth: An earbud-based earhealth monitoring system that detects common conditions. ACM Transactions on Computing for Healthcare. https://doi.org/10.1145/3543851
- - Onwughalu, C., et al. (2024). Review pneumatic otoscopy for middle ear fluid detection. Clinical Review of Diagnostic Procedures.