SmartCityX: The AIoT Hackathon

Prototype Phase REPORT

Project name: 23. Smart Cradle - An IoT-Based Child Safety and Monitoring System
Team name: ESP rockers

Team Lead:
1. A. SRI CHARAN – CB.EN.U4ECE23206 – ECE 3rd year

Team Members:
1. NAVANEETH A B S – CB.EN.U4ECE23001 – ECE 3rd year
2. MADHAVH S R K – CB.EN.U4ECE23022– ECE 3rd year

Theme: Child Well-being
Track: 1D model

Idea Brief:
This project aims to monitor an infant's safety and comfort using an intelligent cradle system. It uses sensors to detect abnormal cradle movements, adverse environmental conditions, and infant crying. The ESP32 processes sensor data and triggers alerts via Wi-Fi using cloud services. The goal is to reduce risks like overheating, over-rocking, and unattended crying, thereby ensuring safer childcare.

Software Requirements:
Website Tech Stack: MERN (MongoDB, Express.js, React.js, Node.js) – for admin dashboard or extended UI
AI/ML model:

- **Model 1:** Detect unsafe cradle movement (abnormal shaking/tilting) using MPU6050, trained in **Edge Impulse** by extracting time-series features and deploying the quantized TFLite Micro model to the ESP32 for real-time detection.
- **Model 2:** Detect infant crying patterns using INMP441 mic data, using **Edge Impulse** with the Kaggle infant cry dataset, extracting MFCC features and training a 1D CNN, then deploying the quantized TFLite Micro model to the ESP32 for real-time cry detection.

Dataset: https://www.kaggle.com/datasets/sanmithasadhish/infant-cry-dataset
Wokwi link: https://wokwi.com/projects/437464521655980033
Cloud Platform: Blynk
Cloud Platform Link: https://blynk.cloud/dashboard/839056/templates/1909870/dashboard

Feasibility:

This system is perfect for daycare centers, hospitals, and homes. It requires little alteration to be deployed on standard cradles. It guarantees that emergency situations, such as loud crying, unusual cradle shaking, or unfavorable room conditions, are immediately communicated to caregivers. AI is responsive and power-efficient because it operates locally on the ESP32. It clearly fills a need in child safety, is reasonably priced, and is very deployable.

Budget:

S. No.	Name	Count	Purchase link/Offline store	Status	Price
1.	ESP32	1	Offline store	Bought	589
2.	DHT11	1	Offline store	Bought	118
3.	MPU6050	1	https://robu.in/product/mpu-6050-gyro-sensor-2-accelerometer/	Yet to order	165
4.	3.7V rechargeable battery	1	Offline store	Yet to order	90
5.	TP4056 Charging Module	1	https://robu.in/product/tp4056-1a-lipo-battery-charging-board-micro-usb-with-current-protection/	Yet to order	15
6.	INMP441	1	https://amzn.in/d/8XjxXan	Yet to order	334
7.	RGB LED	1	Offline store	Bought	10
				Total required	604
				Total Available	717
				Total Budget	1321