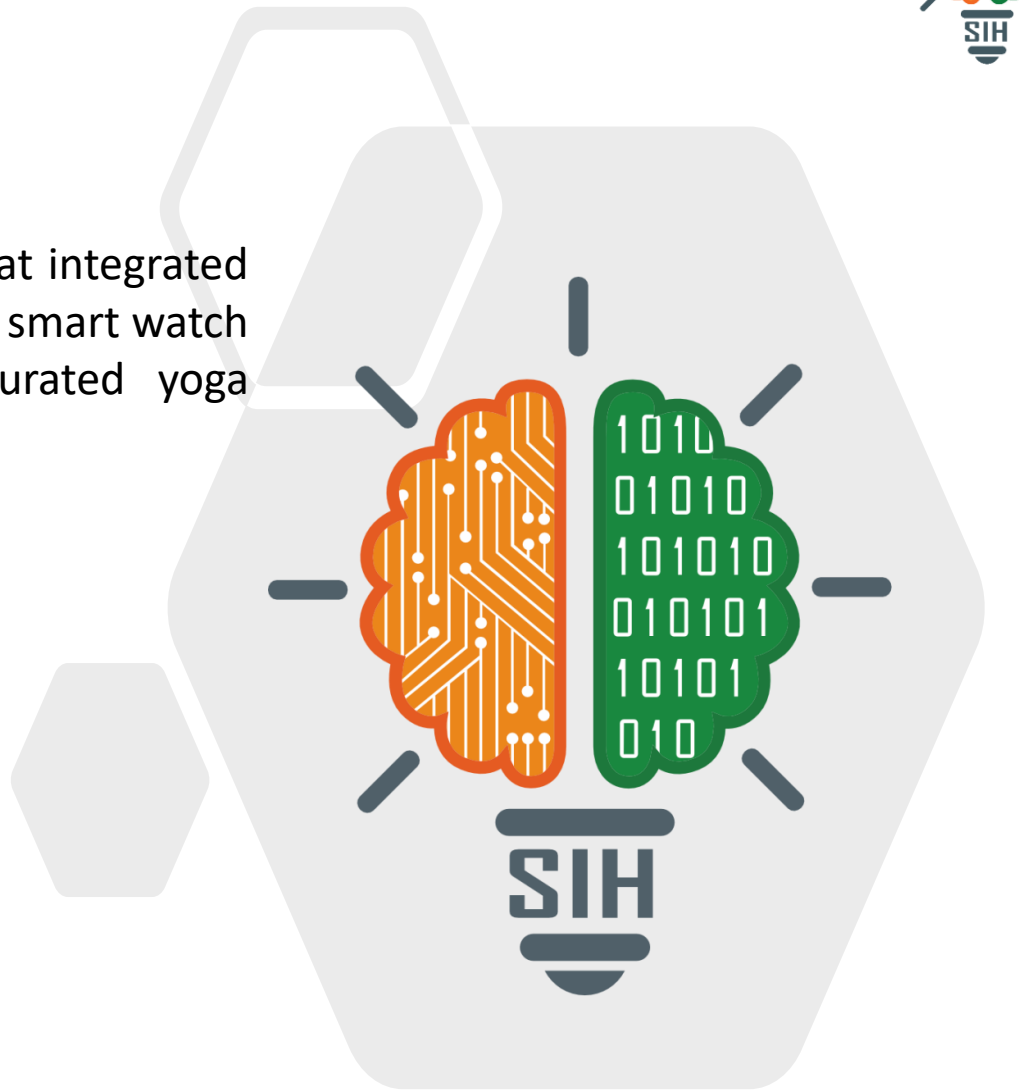
SMART INDIA HACKATHON 2024

SMART INDIA HACKATHON 2024

- **Problem Statement ID –** SIH1556
- **Problem Statement Title -** Develop a Smart Yoga Mat integrated with Artificial Intelligence (AI) capabilities to support smart watch integration for tracking progress and provide curated yoga content by experts, while ensuring its affordability.
- **Theme -** MedTech / BioTech / HealthTech
- **PS Category -** Hardware
- **Team ID -**
- **Team Name -** System 404



System 404

IDEA TITLE

SMART INDIA HACKATHON 2024

APPROACH

- Creating a MAT using Thermo-elastic Polymers (Better and Ecofriendly).
- Embedded Capacitive and Pressure sensors for posture detection.
- Microcontrollers (ESP32) to connect to Smartwatch and Other Devices.
- Use of ML (CNN & regenerative model) for generation of Correct postures and their comparison with Actual posture.
- Progressive Web App for user interaction.

SOLUTION

- Measures key metrices such as Heart rate, Calories Burned and Workout Duration by connecting to smartwatch.
- AI integration keeps track of Progress and recommends the Contents and Exercises accordingly.
- Detects and commands the user in posture correction through voice and streaming devices.
- Privacy Enabled Practice (No-Camera, Non-Intrusive Solution).

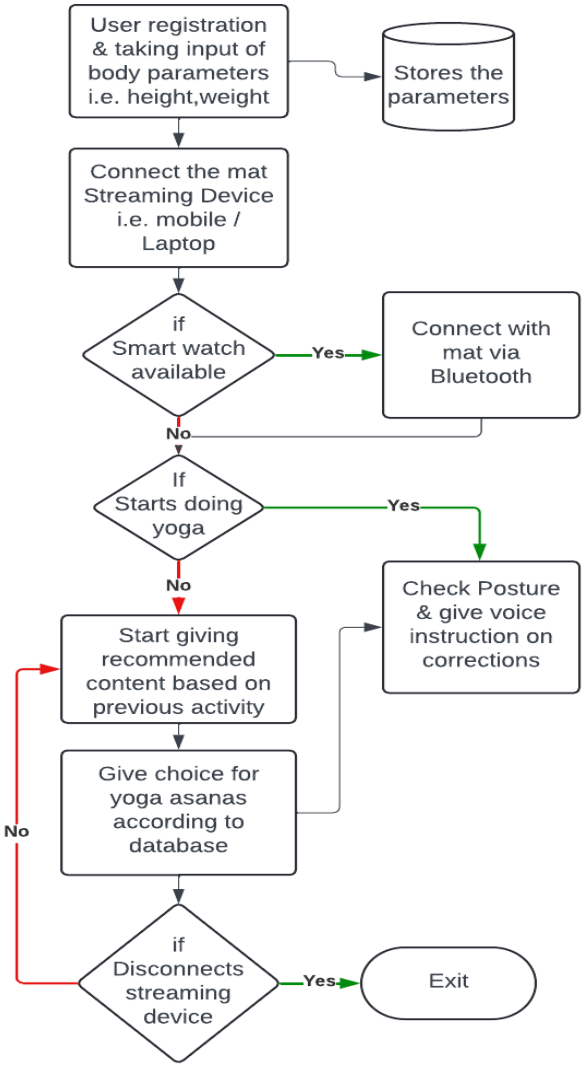
PROSPECTS

- Gamify the total interface so that for every correct asana the user will get rewarded with tokens and it can be used for premium purchases.
- Personalized voice activated AI assistant for real time interaction with user.
- Android and iOS application for better user experience.

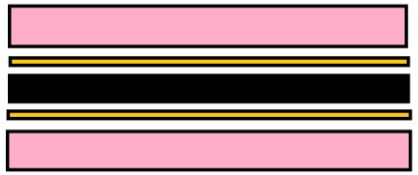
System 404

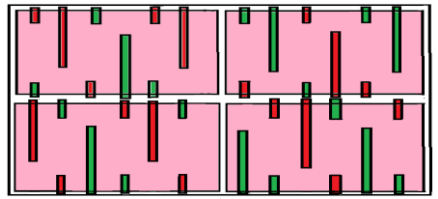
TECHNICAL APPROACH

SMART INDIA HACKATHON 2024

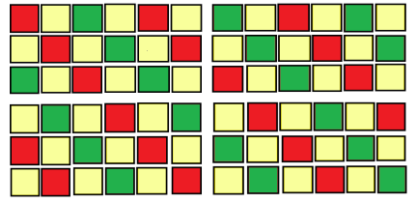


Layer Diagram →





Circuit diagram



Sensor placement

- Pressure Sensor
- Capacitive Sensor

- **16:1 Multiplexer :** Used for getting single i/p for ESP32 from all sensor nodes. [**74HC4067 IC**]
- **Binary counter :** Used a 8 bit counter to count the sensor node o/p ’s . **[74HC590 IC]**
- **Microcontroller :** Used efficient & low-cost **ESP32** for large data collection and data sending to backend.
- **Capacitive Sensor :** Used for the asanas which don’t need pressure rather soft touch or proximity.
- **Pressure Sensor :** Used efficient embedded pressure sensors to generate a 2D pressure map.
- **Battery & Charging module :** Used a separate battery case with 3 x 2000 mAh battery with 3.7v each with charging module for precautions.

Technology Stack:

System 404

FEASIBILITY AND VIABILITY

SMART INDIA HACKATHON 2024

Feasibility

- Used eco-friendly thermoelastic polymer for sustainability.
- Integrated low-cost conductive foam for better sensor data.
- Applied lightweight, durable aluminum sheets for conduction plates.
- Employed efficient, low-cost microcontrollers & modules.
- Leveraged users' smart devices to cut costs.

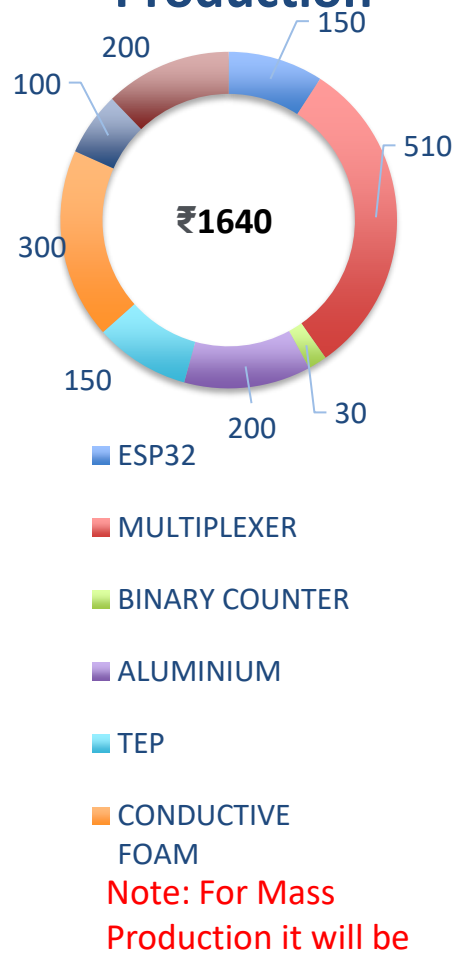
Challenges

- To make the product affordable for yoga enthusiasts without compromising the functionalities and quality.
- To detect posture using non-intrusive and affordable sensors.
- Place the sensors efficiently and with circuits without compromising the flexibility.

Solutions

- Designed low-cost embedded pressure and capacitive sensors with efficient functionality
- Combined sensors with ML to achieve 2D and 3D posture mapping
- Used a cost-effective box grid pattern for efficient sensor and wiring placement

Cost of Production



Note: For Mass Production it will be around ₹1500

System 404

IMPACT AND BENEFITS

SMART INDIA HACKATHON 2024

Impacts

Enhanced Yoga Experience: Provides real-time posture feedback and tracks progress, improving practice and reducing injury risk.

Increased Accessibility: Offers guided sessions for beginners and enables remote learning from home.

Health Insights: Tracks balance and alignment, providing personalized health data and tailored workouts.

Physical & Mental Wellness: Supports stress relief and mindfulness, improving overall well-being.

Convenience: Allows at-home practice, offering flexibility and autonomy for users.

Benefits

Social: Enhances health & well-being, promotes inclusivity, and fosters virtual communities.

Economic: Saves costs on yoga classes, creates jobs in tech and wellness sectors, and reduces healthcare expenses.

Environmental: Lowers carbon footprint by reducing travel, supports sustainable materials, and minimizes resource usage through digital integration.

System 404

RESEARCH AND REFERENCES

SMART INDIA HACKATHON 2024

- https://www.tutorialspoint.com/binary-counter-in-digital-electronics
- https://www.kaggle.com/datasets/niharika41298/yoga-poses-dataset
- https://learn.bela.io/tutorials/pure-data/sensors/diy-pressure-
- sensor/#:~:text=To%20make%20an%20FSR%2C%20sandwich,the%20side%20with%20the%20resistor
- https://electronics.stackexchange.com/questions/331325/help-with-161-mux-ic-wiring