



Piezoelectric Shoe: A Step Toward Self-Powered Wearable Technology

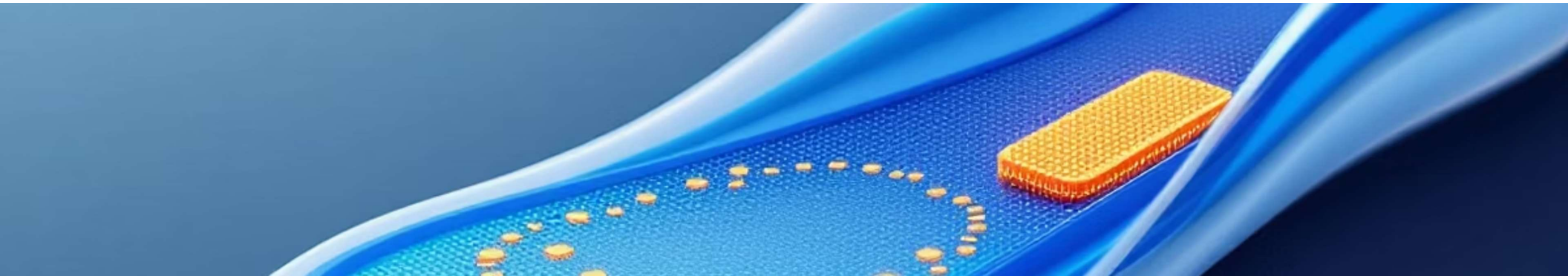
Transforming every step into sustainable energy for wearable devices

The Battery Life Challenge

The Problem

In our device-saturated world, smartwatches, fitness trackers, and health monitors constantly demand charging. Battery anxiety limits adoption and functionality, particularly in remote areas where power access is scarce.





Harvesting Energy from Human Motion

01

Pressure Application

Each footstep applies force to embedded piezoelectric sensors in the shoe sole

03

Power Conditioning

Rectifier and boost converter transform raw AC output into stable 5V DC power

02

Energy Generation

Sensors convert mechanical pressure into electrical voltage through the piezoelectric effect

04

Energy Storage

TP4056 charging module safely stores generated power in an integrated battery system

Circuit Architecture & Power Flow

Key Components

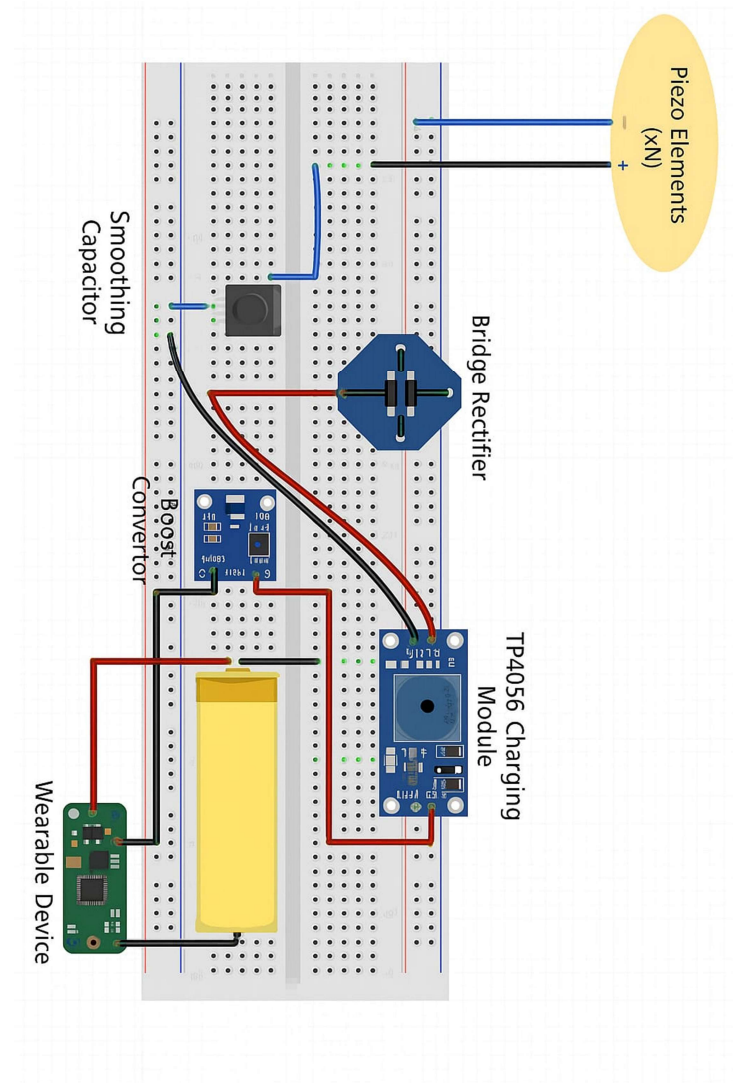
- Multiple piezoelectric transducers
- Bridge rectifier circuit
- DC-DC boost converter (5V output)
- TP4056 lithium battery charger

Power Specifications

Average power generation: **2-5mW per step**

Daily energy potential: **50-100mWh** (10,000 steps)

Sufficient for low-power sensors and intermittent device charging



Real-World Applications



Health Monitoring

Continuous powering of heart rate sensors, temperature monitors, and glucose trackers without external charging requirements



Emergency Tracking

Self-powered GPS beacons for hikers, elderly care, and search-and-rescue operations in remote locations



Developing Regions

Enabling wearable technology adoption in areas with limited electrical infrastructure and unreliable power grids



Our Innovation Differentiators

Cost-Effective Design

Utilising readily available electronic modules reduces manufacturing costs by 40% compared to custom solutions

Comfort-First Engineering

Sensors integrate seamlessly into shoe architecture without compromising walking comfort or foot support

Real-World Testing

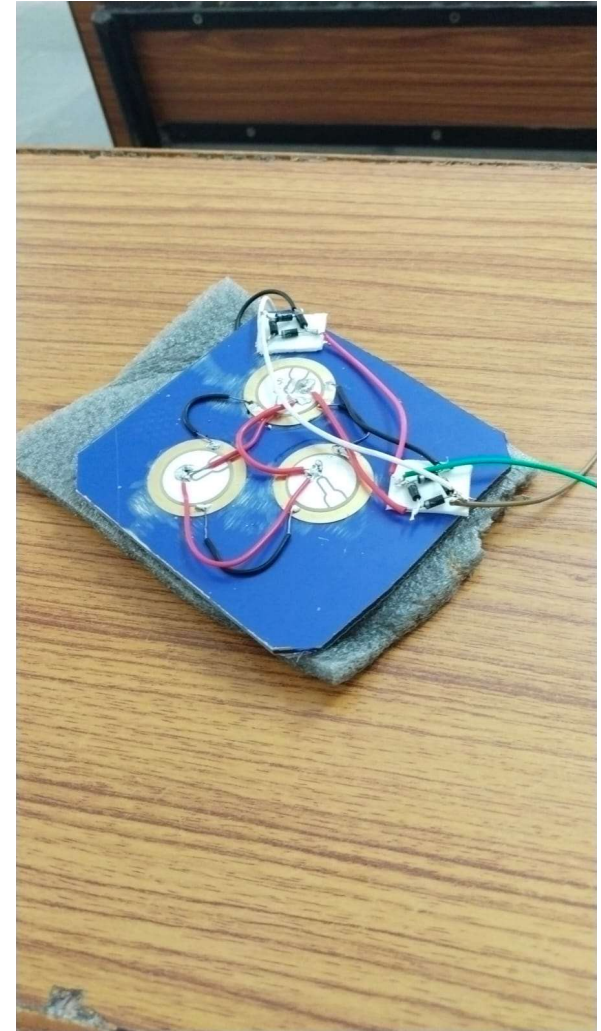
Extensive field trials with diverse users validate power generation across different walking patterns and terrains

Performance & Future Potential

Current Capabilities

- Powers step counters continuously
- Charges small sensors intermittently
- Operates in all weather conditions
- Maintenance-free operation

Next-generation improvements could increase power output by **300%** through advanced materials and circuit optimisation.



A Sustainable Step Forward

Our project demonstrates how sustainable, motion-based energy harvesting can revolutionise wearable technology independence. Every step becomes a power source, eliminating charging constraints and enabling truly autonomous devices.

It's a small step for us, but a giant leap for wearable technology.



Thank You

“Every step you take shouldn’t just move you forward — it should power the future.”

