VIBRATED GLOVE

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Section: TM471 Final Year Project

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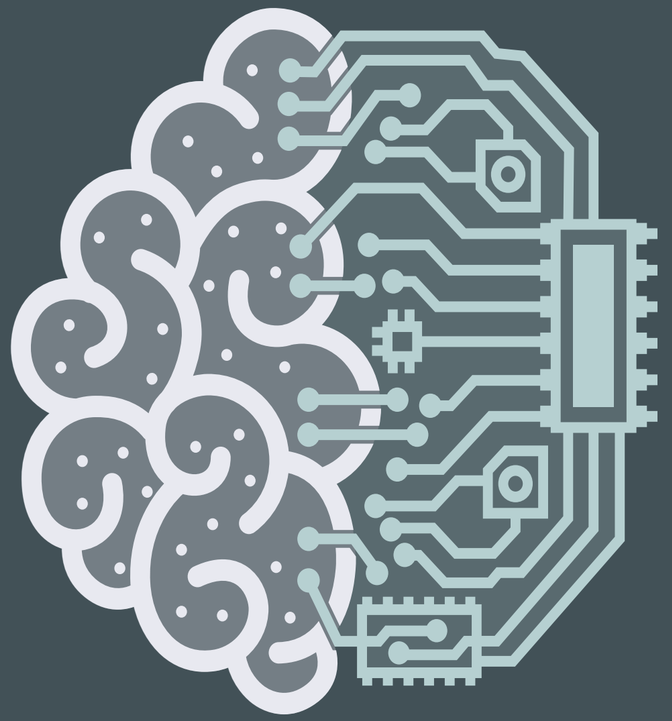
A Wearable Feedback System for Tremor Management

Date: 2024–2025

AGENDA

- Abstract
- Problem Statement
- Aim and Objectives
- Solution
- Work Flow / Methodology
- Hardware Implementation
- Software Implementation
- Experimentation
- Future Work / Future Scope
- Conclusion
- Acknowledgments
- Q&A



VIBRATED

wearable device

GLOVE

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ABSTRACT

- This project is focused on creating gloves that vibrate to help individuals, with Parkinsons disease enhance their motor skills and well-being.

- By delivering vibratory feedback to parts of the hand and fingers these gloves are designed to lessen tremors improve hand coordination and boost overall motor abilities.

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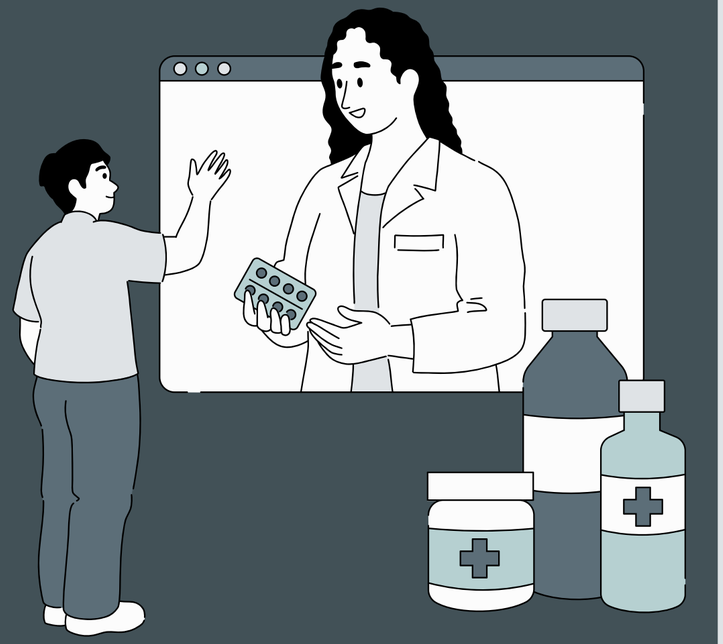

PROBLEM STATEMENT

- **Key Issue:** Parkinson’s disease causes debilitating hand tremors, affecting daily tasks (eating, writing, dressing).

- **Gaps in Existing Solutions:**
  - **Gyro Glove:** Passive, lacks adaptability.
  - **EMG Systems:** High accuracy but complex calibration.
  - Need for affordable, user-friendly solutions.

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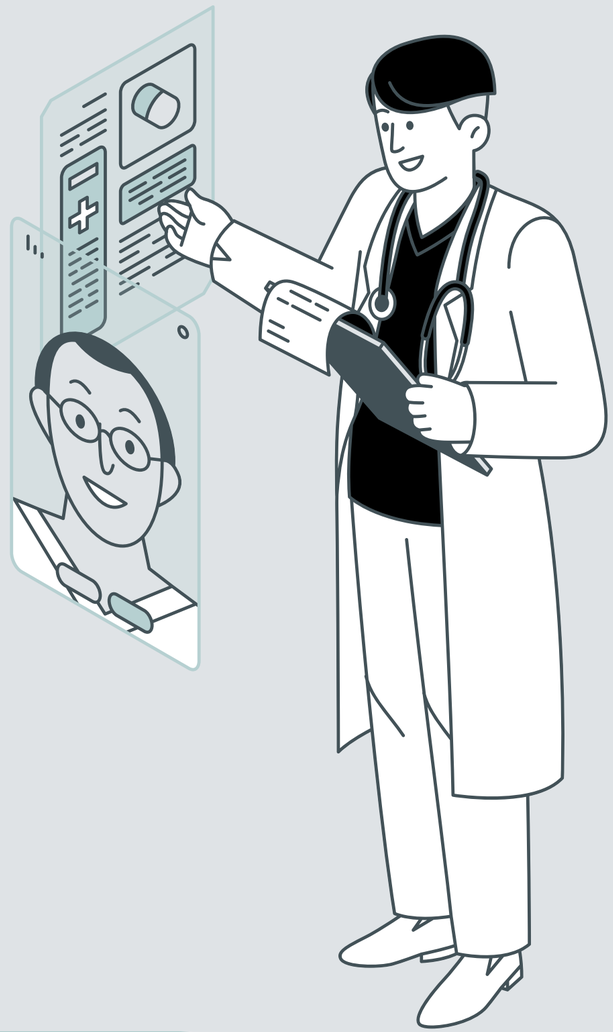
AIM AND OBJECTIVES

To advance medical technology and therapeutic methods by developing a wearable that:

- Suppresses Parkinson’s tremors through adaptive feedback.
- Enhances neurorehabilitation by improving motor coordination and sensory feedback.
- Pioneers non-invasive, patient-specific therapy for neurological disorders.



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SOLUTION

Innovation in Healthcare Solutions:

- **Technological:** Integrates sensors , motors , wireless and mobile control.
- **AI Potential:** Future-ready for adaptive AI models that personalize therapy and predict tremors.
- **Assistive Wearable:** Provides non-invasive relief for tremor patients.
- **Accessible Design:** Focuses on low-cost components for broader reach in real-world settings.
- **Data-Driven Care:** Has potential for remote diagnostics, real-time feedback, and clinical integration.

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WORKFLOW

Sensor Data Acquisition: MPU6050 captures hand motion.

Tremor Detection: Algorithm processes data to identify tremor patterns.

Feedback Activation: Vibration motors trigger based on tremor severity.

User Interaction: Mobile app adjusts settings Real-time monitoring of tremor activity.

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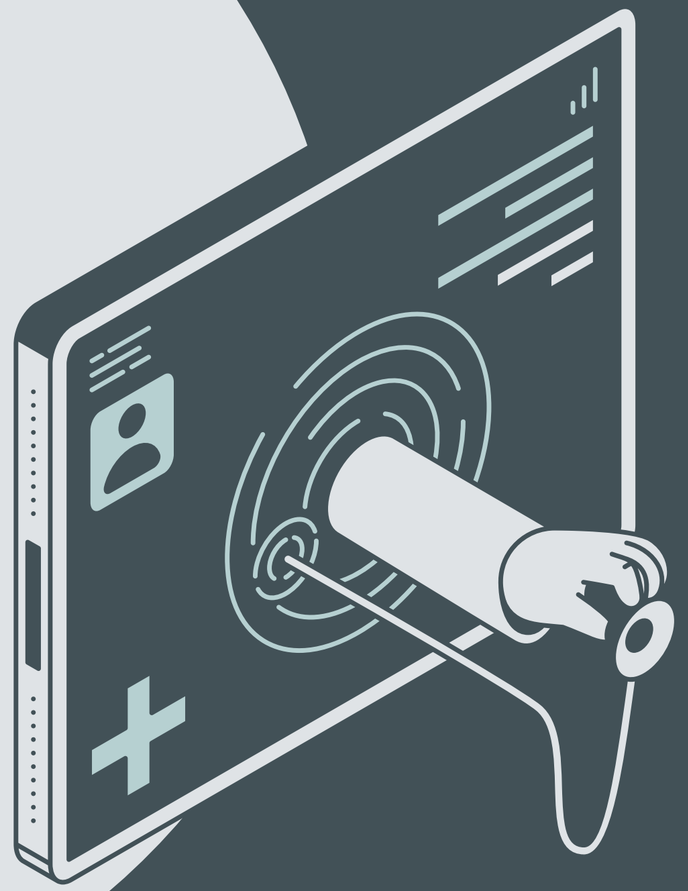
HARDWARE IMPLEMENTATION

- **Key Components:**
  - **ESP32:** Processes sensor data and controls motors.
  - **MPU6050:** Detects tremor Intensity.
  - **Vibration Motors:** Miniaturized motors for targeted feedback.
  - **Battery & Charging:** lithium battery with TP4056 module.

- **Challenges Solved:**
  - Power management to prevent ESP32 resets.
  - Secure sensor-motor integration on a wearable glove.



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SOFTWARE IMPLEMENTATION

- **Firmware (Arduino IDE):**
  - Real-time tremor intensity calculation.
  - Bluetooth command handling (e.g., "SET_FREQ 500").

- **Mobile App (MIT App Inventor):**
  - 3-screen interface: Welcome, Patient Info, Control Dashboard.
  - Features: Tremor Monitoring, battery status, vibration presets.

GET STARTING SCREEN

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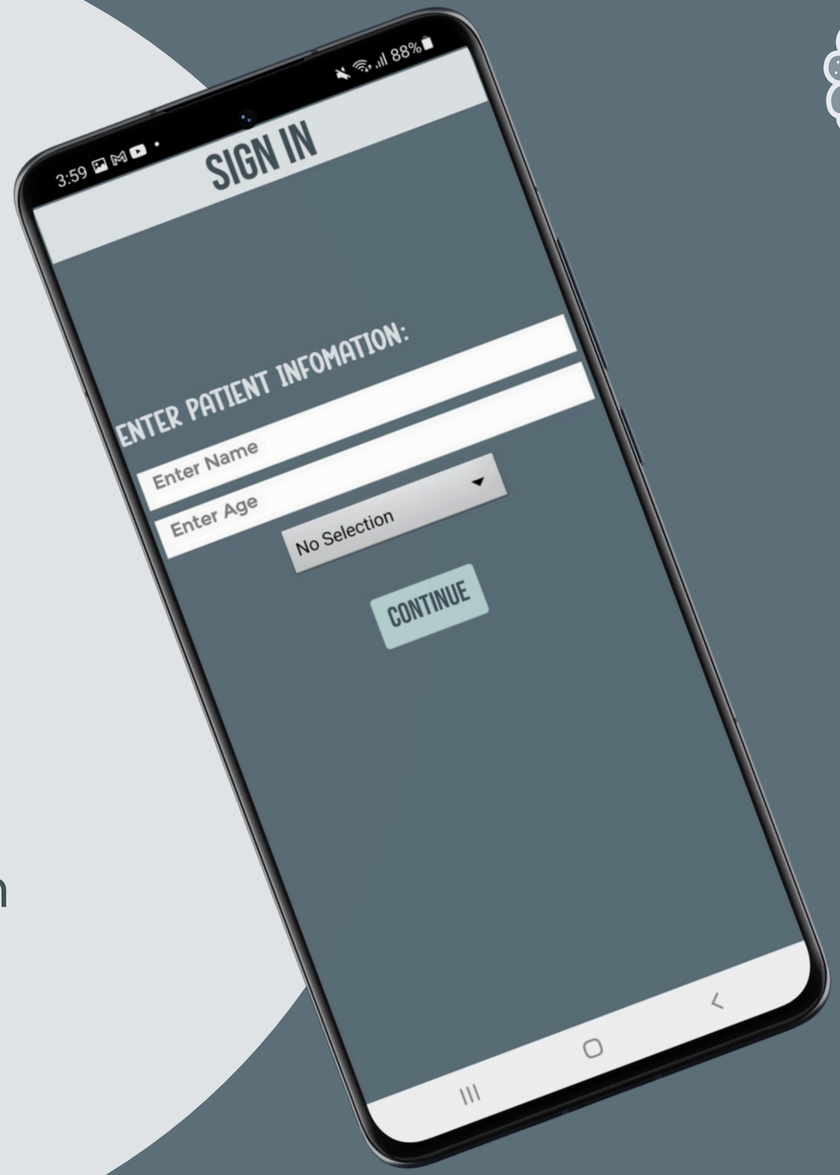

SIGN IN SCREEN

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CONTROLLEDR SCREEN

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EXPERIMENTATION

Clinical Testing Setup:

- Participants: Parkinson’s patient with mild-to-moderate tremors.
- Tasks: Resting, writing, lifting objects.
- Metrics: Tremor amplitude reduction, user comfort ratings.

Results:

- 70% average tremor reduction during tasks.
- 85% user satisfaction on comfort and ease of use.

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FUTURE WORKS

AI Integration

- Machine learning for tremor prediction.
- Personalized therapy using reinforcement learning.

Clinical Trials

- Large scale testing for medical validation.

Commercialization

- Miniaturization and Certifications.
- Design miniaturization.
- Partnerships with medical device manufacturers.

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CONCLUSION

- **Impact:** Enhances independence and quality of life for patients of Tremor Types.

- **Achievements:**
  - Functional prototype validated through testing.
  - Competitions.

- **Vision:** Transition from academic project to real-world therapeutic device.

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ACKNOWLEDGMENTS

- I am grateful to my university mentors and advisors, **Dr. Ibrahim Elhasoni & Dr. Ramadan Fawzy Mohamed Babers** for their ongoing support.

- And more express my sincere gratitude to the **Clinical instructor. Asmaa Sabry Nagy Elwany,** She provided the idea and medical insights.

- This project is the outcome of working together

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IF ANY QUESTIONS