

TEAM: NEURALNEST

TITLE: A Self-Stabilizing Spoon for Parkinson's Patients

➤ Problem Statement:

Tremors, a hallmark symptom of Parkinson's disease, manifest as involuntary rhythmic movements, particularly affecting the hands. These tremors significantly impede the ability of patients to engage in basic activities of daily living, such as eating. The loss of independence in these fundamental tasks not only impacts the physical health of patients but also takes a toll on their psychological well-being.

Significance:

The importance of addressing the challenges faced by Parkinson's patients in eating independently cannot be overstated. Maintaining a sense of autonomy is vital for their overall quality of life, self-esteem, and mental health. Enabling individuals with Parkinson's disease to regain control over essential daily activities contributes directly to their independence, fostering a sense of normalcy and reducing the burden on caregivers.

Statistics:

- ✓ **Global Prevalence:** According to the World Health Organization, an estimated 6 million people worldwide are currently living with Parkinson's disease. This number is expected to rise as the global population ages. Hand Tremors Prevalence: Studies consistently show that a significant majority of Parkinson's patients, up to 70%, experience hand tremors. These tremors are not only a source of physical discomfort but also a major obstacle to performing simple tasks that others may take for granted.
- ✓ **Impact on Everyday Tasks:** Hand tremors in Parkinson's patients affect various daily activities, with eating being particularly challenging. The inability to control utensils contributes to frustration, loss of nutrition due to spills, and an overall decline in the quality of life for both patients and their caregivers.
- ✓ **Economic and Social Implications:** The cumulative effect of these challenges extends beyond individual suffering, impacting the healthcare system and social structures. Addressing these issues can potentially reduce the economic burden associated with the care of Parkinson's patients and enhance their integration into society.

➤ Development of Self-Stabilizing Spoon for Parkinson's Patients

Our innovative solution for Parkinson's patients revolves around the creation of a self-stabilizing spoon designed to empower individuals facing hand tremors and difficulties in independent eating. The development process integrates various hardware components and intelligent software to provide a holistic and effective solution.

The hardware components include tilt and acceleration sensors, a rechargeable battery for sustained usability, a comfortable grip handle for ease of use, and a suspension system to absorb shocks and enhance stability. The modular design allows for easy replacement of the top part, enabling the use of different utensils such as spoons, forks, and more. This design not only accommodates individual preferences but also caters to the diverse needs of users.

The core functionality of the self-stabilizing spoon relies on its ability to compensate for hand tremors through real-time data processing. An embedded computer interprets signals from tremor sensors and executes algorithms that move the spoon in the opposite direction, effectively counteracting vibrations and tilts caused by tremors.

The innovation extends beyond mere stabilization, incorporating real-time data analytics for comprehensive monitoring. The spoon collects and analyzes tremor patterns during usage, providing valuable insights to guardians and caregivers. The system displays the patient's condition by interpreting tremor error patterns in different axes, allowing for a comparison with historical data. Additionally, the device communicates when it is in use and provides the battery percentage, ensuring users and caregivers are informed about the device's status.

User interaction is a key focus, with a user-friendly interface on the spoon itself. This interface allows patients to check battery status, device activity, and receive feedback on when the device is compensating for tremors. The design ensures accessibility and simplicity to cater to the unique needs of individuals with Parkinson's disease.

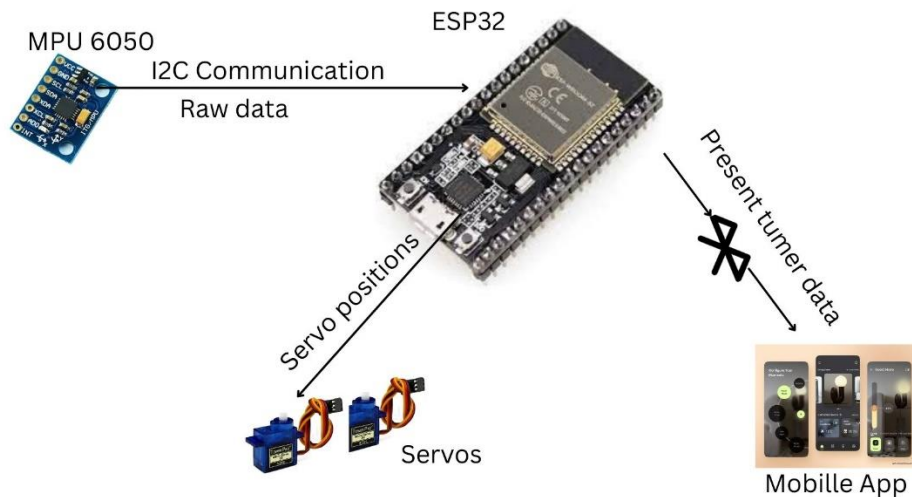


Figure 01: Basic Block Diagram of the Product

➤ **Additional Features of the Device:**

1. Power Management:
2. ESD (Electrostatic Discharge) Protection:
3. Low Battery Alarm:
4. Auto Sleep Mode When Not in Use:
5. Fail-Safe Mechanism:

➤ **Novelty and the uniqueness of product**

1. Real-Time Compensation for Hand Tremors:
2. Modular Design with Interchangeable Utensils:
3. Embedded Computer for Intelligent Control:
4. User-Friendly Interface with Real-Time Feedback:
5. Auto-Sleep and Fail-Safe Mechanisms:
6. Data Analytics for Condition Monitoring:
7. Comprehensive Power Management and ESD Protection:

References

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