

Summary: Development of a Wireless Electrogastrography Measurement System

Overview

This paper details the creation of a wireless electrogastrography (EGG) system designed to measure the myoelectrical activity of the stomach using surface electrodes. The system is structured into five main stages, facilitating the collection, processing, and transmission of EGG data.

Key Components

1. Pre-amplification Stage:

- Utilizes a pre-amplification array with a gain of 1000.
- Incorporates a driven right leg circuit to minimize noise.

2. Filtering and Amplification:

- A band-pass filter with a cutoff range of 0.015 Hz to 3.12 Hz is implemented.
- An additional amplification stage provides a total gain of 10, resulting in an overall gain of 10,000.

3. Analog-Digital Conversion:

- A 16-bit ADC digitizes the EGG signal for further processing.

4. Microcontroller and Wireless Transmission:

- An ESP32 microcontroller transmits the data via WiFi to a PC for visualization and storage.

Testing and Validation

- The system was tested on 10 healthy subjects (ages 18-23).
- Data were analyzed in the frequency domain to validate the EGG frequency signature.
- The study highlights the relevance of EGG in diagnosing gastric disorders like gastroparesis and functional dyspepsia.

Results

- The EGG signals collected showed a characteristic frequency of 0.055 Hz, consistent with normal gastric rhythms.
- The system successfully discriminated between EGG signals and other physiological signals (respiration and heartbeat).

Conclusion

The developed wireless EGG monitoring device demonstrates effective collection and analysis of gastric myoelectrical activity, indicating its potential for clinical gastroenterological diagnostics. Future work will focus on expanding the system for long-term multichannel data acquisition and creating a public EGG database.

Action Items

- Further development of a long-term multichannel EGG acquisition system.
- Creation of a public database for EGG data to enhance research in the field.