**Project Title: Heart Beats - Bass Note Detector**

Overview:

Conceived and developed "Heart Beats," a solo endeavor aimed at creating a cost-effective, portable bass note detector with digital filters for precise bass detection and PID-controlled AGC to maintain consistent performance across a wide dynamic range. The system features an LED indicator for real-time feedback upon detecting a bass note, all powered by a single AAA battery. The pendant-style enclosure, crafted using Fusion 360, adds both functionality and aesthetics to the product.

Project Objectives:

1. **Objective 1:** Design a low-cost bass note detector capable of handling a wide dynamic range.
2. **Objective 2:** Implement digital filters for accurate bass note detection in music.
3. **Objective 3:** Utilize PID controlled AGC to maintain consistent performance across varying input levels.
4. **Objective 4:** Design a portable product with a compact form factor.
5. **Objective 5:** Create an aesthetically pleasing pendant-style enclosure using Fusion 360.

Role and Responsibilities:

As the sole developer:

* Conducted market research to identify the need for a portable and affordable bass note detector.
* Developed digital filter algorithms for accurate bass note detection.
* Engineered the hardware components, incorporating PID controlled AGC for dynamic range adjustment.
* Designed and prototyped the low-power circuit ensuring compatibility with a single AAA battery.
* Utilized Fusion 360 to design a pendant-style enclosure for user-friendly and stylish portability.

Design Process:

1. **Conceptualization:** Identified the need for a portable bass note detector and outlined the key features required.
2. **Algorithm Development:** Developed digital filters for precise bass note detection over a wide dynamic range.
3. **Hardware Implementation:** Designed the hardware components, incorporating PID controlled AGC for dynamic range adjustment.
4. **Power Efficiency:** Engineered a low-power circuit to ensure portability with a single AAA battery.
5. **Enclosure Design:** Utilized Fusion 360 to design a pendant-style enclosure, considering both aesthetics and practicality.

Key Features:

1. **Digital Filters:** Implemented digital filters for precise bass note detection over a wide dynamic range.
2. **PID Controlled AGC:** Utilized PID control for Automatic Gain Control, ensuring consistent performance.
3. **Portability:** Powered by a single AAA battery for on-the-go use without compromising performance.
4. **Compact Form Factor:** Designed for easy portability and convenient use.
5. **LED Indicator:** Illuminates an LED upon detecting a bass note, providing real-time feedback to the user.
6. **Pendant-style Enclosure:** Designed a stylish and user-friendly pendant enclosure using Fusion 360.

Tools and Technologies:

1. **Algorithm Development:** MATLAB for digital filter development.
2. **Hardware Design:** Altium Designer for schematic and layout.
3. **Enclosure Design:** Fusion 360 for 3D modeling and design.

Results and Achievements:

The "Heart Beats" project stands as a testament to individual innovation, successfully delivering a cost-effective, portable, and stylish bass note detector with precise digital filtering and PID-controlled AGC. The incorporation of a single AAA battery ensures portability, making it an ideal companion for music enthusiasts on the go.

Lessons Learned:

The project provided valuable insights into optimizing power consumption while maintaining performance. The Fusion 360 enclosure design emphasized the importance of both functionality and aesthetics in user-oriented products.

Conclusion:

The "Heart Beats" project exemplifies the capabilities of an individual developer in integrating digital signal processing, control systems, and industrial design to create a unique and portable bass note detector. The combination of accurate bass detection, PID-controlled AGC, and a stylish pendant-style enclosure makes "Heart Beats" a standout product in the market.

Additional Resources:

* Link to Schematic Diagram
* Link to Fusion 360 Enclosure Model