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## AN APPROACH TO HAVE CLEAR CONVERSATION WHILE USING HEARABLES

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# AN APPROACH TO HAVE A CLEAR CONVERSATION WHILE USING A PAIR OF HEARABLES

## Abstract:

The current market is booming with the advancement in the field of hearables. The last decade witnessed the massive development in the look and feel of hearables. Now different types of hearables like headphones, earbuds, or earphones come loaded with a variety of features and have become an integral part of human beings around the whole globe. One such significant and the most desirable feature is noise cancellation.

The two types of noise cancellation used in hearables are passive noise cancellation and active noise cancellation[1]. Also, all the passive noise cancellation hearables are a subset of active noise cancellation hearables. But the presence of the noise cancellation feature devoids the users from having a clear conversation while using the hearables, and thus sometimes, this feature becomes non-desirable.

This paper attempts to provide a solution that enables a user to have a clear conversation while using a pair of hearables.

## Problem Statement:

The proportion of people using hearables for their daily use is increasing rapidly. Also, all hearables nowadays provide a passive noise cancellation feature. This high usage implies that a user using a pair of hearables, will not be able to have a clear conversation with anyone nearby.

## Proposed Solution:

As per our solution, a hearables system will operate in following two different modes:

1. **Active mode:** This mode refers to the state when the pair of hearables are continuously getting audio input from its host device. This mode also includes the scenario when the user is on a call using his pair of hearables.

2. **Idle mode:** This mode refers to the state when the pair of hearables are not getting any audio input from its host device. The conversation mode will be a subset of this mode.

**The proposed solution works on the following principles:-**

1. To use this feature, the user may or may not connect his pair of hearables to a host device like a mobile phone or a laptop. So the system does not need to receive an audio signal, but it needs to have a constant power supply and a microphone sensor.[\[2\]](#)
2. If the user connects his hearables with a host, then his hearables needs to be in the Idle mode to use this feature. The hearable system restricts the users to enable conversation mode in its active mode. This restriction prevents interruptions due to accidental switch to conversation mode.
3. Now once the user enables the conversation mode (for example, the hearable system can use a designated/ existing physical button or touch panel by sensing a long/ short/ multiple press to enable or disable this mode), the hearable system will check whether it has the feature of active voice cancellation or not?
  - a. If yes, then it will enable the noise cancellation feature to give a better conversational experience to the user.
  - b. Else it will follow the next step.
4. Now the hearable system will use a suitable unsupervised machine learning algorithm related to the Cocktail Party Effect[\[3\]](#) to separate the voice from the noise captured via microphone.
5. Finally, the amplitude of the output voice from the previous stage will be adjusted and generated by the speakers of both the pair of hearables.

**Flow:**

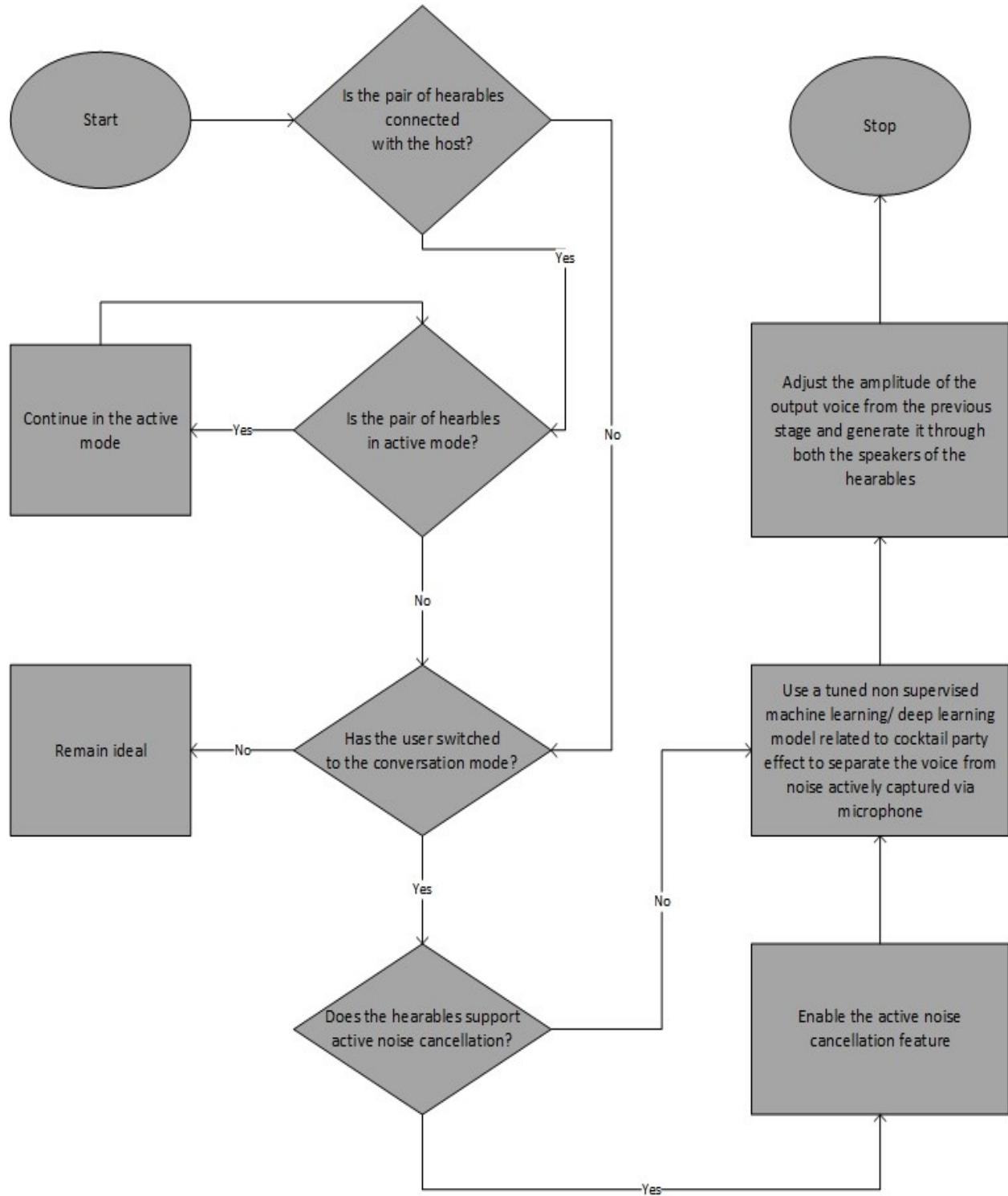


Figure: A simplified flow diagram representing the working of the proposed hearable system

### Advantages:

- The proposed solution will enable users to have a clear conversation, even while using a pair of hearables.
- Since the users don't need to remove their hearables before starting a conversation with someone nearby, this solution will also prevent unwanted misplacement of small-sized hearables like EarPods, which especially happens while travelling.

### References:

[1] There are two types of noise cancellation offered by a hearable system. These two types are active and passive noise cancellation.

Source: <https://electronics.howstuffworks.com/gadgets/audio-music/noise-canceling-headphone3.htm>

[2] Active noise cancellation hearables can even work without music. So it just requires a microphone and a designated noise cancellation circuit.

Source: <https://soundproofliving.com/noise-canceling-headphones-technology/>

[3] A Deep Learning can be used to solve the Cocktail Party Problem and thus filter out the voice from noise.

Source: <https://www.technologyreview.com/s/537101/deep-learning-machine-solves-the-cocktail-party-problem/>