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Employing assistive device audio input to detect and mitigate loud noises

ABSTRACT

In dense environments, such as apartments, townhomes, etc., people are often bothered by loud sounds generated by neighbors or others nearby. Currently, alerting the source of the disturbance requires walking over to the person or manually messaging them via a suitable communication mechanism. This disclosure describes the use of an assistive device with ambient sound input capabilities to detect sound disturbances from the surrounding environment, locate the source(s) of the detected disturbance(s), and generate alerts for appropriate mitigating actions. The described techniques are implemented with specific user permission.

KEYWORDS

- Loud noise
- Loud neighbor
- Smart speaker
- Voice assistant
- Mesh network

BACKGROUND

In dense housing environments, such as apartments, townhomes, etc., people are often bothered by loud sounds from other housing units around them. For example, such sounds are a result of a neighbor playing media, such as music, television, etc. at a volume loud enough to travel beyond the confines of the neighbor's home. Currently, alerting the source of the disturbance requires walking over to the person's house or manually messaging them via a suitable communication mechanism, such as a phone call, a text message, etc.

DESCRIPTION

This disclosure describes mechanisms for user-permitted use of an assistive device with ambient sound input capabilities to detect sound disturbances from the surrounding environment. With permission from the relevant parties, the device can be further used to locate the source(s) of the detected disturbance(s) and to generate alerts for appropriate mitigating actions.

The described techniques are based on the observation that disturbing noises from the surrounding environment that are loud enough to be heard by humans can also be picked up by devices that process sound and voice input, if permitted by users. Such devices include voice assistants, smart speakers, assistive smartphone apps, Internet of Things (IoT) appliances, etc. If the relevant parties permit, such devices can analyze the sound to determine various relevant aspects, such as frequencies, intensity, direction, content, etc. For instance, sounds that travel across walls contain lower frequencies. The direction of the sound can be estimated based on device input hardware, such as omnidirectional microphone arrays. If the user permits, analysis can be performed on sound input collected by multiple such devices connected together to form a mesh network.

With permission, the detected content, such as music, videos, games, etc. can be compared with the content currently being streamed to households in the neighborhood from various online services. The content information, obtained with user permission, can be used to determine the person or the neighboring household that is the likely source of the loud sound.

Capabilities are included to inform the source of the loud sounds that sounds emanating from their homes are likely to bother the neighbors. The notifications can be delivered via any suitable mechanism, such as messages, voice assistant output, alerts from the online content provider, etc. Once notified, the parties can take appropriate mitigating actions, such as reducing the volume, stopping the media playback, etc.

Alternatively, or in addition, users can choose to enable automatic mitigating actions that can be taken on their behalf in order to bring the sound levels down. Such automated actions can include reducing the volume of the sound that is found to be too loud, disabling specific frequencies that are likely to cause disturbance, pausing the sound playback, etc.

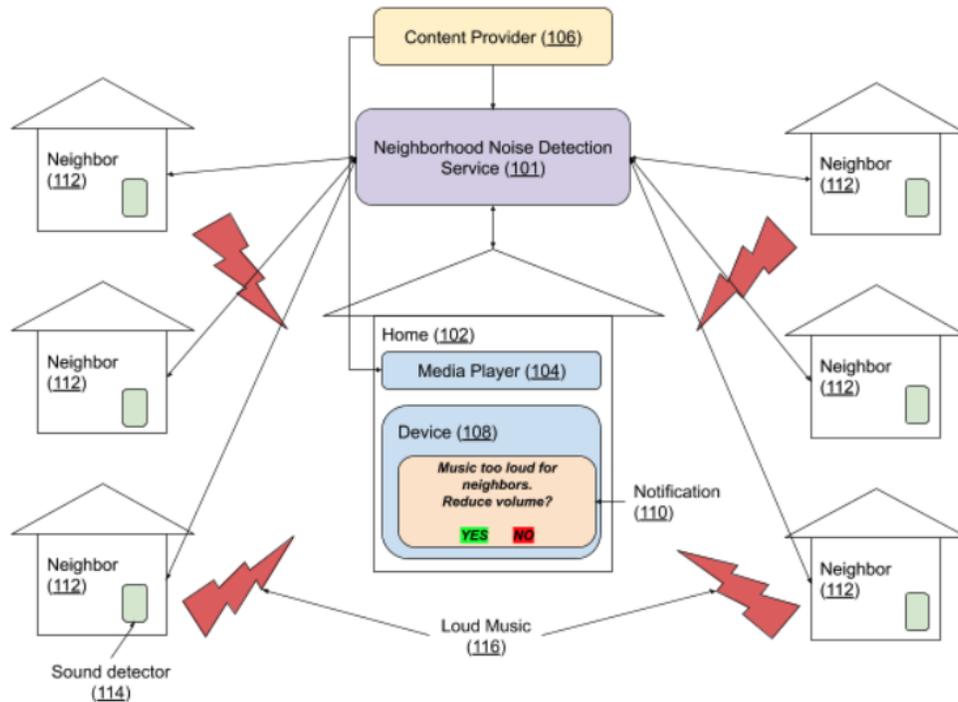


Fig. 1: Informing a user that the music is too loud

Fig. 1 shows an example of use of the techniques to detect and mitigate loud sounds. A media player (104) in a person's home (102) is playing music (116) streamed from an online content provider (106). The music is loud enough to bother one or more of the neighbors (112). With permission of the relevant parties, the loud music is picked up by a device and/or network of devices with sound detection capabilities (114) present in the homes of one or more neighbors. The device(s) then notify a neighborhood noise detection service (101) that there is a source of loud sound in the neighborhood, and detected properties, such as type, intensity, content, direction, etc. of the loud sound. If the residents of the neighborhood permit, the neighborhood

noise detection service combines the received information about the noise with that received from content provider partners to determine the source of the sound. The household is then alerted by a notification (110) displayed on a device (108), such as a smartphone. The notification informs the person that their music playback volume is loud and provides an option to lower the volume.

Although shown as a separate central service in Fig. 1, the noise detection service can be implemented such that individual components are distributed across the homes in the neighborhood and networked together to realize the intended functionality.

The techniques described in this disclosure can be applied to any content that involves sound output such that the audio could leak outside the home to one's neighbors. With permission of the relevant parties, the system operation helps people avoid awkward social situations resulting from overly loud noises by proactively avoiding inadvertently disturbing others in the neighborhood and obviating the need to confront a neighbor regarding noise complaints. Importantly, the detection and notification is limited only to determining whether a given sound is deemed too loud. The identity of the source(s) and the recipient(s) of the loud noise is not revealed at any time during the system operation.

With permission from users, the techniques can be extended to other types of audio input such as human voices and speech. Moreover, the system can be applied for other suitable purposes, e.g., to improve privacy by eliminating inadvertent sound leakage outside a home or to detect emergencies. The techniques can serve any densely occupied environment that involves separation among occupants, such as hotels, office buildings, universities, etc.

Further to the descriptions above, a user may be provided with controls allowing the user to make an election as to both if and when systems, programs or features described herein may

enable collection of user information (e.g., information about a user's social network, social actions or activities, profession, a user's preferences, or a user's current location), and if the user is sent content or communications from a server. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user's identity may be treated so that no personally identifiable information can be determined for the user, or a user's geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of a user cannot be determined. Thus, the user may have control over what information is collected about the user, how that information is used, and what information is provided to the user.

CONCLUSION

In dense environments, such as apartments, townhomes, etc., people are often bothered by loud sounds generated by neighbors or others nearby. Currently, alerting the source of the disturbance requires walking over to the person or manually messaging them via a suitable communication mechanism. This disclosure describes the use of an assistive device with ambient sound input capabilities to detect sound disturbances from the surrounding environment, locate the source(s) of the detected disturbance(s), and generate alerts for appropriate mitigating actions. The described techniques are implemented with specific user permission.

REFERENCES

1. Fadell, Anthony Michael, Matthew Lee Rogers, Yoky Matsuoka, David Sloo, Shigefumi Honjo, Scott A. McGaraghan, Michael Plitkins, Maxime Veron, and Isabel Guenette. "Environmental sensing with a doorbell at a smart-home." U.S. Patent 9,960,929, issued May 1, 2018.