Claims

1. A soundscape augmentation system comprising:

   a data acquisition system configured to provide ambient soundscape data;

   a database including a plurality of masker configurations;

   a perceptual attribute predictor coupled to the data acquisition system and the database, the perceptual attribute predictor configured to generate predictions representing perception on one or more pre-defined perceptual attribute scales for each masker configuration of the plurality of masker configurations based on the ambient soundscape data;

   a masker configuration ranking system configured to determine one or more optimal masker configurations based on the predictions generated by the perceptual attribute predictor; and

   a playback system configured to play back or reproduce the one or more optimal masker configurations;

   wherein the perceptual attribute predictor is configured to generate predictions based on one or more masker gain inputs in addition to the ambient soundscape data and the plurality of masker configurations;

   wherein the data acquisition system is configured to generate the ambient soundscape data by directly recording or sensing an ambient soundscape of an environment.

2. The soundscape augmentation system according to claim 1,

   wherein the data acquisition system is also configured to provide demographic or contextual data.

3. The soundscape augmentation system according to claim 2,

   wherein the perceptual attribute predictor is configured to generate the predictions also based on the demographic or contextual data.

4. The soundscape augmentation system according to any one of claims 2 to 3, wherein the demographic or contextual data comprises data related to environmental parameters, demographic data of one or more listeners, psychological data of the one or more listeners, physiological data of the one or more listeners, or any combination thereof.

5. The soundscape augmentation system according to claim 4, wherein the data related to environmental parameters comprises data related to location, data related to the visual environment, number of people nearby, air temperature, humidity, wind speed, or any combination thereof.

6. The soundscape augmentation system according to claim 4 or claim 5, wherein the demographic data of the one or more listeners comprises data related to age, gender, occupation, or any combination thereof.

7. The soundscape augmentation system according to any one of claims 4 to 6, wherein the psychological data of the one or more listeners comprises data related to noise sensitivity, perceived stress, well-being index scores, or any combination thereof.

8. The soundscape augmentation system according to any one of claims 4 to 7, wherein the physiological data of the one or more listeners comprises data related to heart rate, blood pressure, body temperature, or any combination thereof.

9. The soundscape augmentation system according to any one of claims 1 to 8, wherein the one or more pre-defined perceptual attribute scales comprise pleasantness, vibrancy, eventfulness, calmness, perceived loudness, sound quality, sharpness, roughness, or any combination thereof.

10. The soundscape augmentation system according to any one of claims 1 to 9,

wherein the perceptual attribute predictor is configured to generate the predictions by combining the ambient soundscape data and each masker configuration.

11. The soundscape augmentation system according to any one of claims 1 to 10,

wherein the perceptual attribute predictor comprises a soundscape feature extractor configured to extract features of the ambient soundscape data;

wherein the perceptual attribute predictor comprises a masker feature extractor configured to extract features of each masker configuration; and

wherein the perceptual attribute predictor is configured to generate the predictions based on the extracted features of the ambient soundscape data and the extracted features of each masker configuration.

12. The soundscape augmentation system according to any one of claims 1 to 11,

wherein the perceptual attribute predictor comprises an objective feature block configured to extract objective features from the ambient soundscape data and each masker configuration;

wherein the perceptual attribute predictor comprises a subjective feature block configured to extract subjective features from the demographic or contextual data; and

wherein the perceptual attribute predictor is configured to generate the predictions based on the extracted objective features and the extracted subjective features.

13. The soundscape augmentation system according to any one of claims 1 to 12,

wherein the perceptual attribute predictor comprises linear regression models configured to generate the predictions based on acoustic or psychoacoustic parameters computed based on the ambient soundscape data and each masker configuration.

14. The soundscape augmentation system according to any one of claims 1 to 13, wherein the perceptual attribute predictor comprises one or more deep neural networks configured to generate the predictions based on raw audio, spectrogram representations computed based on the ambient soundscape data and each masker configuration, or a combination of the raw audio and the spectrogram representations.

15. The soundscape augmentation system according to any one of claims 1 to 14, wherein the data acquisition system is configured to generate the ambient soundscape data based on inputs from one or more microphones, one or more antennas, a storage medium, or any combination thereof.

16. The soundscape augmentation system according to any one of claims 1 to 15, wherein the plurality of masker configurations comprises one or more audio tracks of recorded or synthesized sounds, one or more audio tracks of silence, or one or more audio tracks derived from the one or more audio tracks of recorded or synthesized sounds and the one or more audio tracks of silence.

17. The soundscape augmentation system according to any one of claims 1 to 16, wherein the playback system comprises one or more speakers, one or more virtual or augmented reality headsets, one or more headphones, one or more earbuds, or any combination thereof.

18. The soundscape augmentation system according to any one of claims 1 to 17, wherein the predictions generated are non-deterministic.

19. A method of forming a soundscape augmentation system, the method comprising:
providing a data acquisition system configured to provide ambient soundscape data;
providing a database including a plurality of masker configurations;

coupling a perceptual attribute predictor to the data acquisition system and the database, the perceptual attribute predictor configured to generate predictions representing perception on one or more pre-defined perceptual attribute scales for each masker configuration of the plurality of masker configurations based on the ambient soundscape data;

providing a masker configuration ranking system configured to determine one or more optimal masker configurations based on the predictions generated by the perceptual attribute predictor; and

providing a playback system configured to play back or reproduce the one or more optimal masker configurations;

wherein the perceptual attribute predictor is configured to generate predictions based on one or more masker gain inputs in addition to the ambient soundscape data and the plurality of masker configurations;

wherein the data acquisition system is configured to generate the ambient soundscape data by directly recording or sensing an ambient soundscape of an environment.