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IN-VEHICLE SAFETY USING AUDIO DETECTION

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ABSTRACT

It can be dangerous to leave children or pets in vehicles, especially in extreme heat conditions. Typically, those responsible for the children or pets do not intend to cause harm and, instead, may have lost track of time while the conditions in the vehicle become dangerous. Techniques presented herein provide mechanisms that can be used to detect audio distress in humans and/or animals in a vehicle and notify a driver of the vehicle/owner of the animal of the distressed human or animal.

DETAILED DESCRIPTION

Research and early developments in noise detection have shown that it is possible to determine specific dog breeds from a sample of barking dogs. Recent research has additionally shown that it is further possible to train machine learning models to infer meaning from dog barking. In this case, a device may indicate what your dog means by its bark. Similarly, recent research has shown that it is possible to classify types of crying in children.

Techniques described herein create a related, but more refined, model that determines specific human or animal distress related to discomfort (e.g., associated with an extreme environment, such as high temperature, while in a vehicle). Techniques described herein utilize a noise detection model that is trained with specific distress-related data, which results in a model capable of detecting the sounds associated with animal or human distress in a vehicle. The noise detection model may be an audio machine learning model that is trained on animal and human distress noises (e.g., screaming, dog whimpering, dog barking, etc.).

Figure 1, below, illustrates sample Mel spectrogram results associated with human distress/screaming, tapping/knocking, and dog barking distress.

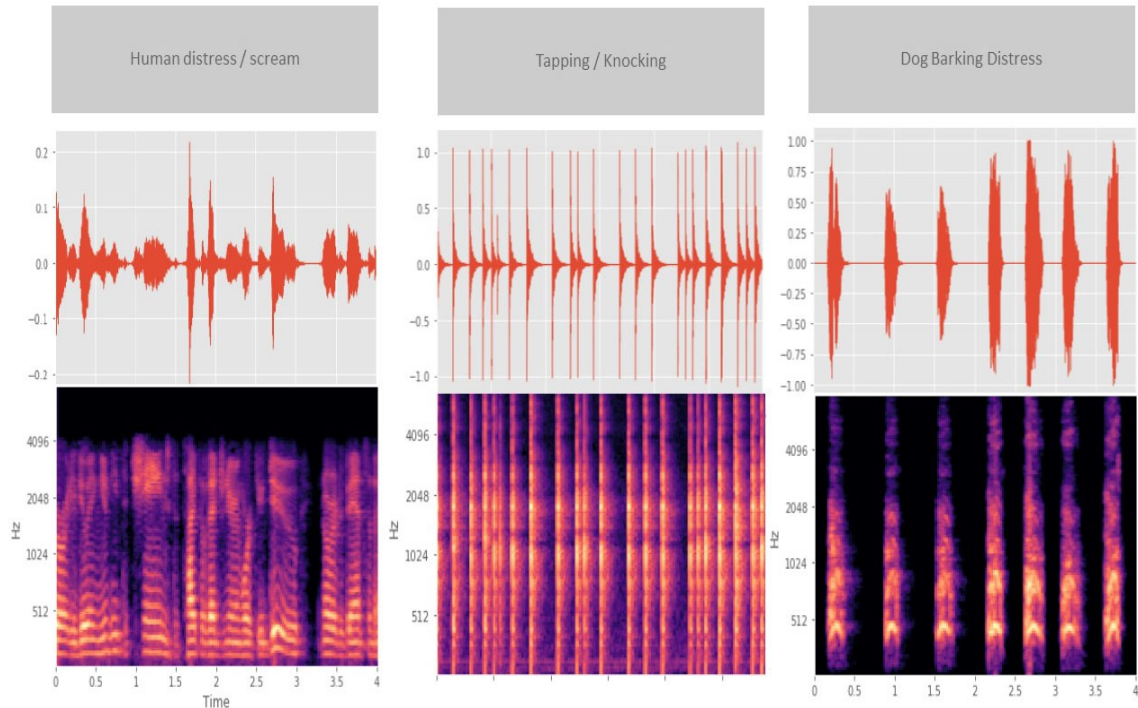


Figure 1: Sample Mel Spectrogram Results

Modern vehicles are equipped with environmental sensors that can measure environmental conditions that the person or animal in the vehicle is experiencing. For example, vehicle sensors may measure the temperature, air quality, and other environmental conditions inside the vehicle. According to techniques described herein, if sensor data is above a threshold (e.g., the temperature in the vehicle is too hot) and distress noises are detected, an action may be invoked.

Whereas some existing techniques simply describe detection of an audible tone, techniques herein provide for detecting specific distress sounds in audio inside the vehicle and taking various actions when the distress sounds are detected. Actions can include, for example, notifying the (remote) driver of the vehicle, notifying the owner of the animal, or notifying emergency services about the distress. In addition, in some cases, physical vehicle actions can be invoked (i.e., if the vehicle supports such physical vehicle actions). The physical vehicle actions may include, for example, activating air conditioning, opening a window, activating an alarm for attention, or performing other actions to alleviate the distress.

It should be noted that the techniques described herein do not propose a 100% determination of distress in vehicles. Rather, techniques of this proposal can provide an early notification based on distress or discomfort as a potential preventative measure to notify a driver/owner of the distress and allow time for the driver/owner to react. In addition, as collaboration solutions become more embedded in vehicle infotainment systems, such collaboration solutions can be used as a mechanism to provide notifications. Thus, techniques herein may facilitate different mechanisms that can be used to detect audio distress in humans and/or animals in vehicles and notify the drivers of the vehicle/owner of the animal of the distressed human or animal.