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Smart Haptics Feedback to Fit Usage Scenario

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Smart haptics feedback to fit usage scenario

ABSTRACT

Haptics feedback, such as vibration, does not take into account contextual factors related to the situation in which a device delivers such feedback. This can result in suboptimal user experience in some circumstances. With user permission, the techniques of this disclosure utilize sensors on a device to detect various usage scenarios. Prior to delivering the haptics feedback, various parameters of the feedback, such as intensity and salience, are adjusted to fit the detected usage scenario.

KEYWORDS

- Smart haptics
- Vibration
- Usage scenario detection
- Haptics feedback adjustment

BACKGROUND

Many devices, such as mobile phones and smartwatches, include the capability to provide haptics feedback, such as vibration. The purpose of such feedback is to provide an alternate mode of notifying the user of events of interest, such as an incoming message. In many cases, such an alternative is desirable as it avoids audio notifications that can be loud, disruptive, non-discrete, and socially inappropriate.

However, depending on the situation in which haptics feedback is delivered, such feedback may fail to attract the user's attention. For example, if the device is in a backpack, the user may not feel or hear the haptics feedback. In contrast, in some situations, the haptics feedback may be overly intense. For example, if the device is on a desk, vibrations from haptics feedback may create a loud noise and/or cause the device to slide across the surface. Haptics feedback that does not account for user context can thus result in suboptimal user experience in some circumstances.

DESCRIPTION

The techniques of this disclosure utilize the sensors on a device to detect various usage scenarios. User permission is obtained for such detection. If the user declines permission (or restricts permission to specific sensors), detection is performed based on user-permitted factors or is not performed. Based on the detected usage scenario, various parameters of haptics feedback, such as intensity and salience, are adjusted. The adjusted haptics feedback is then delivered by the device thus providing an improved user experience.

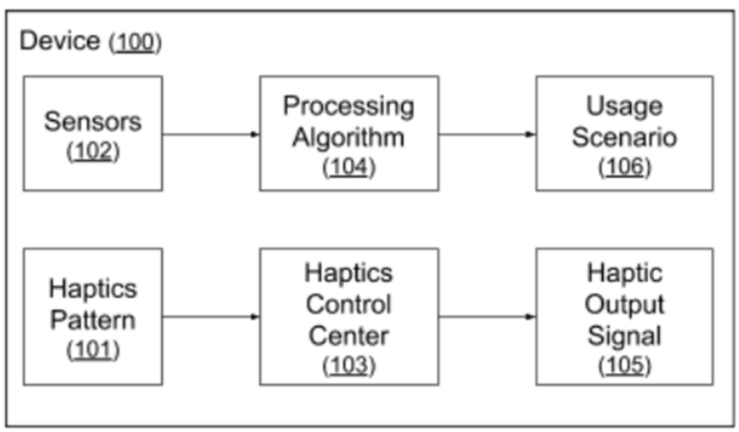

Fig. 1: Delivering haptics feedback to fit usage scenario detected by device sensors.

Fig. 1 shows an implementation of the techniques of this disclosure within a device (100). The device can be any device with sensors (102) for measuring situational characteristics and actuators for generating haptics patterns (101) used for delivering haptics feedback. For example, the device may be a smartphone or a smartwatch. The sensors on the device, such as accelerometer, gyroscope, microphone, ambient light detector, camera, touchscreen, etc. detect and measure various factors related to the situation of the device. Measurements from these sensors are utilized as permitted by the user. The measurements are passed to a processing algorithm (104).

Based on the measurements, the situation of the device is classified by the processing algorithm into one of a number of common usage scenarios (106). For example, the detected scenario may indicate that the device is in a jacket pocket. The detected scenario is provided to a Haptics Control Center (103) on the device. Based on the received scenario, the generated haptics pattern is adjusted to fit the characteristics of the scenario. For example, if the usage scenario indicates that the device is lying on a desk, the intensity of the vibration may be attenuated to avoid excessive noise and movement. The adjusted haptic output signal (105) is then delivered as haptics feedback.

As a result of a better fit with the situation of the device and the user, the adjusted haptics feedback improves user experience. For instance, the volume is louder under circumstances in which the feedback may be harder to notice. The adjustments to the haptics feedback may be applied to one or more characteristics such as volume and vibration. The algorithm used to process the inputs from the device sensors to recognize and label usage scenarios can be implemented in a variety of ways. For instance, implementations can include use of neural networks, such as Long Short-Term Memory (LSTM) or Gated Recurrent Unit (GRU). Alternatively, specialized hardware can be utilized to implement the algorithm.

The Haptics Control Center is integrated as a separate module within the haptics control capabilities of the device operating system (OS). The commands for haptics patterns generated by the OS pass through the Haptics Control Center. Based on the usage scenario label received from the processing algorithm, the haptics patterns are selected or scaled by the Haptics Control Center as appropriate for the scenario. No changes are made by the Haptics Control Center when no usage scenario label is received, e.g., if the scenario cannot be detected.

The smart haptics system described in this disclosure is a separate and self-contained module that easily integrates with the existing haptics system on a device with no dependencies and impact on the original operation. The system is activated only when a haptics pattern is generated by the device for delivering haptics feedback, and is deactivated when disabled by the user or an application, e.g., to save power.

CONCLUSION

The techniques of this disclosure utilize sensors on a device to detect various usage scenarios. Based on the detected usage scenario, various parameters of haptics feedback, such as intensity and salience, are adjusted to fit the situation. The adjusted haptics feedback is delivered by the device. As a result of a better fit with the situation of the device and the user, the adjusted haptics feedback improves user experience.