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Wearable Device Charging Dongle with Integrated Heatsink and Fan

Matthew Valente

Emeka Ugwu

Eric Bokides

Lloyd Holland

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ABSTRACT

This disclosure describes techniques for effective thermal management of wearable devices such as AR/VR headsets or smartglasses when used in developer mode. Per techniques of this disclosure, a charging dongle that includes a heatsink and/or a fan is provided for use of a wearable device when in developer mode. The heatsink and/or fan on the charging dongle improves heat dissipation from the wearable device and mitigates overheating of the wearable device. Optionally, a temperature sensor is provided to enable accurate measurement of the temperature of the wearable device. If the measured temperature of the heatsink is close to a threshold, an alert is transmitted to the user and/or the charging current adjusted to a lower value. Further, the fan can be automatically activated based on the sensed temperature.

KEYWORDS

- Thermal management
- Head-mounted display (HMD)
- Charging dongle
- Dongle with heatsink
- Dongle with fan
- Smartglasses
- AR headset
- VR headset
- Developer mode
- Heat dissipation

BACKGROUND

Use of wearable devices such as augmented reality (AR) and virtual reality (VR) headsets in a developer environment (developer mode) can pose additional thermal management challenges as compared to normal use. For example, developers tend to use such devices in an indoor environment while stationary and for prolonged durations of time. This can lead to large thermal loads in relatively still air, thereby posing heat dissipation challenges that are not seen during normal use. Additionally, due to battery capacity constraints and the need for improved data connectivity (e.g., to facilitate real time data exchange into/out of the device), the wearable device is usually connected to another computing device by a charging dongle when in developer mode. This can further compound the thermal management challenges since the charging of the wearable device can introduce an additional thermal load due to efficiency losses, and also because the charging dongle may cover some of the surface area used for heat dissipation from the wearable device.

The heat load can be reduced in developer mode by limiting (or preventing) charging. This is insufficient to prevent overheating. Further, a large heatsink can be added to the device to increase the surface area for heat loss; however, the heatsink can interfere with the dongle placement. A fan can be pointed towards the wearable device to blow air over the device and improve heat loss. However, this results in air flow towards the face of the developer user donning the device and correspondingly, to a poor user experience.

DESCRIPTION

This disclosure describes techniques for effective thermal management of wearable devices when used in developer mode or any other usage profile that exceeds thermal performance boundaries defined based on normal usage. Per techniques of this disclosure, a

charging dongle that includes a heatsink and/or a fan is provided for use of a wearable device in developer mode. When the wearable device is plugged into a socket and/or computing device in developer mode (e.g., for external power, debugging, etc.), the heatsink and fan enable dissipation of any additional thermal loads from the device. This can ensure that thermal touch limits (e.g., to a user) or thermal shutdown limits of the wearable device are not reached in a developer environment.

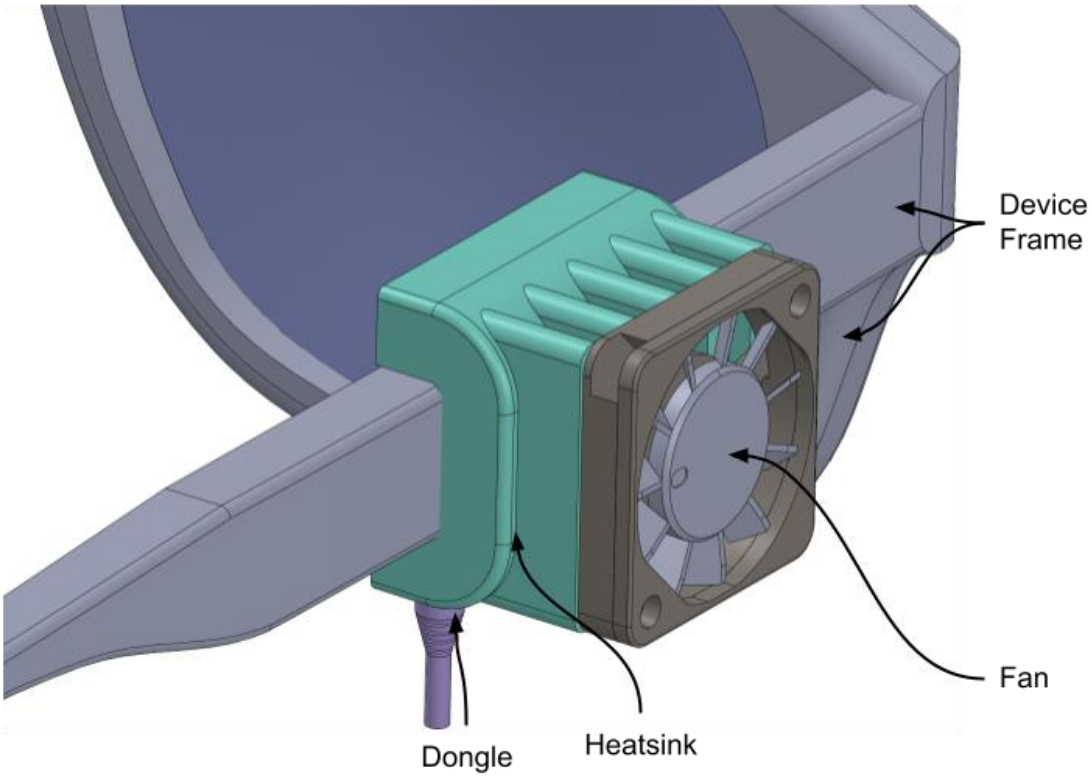

Fig. 1: Charging dongle with integrated heatsink and fan for heat dissipation

Fig. 1 depicts an example charging dongle connected to a wearable device, per techniques of this disclosure. As depicted in Fig. 1, the charging dongle includes an integrated heatsink and a fan. When the wearable device is connected to a socket or computing device via the dongle, the heatsink and/or fan act to improve heat dissipation and mitigate overheating of the wearable device and reduce user discomfort. The fan facilitates forced conduction and can

enable a reduction of the overall mass of the heatsink. Optionally, a handshake can be performed between the dongle and wearable device before power is supplied to the wearable device through the dongle.

A temperature sensor (not shown) can additionally be provided to enable accurate measurement of the temperature of the wearable device. The fan can be automatically activated (at an appropriate speed) based on the sensed temperature. Further, if the measured temperature of the heatsink is close to a threshold (e.g., maximum temperature), an alert can be transmitted to the developer user and/or the charging current adjusted to a lower value.

Techniques of this disclosure can enable developers to use wearable devices that generate a large amount of heat, such as AR/VR headsets, in a stationary, high-usage setting with no modification to the design of the device (for normal usage), while promoting user comfort and safety for any user that uses the device for extended duration of time while plugged into a power supply and/or another computing device.

CONCLUSION

This disclosure describes techniques for effective thermal management of wearable devices such as AR/VR headsets or smartglasses when used in developer mode. Per techniques of this disclosure, a charging dongle that includes a heatsink and/or a fan is provided for use of a wearable device when in developer mode. The heatsink and/or fan on the charging dongle improves heat dissipation from the wearable device and mitigates overheating of the wearable device. Optionally, a temperature sensor is provided to enable accurate measurement of the temperature of the wearable device. If the measured temperature of the heatsink is close to a threshold, an alert is transmitted to the user and/or the charging current adjusted to a lower value. Further, the fan can be automatically activated based on the sensed temperature.