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Controlling Smartphone Webcam Mode Using Alternatives to Smartphone Touchscreen

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ABSTRACT

This disclosure describes user-friendly techniques to connect a smartphone that is utilized as a web camera (webcam) by pairing the smartphone with a host device. Button-press patterns of a power button or another physical button on the side of a smartphone is used to convey user intent to enable/disable a webcam mode for the smartphone that is connected to a host device. This enables users to turn the webcam mode on/off even when the screen is turned off or facing away from the user, as is the case when a rear camera of the smartphone is used in the webcam mode. Alternatively, a companion wearable device can provide a user interface (UI) that can be utilized to perform control functions for a smartphone used as a webcam. The control functions can include turning the webcam mode on or off, providing real-time status of whether the smartphone is streaming video to the host device, and controlling parameters of the video captured by the smartphone, e.g., zoom, flash, active camera, quality, framerate, autoframing, focus, etc.

KEYWORDS

- Webcam
- Video conferencing
- Ubiquitous computing
- Power button
- Press pattern
- Tap sequence
- Device pairing
- Continuity camera

BACKGROUND

Users sometimes utilize their smartphones as web cameras (webcams) while participating in video conferences (virtual meetings) that they participate in from a different computing device (host device), e.g., a laptop/ desktop computer, tablet, smart television, etc. The use of a phone as

a webcam can provide a superior user experience since smartphones include cameras that can capture high quality, high resolution images/video that are often superior to those captured by a camera included in the host device. In such a scenario, the smartphone is paired to the host device, and transmits images captured by the smartphone camera into the video conference.
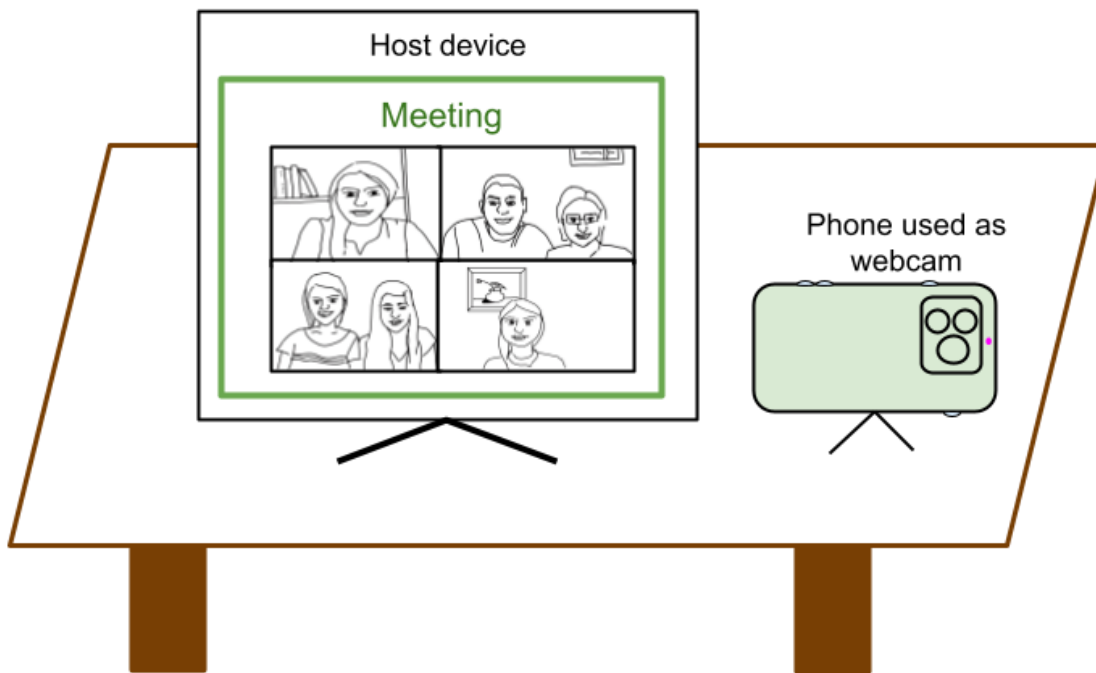

Fig. 1: A smartphone camera can be used as a webcam

Fig. 1 depicts an example of a smartphone camera being utilized as a webcam. As depicted in Fig. 1, a user participates in a video conference via a host device (a desktop computer in this case) and uses a smartphone as a webcam. The smartphone transmits images (e.g., of the user) to the host device and/or to the meeting platform as the user's video feed for the video conference.

However, in order to use the smartphone camera as a webcam, there is a need to connect or pair the smartphone with the host computing device. This can be performed via the smartphone touchscreen display that the user can interact with to place the phone in webcam

mode. Another option is to utilize wireless pairing by searching for nearby wireless devices to pair the smartphone with the host device.

Activating webcam mode to provide video feed into a video conference via a smartphone by using a user interface (UI) displayed on the smartphone display can be cumbersome since the user needs to manually switch the screen on and click through a set of on-screen UI elements. This can be particularly inconvenient when the user is using one or more cameras on the rear of the smartphone as the webcam since the display screen faces away from the user. Rear cameras are typically of higher quality than front cameras, and therefore, this scenario can be a frequent occurrence.

Utilization of wireless pairing can pose privacy concerns if the pairing is based on proximity between the smartphone and the host device, and both devices being on the same network. For example, it is possible that a user may forget that their smartphone was enabled and paired as a webcam, possibly leading to streaming of unintended frames to the host device, e.g., if a malicious or misbehaving application on the host device requests frames. While the smartphone is in webcam mode, the host device controls the streaming of frames from the smartphone. With the smartphone display screen facing away from the user, the user cannot effectively monitor if the smartphone device is streaming any frames to the host device (and the video conference). Therefore, it is important that users have a convenient, but explicit way to turn the smartphone webcam functionality on or off, even after the smartphone has been paired.

DESCRIPTION

This disclosure describes user-friendly techniques to connect a smartphone that is utilized as a web camera (webcam) by pairing the smartphone with a host device. Per techniques of this disclosure, conveniently placed buttons on a smartphone can be utilized to pair a smartphone to

and unpair the smartphone from a host device for use of the smartphone camera as a webcam. For example, the smartphone operating system can detect quick triple taps on a power button and toggle the webcam mode on the smartphone.

In some implementations, a user interface (UI) can be provided on a companion wearable device, e.g., smartwatch, smart glasses, etc., that can be utilized to establish, control, and monitor the smartphone in webcam mode.
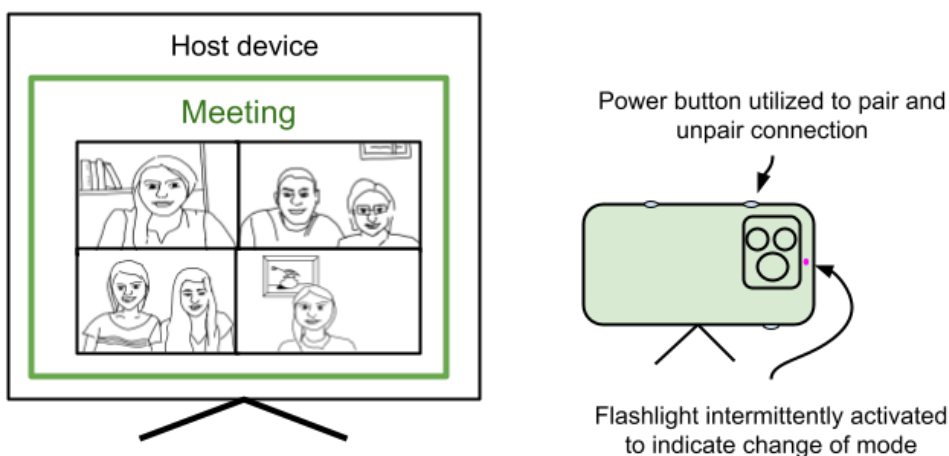

Fig. 2: Button press patterns utilized to enable/disable webcam mode

Fig. 2 depicts an example of a smartphone camera being utilized as a webcam. As depicted in Fig. 2, the power button of the smartphone can be utilized to convey user intent to connect (pair) the smartphone to a host device and to disconnect (unpair) the smartphone from the host device. A particular button press pattern, e.g., three times in a row, can be used to enable and/or disable the webcam mode.

A combination of hardware and software on the smartphones can be utilized to detect when a user presses a physical button multiple times in a row. This can be utilized to quickly, conveniently, and explicitly toggle the enabled and pairing state of webcam mode on the smartphone.

An example user flow is as follows:

- User connects the smartphone to the host device either through a wired or wireless connection.

- User presses the power button (or another conveniently placed button on a side of the smartphone) a prescribed number of times in quick succession to enable webcam mode on the smartphone. To inform the user that the webcam mode was successfully enabled, the device can provide a confirmatory signal, e.g., a notification sound, a vibration, blinking of the flashlight (commonly located on the rear of the smartphone) a certain number of times.

- Since the power button is accessible even when the screen is not visible, e.g., when the smartphone is placed on a webcam mount and the rear of the smartphone faces the user, etc., it enables a convenient opinion that does not require the user to unmount the phone. It also offers an unambiguous user interface option such that the user is sure that the webcam mode on the smartphone is not accidentally enabled.

- The user uses the smartphone as a webcam; image frames captured by the smartphone camera are streamed to the host device for transmission to the video conference.

- When the user has completed their use of the webcam, they can simply tap the power button a prescribed number of times in quick succession to disable webcam mode. To inform the user that the webcam has been successfully disabled, the smartphone can provide a confirmatory signal, e.g., a notification sound, vibration, or a blinking of the flashlight, etc. In some implementations, the confirmatory signal for the disabling of webcam mode can be different from the confirmatory signal provided for the enabling of webcam mode.

This workflow provides a convenient way for the user to control the webcam mode of the smartphone. The use of an accessible button enables the user to control the webcam mode without needing to switch on the phone screen and without having to control an on-screen user interface (UI).
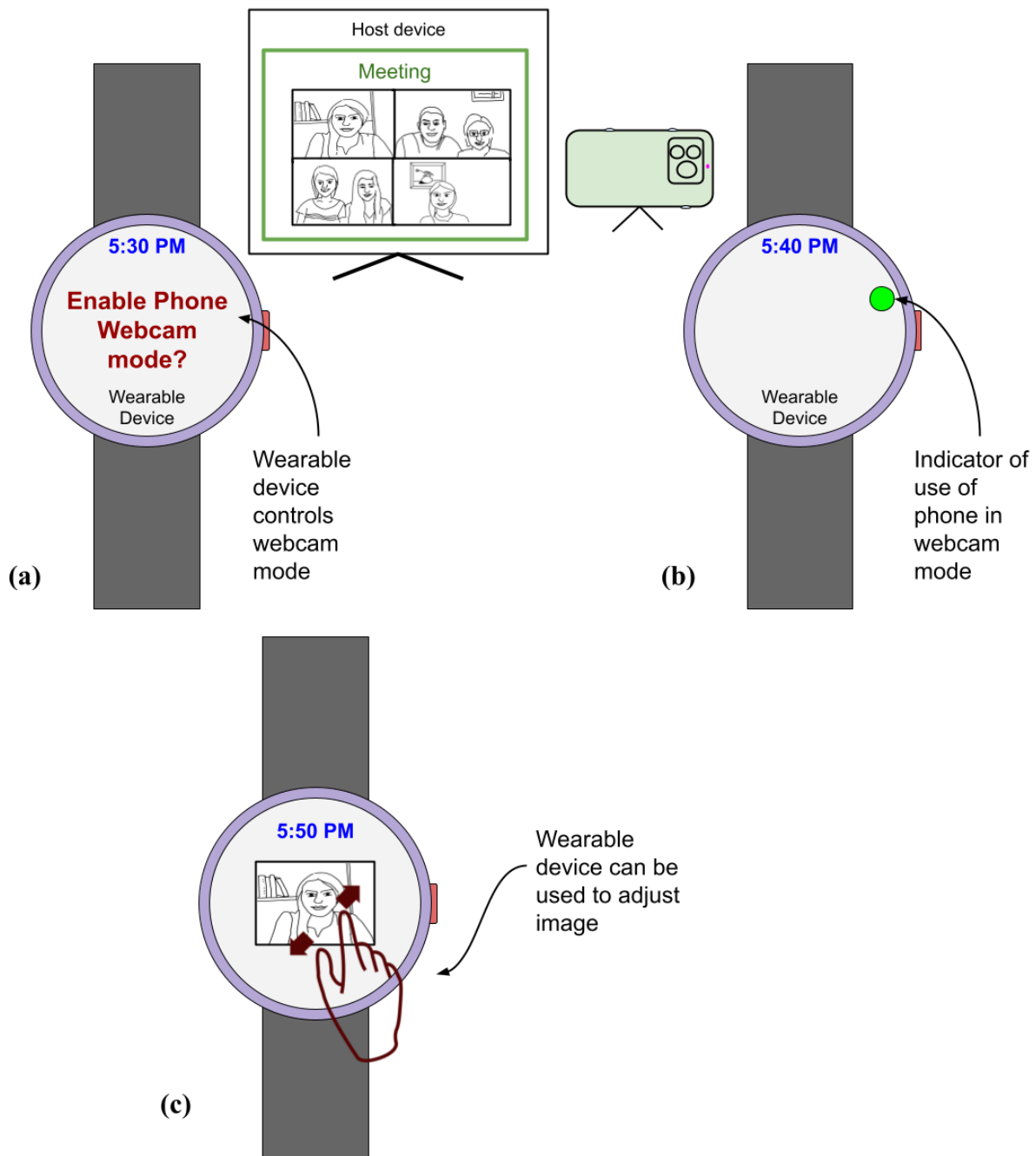

Fig. 3: Using a wearable device to enable and control webcam mode on a smartphone

Fig. 3 depicts a companion wearable device (e.g., smartwatch) that includes a user interface (UI) that can be utilized to perform control functions for a smartphone in webcam mode. Users can interact with the companion wearable device to turn the webcam functionality on or off, as well as to control webcam operations. While a smartwatch is depicted in Fig. 3, the companion wearable device can include glasses/head-mounted devices, fitness bands, or any other device worn by a person, and connected to the smartphone.

As depicted in Fig. 3(a), a suitable UI can be provided on the wearable device that can enable the user to turn on and turn off webcam functionality of a paired smartphone. The smartphone may be connected to the host device either through a wired or wireless connection. The companion wearable device can also provide a notification to the user when the host device requests a webcam feed. Additionally, as depicted in Fig. 3(b), real time status of whether the smartphone is streaming video to the host device can be displayed.

Since the display screen of the smartphone is facing away from the user, the user has no convenient way to control the smartphone image feed, e.g., change of focus, zoom, active camera, etc. As depicted in Fig. 3(c), the companion wearable device can be utilized to select, adjust, and/or control the frames that are being transmitted to the host device. The controls can include, e.g., zoom, turning flash on/of, selecting the active camera, image quality, framerate, autoframing, focus, 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 the collection of user information (e.g., information about a user's smartphone, wearable devices, and other devices; 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

This disclosure describes techniques to enable user-friendly connections of smartphones that are utilized as web cameras (webcams) to respective host devices. A button-press pattern of a power button can be utilized to convey user intent to connect (pair) the smartphone to a host device and to disconnect (unpair) the smartphone from the host device. A companion wearable device (e.g., smartwatch) includes a user interface (UI) that can be utilized to perform control functions. Users can interact with the companion wearable device to turn the webcam functionality on or off. A real time status of whether the smartphone device is streaming to the host device can be displayed. The companion wearable device can also be utilized to select, adjust, and/or control the frames that are being transmitted to the host device. The controls can include, e.g., zoom, flash, active camera, quality, framerate, autoframing, focus, etc.

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