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Automatically Invoking A High Resolution Camera

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ABSTRACT

Mobile and wearable devices include cameras that can capture photos or recognize objects in the user's field of view and provide corresponding user interfaces. However, such devices have limited battery capacity owing to which high resolution cameras on such devices cannot be configured in an always-on mode. Due to this limitation, the user needs to manually activate the camera to capture pictures or receive user interfaces appropriate for objects that are in their field of view. This disclosure describes the use of an always-on, low-power visual sensor or other sensor (with user permission) to detect contexts such as the presence of a barcode/QR code or large scannable text in the user's field of view and automatically activate a high-resolution camera. The high-resolution camera obtains a high resolution image of objects in the user's field of view which is analyzed to provide a suitable user interface.

KEYWORDS

- Smart glasses
- Head-mounted display (HMD)
- Low power visual sensor
- Low power trigger
- Object recognition
- Text scan

BACKGROUND

Mobile and wearable devices include cameras that a user can utilize to capture photos or to recognize objects and invoke corresponding actions. For example, augmented reality/ mixed reality (AR/MR) glasses have on-board camera(s) that may recognize objects in the user's field

of view and provide a corresponding user interface. Wearable and mobile devices such as head-mounted displays (HMDs) for AR/MR, smart glasses, smartphones, smartwatches, etc. have limited battery capacity. Due to the high battery costs for always-on high resolution cameras on such devices, most devices are operated in reactive mode, where the user has to manually activate the camera to capture pictures or receive user interfaces appropriate for objects that are in their field of view. Such manual activation may include explicitly invoking the camera, e.g., by tapping on a button or a specific portion of the mobile device.

Lower resolution cameras on mobile devices may be able to run all day since they use less battery power. However, typical low resolution cameras are only capable of a coarse level of recognition which renders them insufficient in many application contexts [1].

DESCRIPTION

This disclosure describes techniques to automatically invoke a high resolution camera on a mobile device by using an always-on low powered visual (or other) sensor to detect and recognize, with specific user permission, text or objects in the field of view that are suitable for capture by the high resolution camera. The low powered visual sensor includes a low resolution image sensor that, although designed for coarse fidelity, is capable of scanning text and recognizing objects using computer vision to enable determination of whether to automatically invoke the high resolution camera. Some examples of use are listed below.

User's field of view includes a quick response (QR) code

For example, when a user wearing smart glasses views a plane ticket with a printed QR code, an on-board low powered visual sensor detects that a QR code is present in the field of view and automatically triggers the high resolution camera which then scans the QR code. In this

example, the smart glasses then provide the user an augmented reality (AR) wayfinder with directions within the airport to the appropriate gate for their departing flight.

In another example, a user wearing smart glasses looks at a utility bill. A low-powered visual sensor in the smart glasses detects text on the bill and automatically activates high-resolution camera. The high-resolution camera identifies usage over time and provides a dynamic, personalized chart of the user's water usage over time.

User's field of view includes large text

The user is watching a movie and a trailer precedes the main attraction. The low-powered visual sensor in the user's smart glasses detects large, scannable text in the user's field of view, e.g., the displayed title of the trailer. In this example, the high resolution camera is then automatically enabled to capture an image of the text of the title. This image is then analyzed, e.g., using optical character recognition (OCR) techniques, to obtain the text of the title, which can be made available if the user wants to reference this text later. Similarly, text displayed on a television screen or other display can be detected.

User's field of view includes a product with a printed barcode

While shopping, a user is wearing smart glasses and wants to know more about particular products, e.g., customer reviews. However, just scanning a barcode associated with a particular product may not provide sufficient product information, since not every barcode is globally unique. The low powered visual sensor recognizes that a barcode is in the user's field of view and automatically enables the high resolution camera to identify the exact product to provide the user with corresponding reviews.

While the foregoing discussion refers to use of a low-powered visual sensor to activate a high-resolution camera, various other low-powered sensors or other techniques can be used for selective activation of the high-resolution camera of a device. For example, an ultrasound signal from speakers; audio earcons (brief, distinctive sounds) from other devices; audio from new speakers or a change in volume, tone or voice of the user; EKG provided by a wearable device; or changes to values detected via inertial measurement units (IMUs), can also be utilized. These alternative sensors can be configured to automatically invoke a high resolution camera when appropriate.

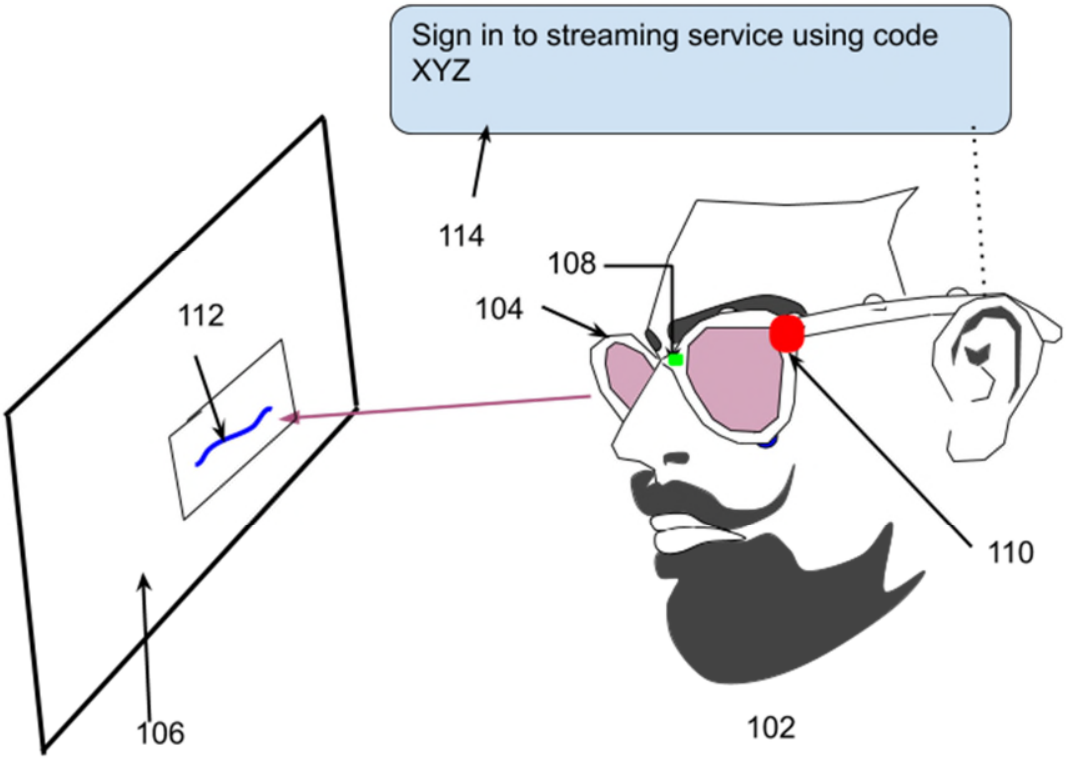

Fig. 1: Example of automatically invoking a high resolution camera

Fig. 1 illustrates automatic invocation of a high resolution camera on smart glasses, per the techniques of this disclosure. A user (102) is wearing smart glasses (104), and is viewing a television display (106), shown on the left side of the figure. The smart glasses include a low

powered visual sensor (108, shown in green color) and a high resolution camera (110, shown in red color).

In this example the user is viewing large text (112) displayed on the television through their smart glasses. For example the text may invite the user to sign into a content streaming service by providing an authentication code, “Sign in to streaming service using code XYZ.” The low powered visual sensor automatically detects presence of the large scannable text on the television display and automatically invokes the high resolution camera. The detected text is then utilized to provide a user interface (114) for the smart glasses, e.g., that enables the user to tap an option to sign in to the streaming service.

CONCLUSION

This disclosure describes the use of an always-on, low-power visual sensor or other sensor (with user permission) to detect contexts such as the presence of a barcode/QR code or large scannable text in the user’s field of view and automatically activate a high-resolution camera. The high-resolution camera obtains a high resolution image of objects in the user’s field of view which is analyzed to provide a suitable user interface.

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