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Person Identification and Displaying AR Banners

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Abstract

A technique for identifying a person and displaying a banner using Augmented Reality (AR) is described. The person is identified by comparing data gathered from orientation sensors such as gyroscope, accelerometer, etc., present in a smartphone of the person with estimated sensor data of the person (e.g. approximate readings of orientation sensors of the smartphone are estimated basis person's motion/movement, which is detected by analyzing images of the person). Finally, AR is used to display an AR banner or an AR bubble (a 3D object) on top of the identified person. The AR banner or the AR bubble may be displayed by superimposing information (e.g. advertisements, details associated with the person, etc.) to be displayed on real-world scenes or by presenting the information on a screen.

Problem Statement

Augmented Reality (AR) is a technology related to displaying virtual objects on real-world scenes in real time. The technology is gaining popularity these days and is being used in multiple industries such as gaming, healthcare, advertising, etc. Displaying AR banners (or AR bubbles) is a new concept, which can be used to display information such as advertisements, personal details, etc., on top of people (superimposed on the real-world scenes). However, there could be a problem in identifying a person for whom the AR banner needs to be displayed. Existing methods such as facial recognition, use of RFID signals, etc., can be used to identify the person. However, these methods seem to have some disadvantages, e.g. an RFID tag needs to be worn by the person and multiple RFID readers are required to detect RFID signals from the RFID tag. Employing the facial recognition technique is complex and costly. Further, facial recognition is less likely to work properly in some scenarios e.g. when images, to be used for facial recognition, are of poor resolution/quality, when the person to be identified is standing at a far distance, etc. Also, use of facial recognition is likely to raise concerns regarding privacy. The present disclosure overcomes these deficiencies and suggests a method to identify the person basis signals received from sensors (e.g. accelerometer/gyroscope) equipped in a smartphone of the person. After

identifying the person, AR is employed to display the AR banner on top of the identified person. The AR banner may be a 3D object (a 360° photo).

Proposed Solution

The proposed solution has a pre-requisite of having an application (app) installed on a smartphone of a person to be identified. The app gathers data from orientation sensors including gyroscope, accelerometer, magnetometer of the smartphone and assigns time-stamps to the gathered data. The app communicates the gathered data to a computing device. Simultaneously, an imaging device (which may be present at a far-off distance from the person to be identified) keeps on capturing images of an area, wherein the person to be identified is present in the area. There may also be other persons present in the area. The imaging device may capture one or more 2D images of the area or may capture a video of the area for a duration of time. A processing device, associated with the imaging device, determines each person's motion/position basis analysis of the captured images (or video) and estimates readings of the sensors of the smartphones associated with each person. The processing device assigns time-stamps to the estimated readings and sends the estimated readings along with the time-stamps to the computing device. The computing device may perform time-stamp alignment for both the data collected from the app installed on the smartphone of the person to be identified and from the processing device of the imaging device. The computing device compares the data (data from orientation sensors) collected from the app installed on the smartphone of the person to be identified with the data (estimated sensor readings) collected from the processing device associated with the imaging device in view of the timestamps. A match is identified between one of the estimated readings and the sensor data gathered from the app of the smartphone. On identifying the match, an AR bubble is generated to be displayed on top of the identified person, wherein the person is associated with the matched estimated reading. In other examples, the computing device may be a remote device or may be a device associated with the imaging device or the app of the smartphone.

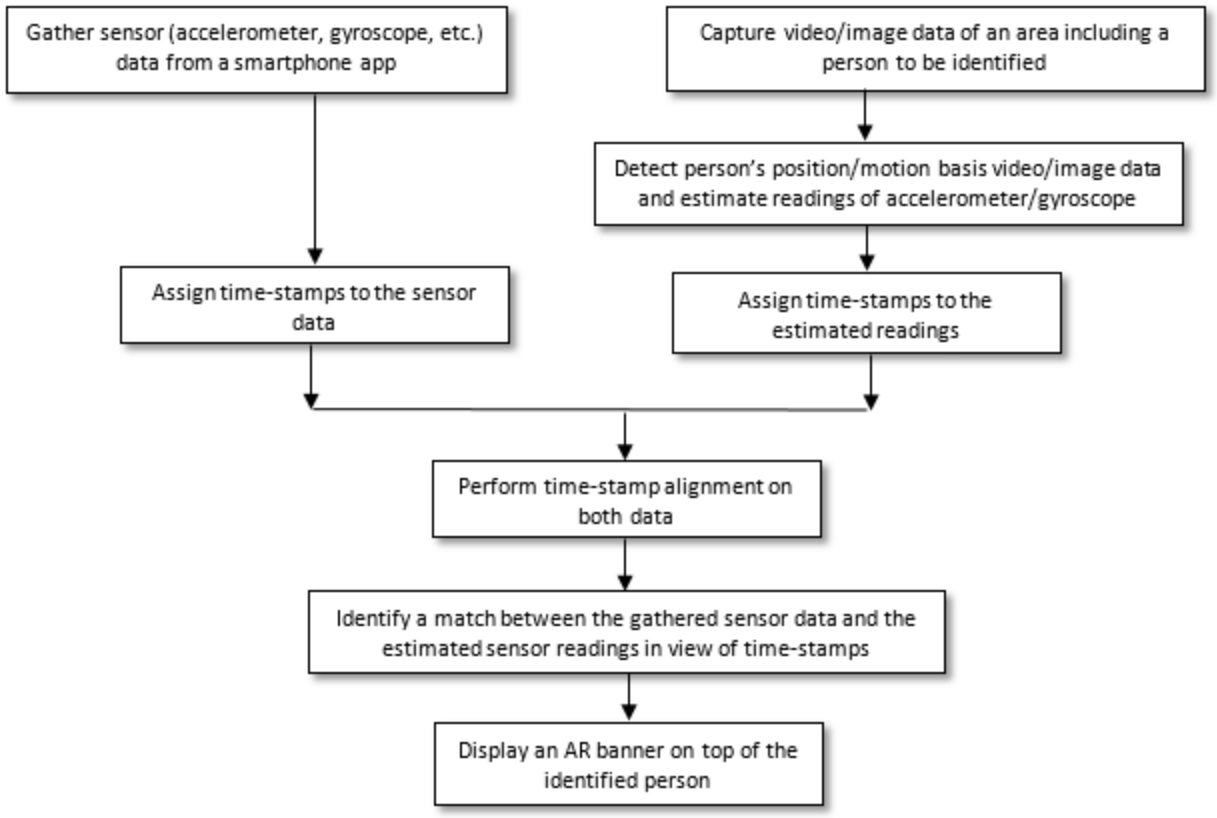

Figure 1: Block diagram for displaying an AR banner

Working

Embodiment 1 – Use of AR bubbles/banners in a rideshare situation

In one of the embodiments, recognizing a requesting rider may be helpful for rideshare companies when a cab driver does not know how the requesting rider looks like. The requesting rider should have an app installed on his/her smartphone. Examples of the app may include a Facebook app for login service, etc. The app may also be used for booking a ride. Sensor data (such as readings from gyroscopic or accelerometer) are collected by the app and time-stamps are associated with the collected data. The app communicates the time-stamped sensor data to a computing device. The computing device may be a handheld device associated with the cab driver or may be a remote device. An imaging device (which may be a camera of the handheld device of the cab driver or may be a separate device placed in a cab) captures images of an area where the requesting rider is likely to be present. The captured images may include images of other persons along with the requesting rider. The imaging device analyzes position and motion

of each person present in the captured images and then, estimates readings of sensors such as gyroscope or accelerometer of each person's smartphone. The imaging device assigns time-stamps to the estimated readings. The imaging device sends the estimated readings along with the time-stamps to the computing device. The computing device performs time-stamp alignment for both the data - received from the app and from the imaging device. Time-stamp alignment is necessary in scenarios where data collected from different sources may have some delays (e.g. communication network delays, processing delays). For example, the data from the app may be received with some time delays, therefore, time-stamp alignment can be used to properly correlate the data in time domain. Further, the computing device compares both the data (the actual readings from the app with the estimated readings). A person, whose estimated reading matches with the collected data from the app, is identified as the requesting rider. Finally, an AR bubble is displayed on top of the identified requesting rider, the AR bubble will help the cab driver to easily identify the requesting rider. The cab driver may receive a notification that the requesting rider has been identified. An app installed on a smartphone of the cab driver may project the AR bubble on top of the identified requesting rider. In yet another embodiment, the method may be helpful for the requesting rider to identify the cab driver and the AR bubble can be displayed on top of the cab driver. In yet another embodiment, captured images/videos may be presented on a screen and accordingly the AR bubble may be displayed on the screen itself.

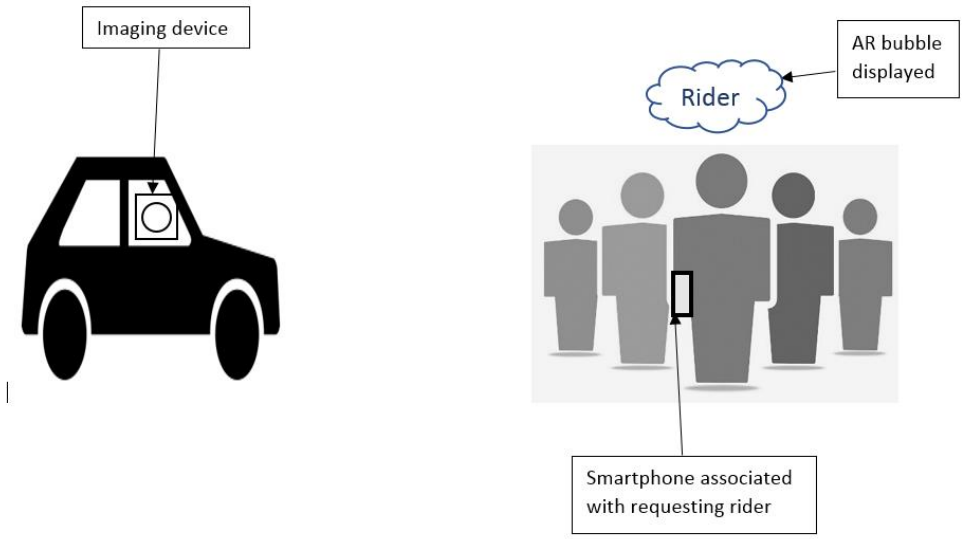

Figure 2: Displaying an AR bubble on a requesting rider

Embodiment 2 – Use of AR banners/bubbles in displaying advertisements

In an alternate embodiment, the method explained in the present disclosure may be utilized for displaying customized advertisements in a retail environment. Multiple customers may be present in a shopping mall, each with a different preference or interest. A customer may have an app installed on his/her smartphone, the app including profile information (such as name, city, preferences/interest, shopping history). The profile information and sensor data (readings from gyroscopic or accelerometer equipped in the customer's smartphone) associated with the customer are sent to a server through the app. The server may associate an identifier with the profile information and the sensor data. The server may select an advertisement to be displayed as an AR banner to the customer in view of the profile information. Further, the server uses the sensor data to identify the customer among multiple customers. An imaging device captures images of the shopping mall (which may include images of the customer to be identified and a few additional customers) and sends the images to the server. The server analyzes the images to estimate readings of gyroscope or accelerometer of each customers' smartphone (who is present in the captured images) and assigns time-stamps to the estimated sensor readings. The server performs time-stamp alignment on the received data. The server compares the estimated sensor readings and the actual sensor data from the app of the customer's smartphone. A candidate customer, whose estimated sensor reading matches with the actual sensor data received from the app, is recognized as the customer to be identified. A location of the customer is determined by analyzing the images of the customer and the advertisement is displayed to the identified customer using an AR module in view of the determined location. The AR module may get instructions for displaying the AR banner from the server. In exemplary embodiments, multiple AR modules may be placed at multiple locations in the shopping mall or the AR module may be installed in the customer's smartphone. The advertisement displayed as the AR banner may be interactive and customer engaging. The AR banner may include audio or video data and may change dynamically basis factors such as change in the location of the customer, any input from the customer, etc. Further, different advertisements can be displayed to different customers using the disclosed method simultaneously.

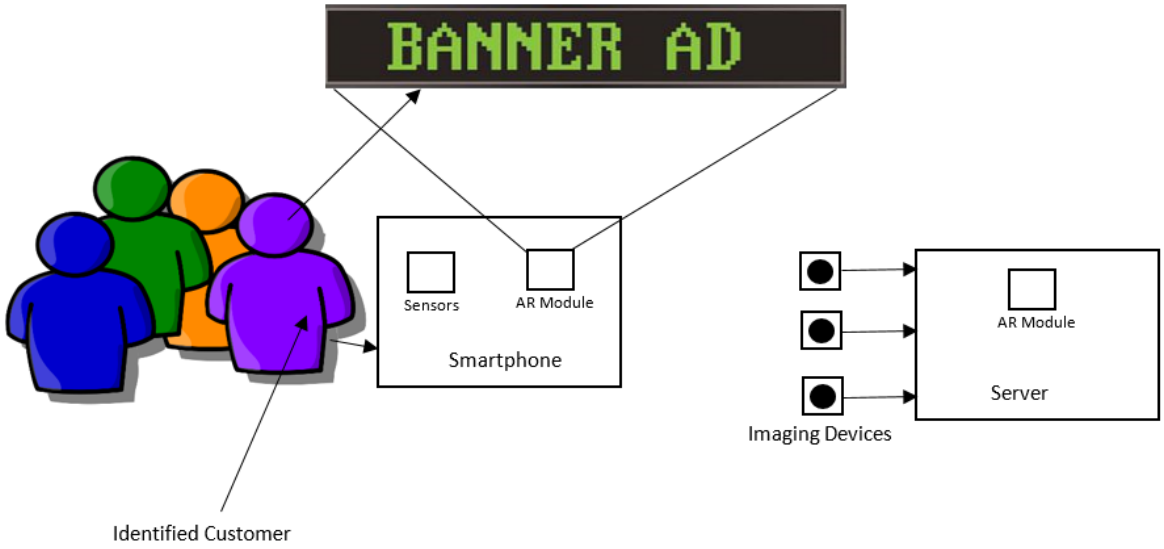

Figure 3 - Displaying an advertisement (AR banner) to an identified customer in a shopping mall

Embodiment 3 – Use of AR bubbles/banners in recognizing friends

In one of the embodiments, the method explained in the present disclosure can be utilized to identify friends who are visiting a user's house. The method may be helpful in identifying friends from a distance without a need of complex technologies such as facial recognition. The person to be identified should have an app installed on his/her smartphone to provide orientation sensor data such as accelerometer, gyroscope, magnetometer, etc. A camera is installed at an entrance of the house, where the camera is used to capture 2D images or videos of an area outside the house. A processing device, associated with the camera, is used to collect images/videos from the camera. The processing device employs an algorithm to detect multiple persons present in the images/videos and to detect their respective position and motion. Basis the detected position and motion of each person, the processing device estimates reading of sensors such as accelerometer, gyroscope, magnetometer, etc. for each respective person (e.g. how readings of orientation sensors would look like in the smartphone of each person present in the images/videos). Further, the processing device receives actual orientation sensor data from the app installed on the smartphone of the person to be identified. The processing device performs time-stamp alignment on both the data and identifies a match in view of the time-stamps. If the match is found then, the processing device identifies the person, whose estimated sensor reading has matched the actual orientation sensor data. The processing device sends the information of the identified person and display it as an AR banner to the user. sends the images or videos to the user's smartphone and an AR module

displays an AR banner on top of the identified person on a screen of the user's smartphone.. Further, the processing device may not be active all the time. E.g. the processing device may be in a sleep state and may be switched to an active state in response to receiving a signal from the app installed in the smartphone of the person to be identified.

In some embodiments, motion vectors of the person to be identified can be derived by analyzing sensor data and motion vectors of multiple persons present in images/videos can be derived by analyzing the images/videos. Further, a comparison can be performed between derived motion vectors. In an example, a position of the identified person can be tracked, and a placement of the AR banner can be changed in view of change in the position of the identified person. In an example, the AR banner may comprise text content, images, videos, animations, etc. In yet another example, the AR banner can be displayed using wearable devices (such as smart glasses and head-sets) and a holographic display.

Conclusion

The fast-paced advancement in AR technologies are set to revolutionize the way we look at the world around us. The disclosure describes a simplified, less expensive and easy to implement method for identifying a person and displaying AR banners. Use of AR helps us to display information for the identified person and provides an enhanced user experience. AR can be used to provide better experience than printed banners/images as AR banners can be dynamic and interactive. Use of videos/animations in AR may help to attract and engage customers in a better way. The disclosed idea can be extended to be utilized in various fields such as advertising, retail industry, rideshare companies, social networking, etc.