Technical Disclosure Commons

Defensive Publications Series

December 12, 2017

Connecting Devices Based On Captured Image Data

Joseph Cohen

Justin Lewis

Follow this and additional works at: http://www.tdcommons.org/dpubs_series

Recommended Citation

Cohen, Joseph and Lewis, Justin, "Connecting Devices Based On Captured Image Data", Technical Disclosure Commons, (December 12, 2017)
http://www.tdcommons.org/dpubs_series/966

CONNECTING DEVICES BASED ON CAPTURED IMAGE DATA

ABSTRACT

Disclosed herein is a mechanism for connecting devices based on captured image data. A streaming media device can transmit content information indicating content that is currently being presented on a display associated with the streaming media device to a server device. A user device can transmit image data (e.g., captured by a camera associated with the user device) to the server device that represents content that is currently being presented on a display device. The server device can, in turn, compare the content information received from multiple streaming media devices with the image data received from the user device to identify a streaming media device that is currently presenting the content represented by the image data transmitted by the user device. The server device can then determine whether the user device has permission to access the identified streaming device, and can transmit a reference to the user device that allows the user device to connect to the streaming media device and to control the playback of content using the streaming media device.

BACKGROUND

Users frequently want to transfer playback of a media content item, or cast the media content item, from a user device (e.g., a mobile phone, a tablet computer, etc.) to a display device (e.g., a television, etc.). For example, a user may begin playing music or a video from a mobile device and may want to cast the music or the video to a nearby television. Casting media content from a mobile device to a display device typically involves connecting both the mobile device and a streaming media device coupled to the display device to the same local network (e.g., a home WiFi network, etc.), opening an application on the mobile device to begin playing the

media content item, and selecting an icon from the application to transfer playback of the media content item to the media device. However, this process can be time-consuming for the user. Moreover, it can be difficult for a user to cast media content from a user device if the user is not the owner of the streaming media device coupled to the display device, for example, if the user is a guest in the owner's home. Thus, there is a need for a better approach for connecting these devices.

<u>DESCRIPTION</u>

The systems and techniques described in this disclosure relate to connecting devices based on captured image data. The system can be implemented on a user device, a streaming media device coupled to a display device, and a server. FIG. 1 shows an illustrative example of an information flow diagram for connecting devices based on captured image data.

Turning to FIG. 1, at step 102, the streaming media device can transmit information indicting content currently being presented on a display coupled to the streaming media device to a server. The content being presented can be any suitable content, such as a video, a television show, a movie, audio content, a slideshow of images, and/or any other suitable content. In some instances, the content can be one or more screensaver images or background images that are presented while the streaming media device is in an idle state. Additionally, in some instances, the streaming media device can transmit location information indicating a location of the streaming media device. For example, the location information can include an Internet Protocol (IP) address of the streaming media device, Global Positioning System (GPS) coordinates associated with the streaming media device, and/or any other suitable location information. In instances where the streaming media device transmits GPS coordinates, the GPS coordinates can be determined using any suitable information, such as based on GPS coordinates of a user device

used to initialize the streaming media device at a time of setup. Note that, in some instances, screensaver images or background images that are presented while a streaming media device is in an idle state can be determined by a server, and, in some such instances, the server can identify screensaver images or background images such that two nearby streaming media devices cause different screen images to be presented.

At step 104, the server can store the content information and the location information. It should be noted that the content information and the location information can be stored in any suitable manner. For example, the server can store the information in a table that uses an identifier associated with the streaming media device as a key and stores identifiers of the media content currently being presented and a location of the streaming media device as values in the table. The server can update the information with any suitable frequency and based on any suitable information. For example, in instances where the server receives updated content information from the streaming media device that indicates that the media content that is being presented has changed (e.g., that a different video is being presented, a different channel is being presented, etc.), the server can delete outdated content information and can replace the content information with an identifier of media content that is currently being presented. It should be noted that steps 102 and 104 can be repeated with any suitable frequency and over any suitable time period.

At step 106, a user device, such as a mobile phone, a tablet computer, a wearable computer, a laptop computer, a desktop computer, and/or any other suitable user device, can transmit an image or a video captured of a display associated with a streaming media device. For example, the image or the video can include content currently being presented using the streaming media device. The captured image data can be a still image or a video, and in

instances where the image data is a video, can include audio content. In some instances, the image data can be captured via an application executing on the user device. For example, the application can be associated with a particular video sharing service.

At step 108, the server can identify a group of candidate streaming media devices based on the image data received from the user device. The server can use any suitable technique or combination of techniques to identify the group of candidate streaming media devices. For example, the server can compare the image data and/or audio data received from the user device with image data and/or audio data received from one or more streaming media devices (e.g., as described above in connection with step 102) that indicates content currently being presented on displays associated with each of the streaming media devices. As a more particular example, the server can compare image fingerprints and/or audio fingerprints of the image data received from the user device with image fingerprints and/or audio fingerprints of content information received from the streaming media devices. As a specific example, the server can use a MinHash function to identify the group of candidate streaming media devices currently presenting content that is likely to match the image data and/or audio data transmitted by the user device at step 106. In some instances, the server can use a MinHash function with any suitable threshold to identify the group of candidate streaming media devices. For example, the server can use a relatively lower threshold for the MinHash function, thereby allowing streaming media devices with a relatively larger mismatch between the content currently being presented by the streaming media device and the image data and/or audio data captured by the user device to be included in the group of candidate streaming media devices.

At step 110, the server can identify a subset of the candidate streaming media devices based on location information (e.g., the location information transmitted by each streaming

media device as described above in connection with step 102) associated with each of the streaming media devices in the group of candidate streaming media devices. For example, the server can identify streaming media devices in the group of candidate streaming devices associated with location information that indicates that a location of the streaming media device is within a predetermined distance (e.g., within 0.5 miles, within one mile, and/or any other suitable distance) of the user device (e.g., based on location information associated with the user device). As another example, the server can identify streaming media devices in the group of candidate streaming media devices associated with IP addresses that indicate that the streaming media device is in a similar geographic region as the user device (e.g., based on an IP address associated with the user device, based on GPS coordinates associated with the user device, and/or based on any other suitable information).

At step 112, the server can identify one streaming media device from the subset of candidate streaming media devices. The server can identify the one streaming media device using any suitable information and using any suitable technique(s). For example, the server can compare the image data and/or audio data captured by the user device with image data and/or audio data received from streaming media devices in the subset of candidate streaming media devices that represents content each streaming media device is currently presenting to identify a match between content captured by the user device and content being presented by the streaming media device. Similarly to that which is described above in connection with step 108, the server can use a MinHash function to identify the one streaming media device. In some instances, the MinHash function used at step 112 can have a relatively lower threshold for identifying a match, thereby allowing a single streaming media device to be identified from the subset of candidate streaming media devices. In some instances, the server can additionally calculate a confidence

value indicating a likelihood that the content being presented by the one identified streaming media device matches content captured by the user device represented by the image data and/or the audio data transmitted to the server at step 106.

At step 114, the server can determine whether the user device has permission to access the identified streaming media device. The server can determine whether the user device has permission to access the identified streaming media device based on any suitable information. For example, the server can determine whether the user device is included in an access control list associated with the streaming media device. In some instances, the access control list can be based on permissions specified by, for example, an owner of the streaming media device. If the server determines that the user device has permission to access the identified streaming media device, the server can transmit a reference (e.g., an authentication token, a passcode, and/or any other suitable type of reference for allowing the user device to connect to the streaming media device) to the user device that allows the user device to connect to the streaming media device.

At step 116, the user device can use the received reference to cause media content to be presented on the streaming media device. For example, the user device can transmit an indication of a media content item (e.g., a name of the media content item, a location of the media content item, an identifier of the media content item, and/or any other suitable identifying information corresponding to the media content item) that is to be presented on a display device associated with the streaming media device to the streaming media device.

At step 118, the streaming media device can cause the media content item indicated by the user device to be presented on a display associated with the streaming media device. For example, the streaming media device can request that a server hosting the indicated media content item begin streaming the media content item to the streaming media device.

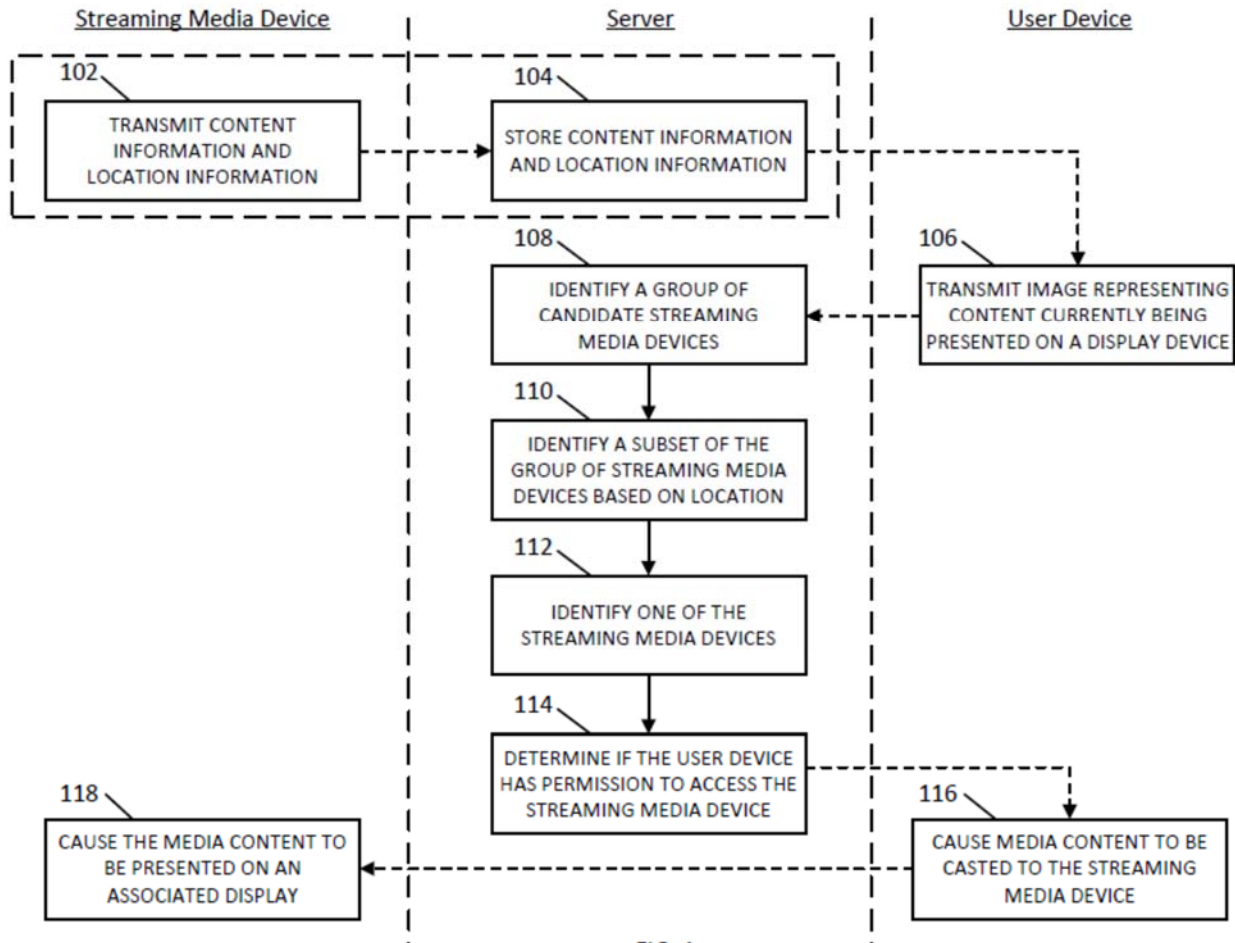Accordingly, a mechanism for connecting devices based on captured image data is provided.

FIG. 1