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Sheldon

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(54) **SYSTEMS AND METHODS FOR REAL TIME FACT CHECKING DURING STREAMING VIEWING**

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H04N 21/81 (2011.01)

(52) **U.S. Cl.**
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(58) **Field of Classification Search**
None
See application file for complete search history.

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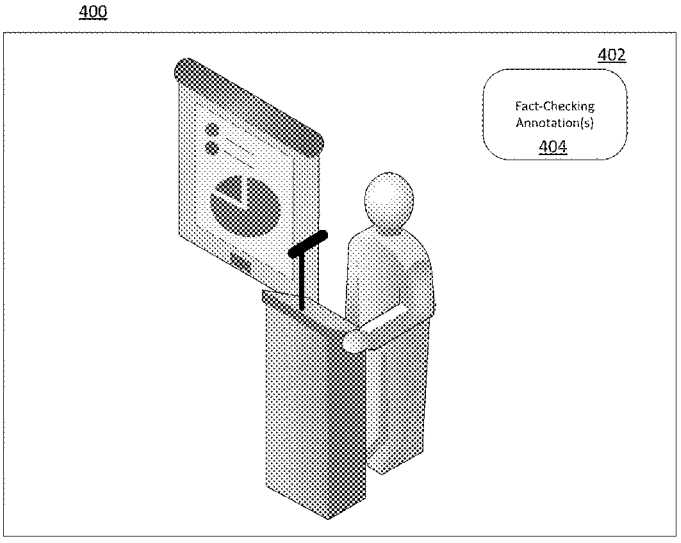
(74) *Attorney, Agent, or Firm* — Polsinelli LLP

(57) **ABSTRACT**

The present disclosure relates to systems and methods for fact-checking contemporary and/or live video streams. In one aspect, the disclosed systems and methods may provide fact-checked commentary and annotations to enhance the enjoyment and engagement with the streaming media. In one aspect, the systems and methods nay generate an overlay for the streaming media that includes fact-checked annotations and comments about statements or assertions made during the live streaming media.

21 Claims, 6 Drawing Sheets



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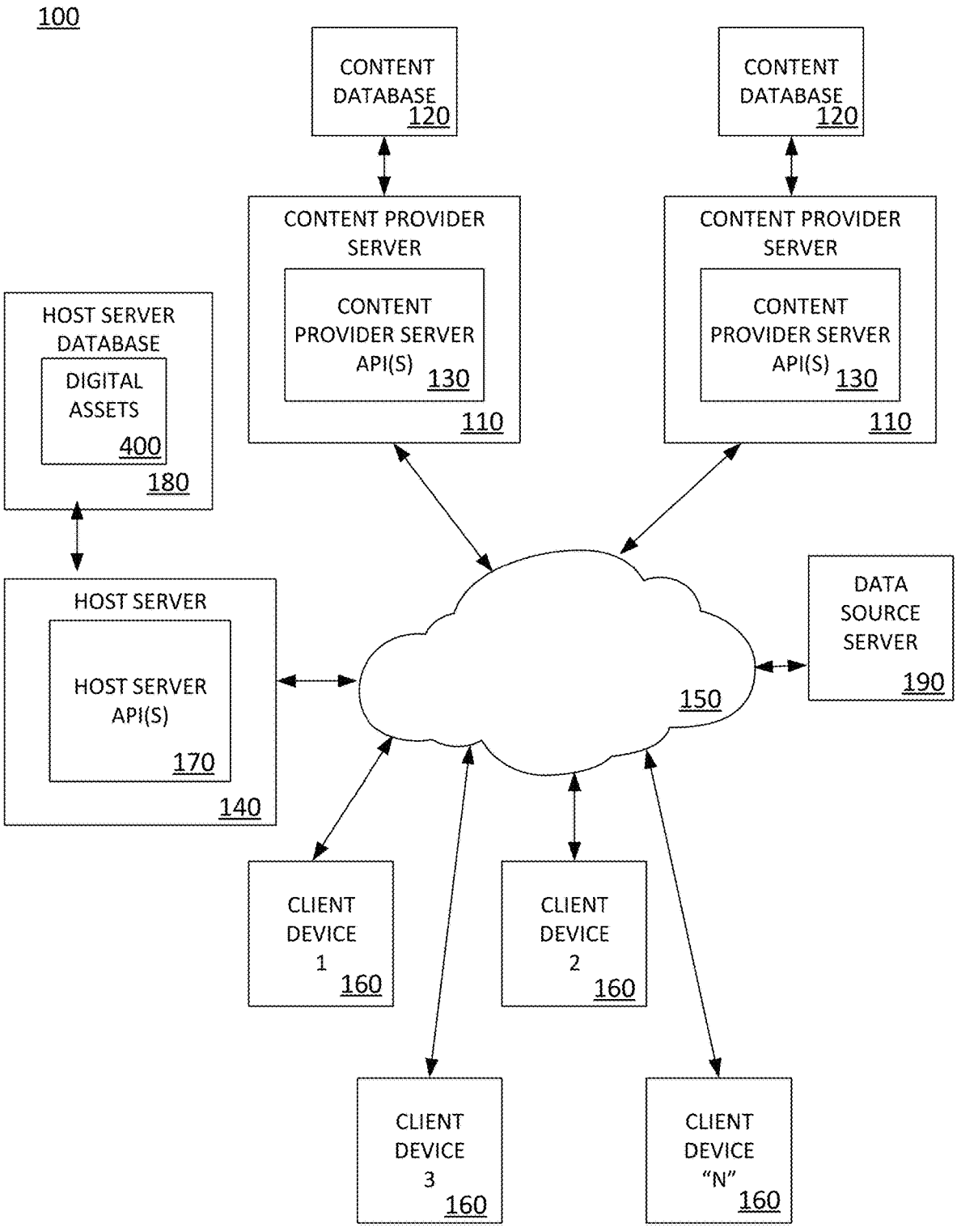
100
CONTENT DATABASE 120
CONTENT DATABASE 120
CONTENT PROVIDER SERVER
CONTENT PROVIDER SERVER API(S) 130
110
CONTENT PROVIDER SERVER
CONTENT PROVIDER SERVER API(S) 130
110
HOST SERVER DATABASE
DIGITAL ASSETS 400
180
HOST SERVER
HOST SERVER API(S) 170
140
150
DATA SOURCE SERVER 190
CLIENT DEVICE 1 160
CLIENT DEVICE 2 160
CLIENT DEVICE 3 160
CLIENT DEVICE "N" 160

Figure 1

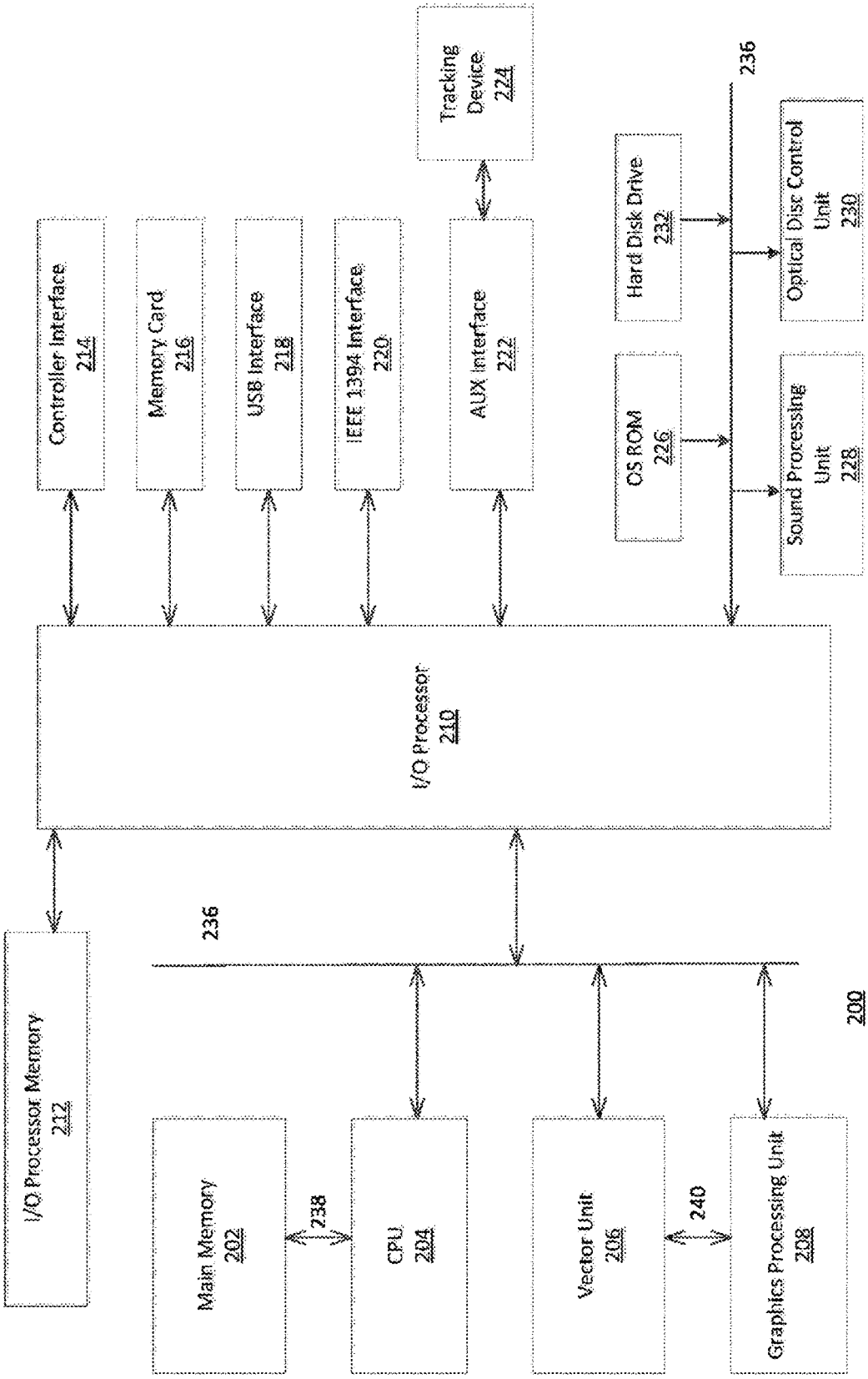
Tracking Device 224
Controller Interface 214
Memory Card 216
USB Interface 218
IEEE 1394 Interface 220
AUX Interface 222
Hard Disk Drive 232
Optical Disc Control Unit 230
236
OS ROM 226
Sound Processing Unit 228
I/O Processor 210
I/O Processor Memory 212
236
Main Memory 202
238
CPU 204
Vector Unit 206
240
Graphics Processing Unit 208
200

Figure 2

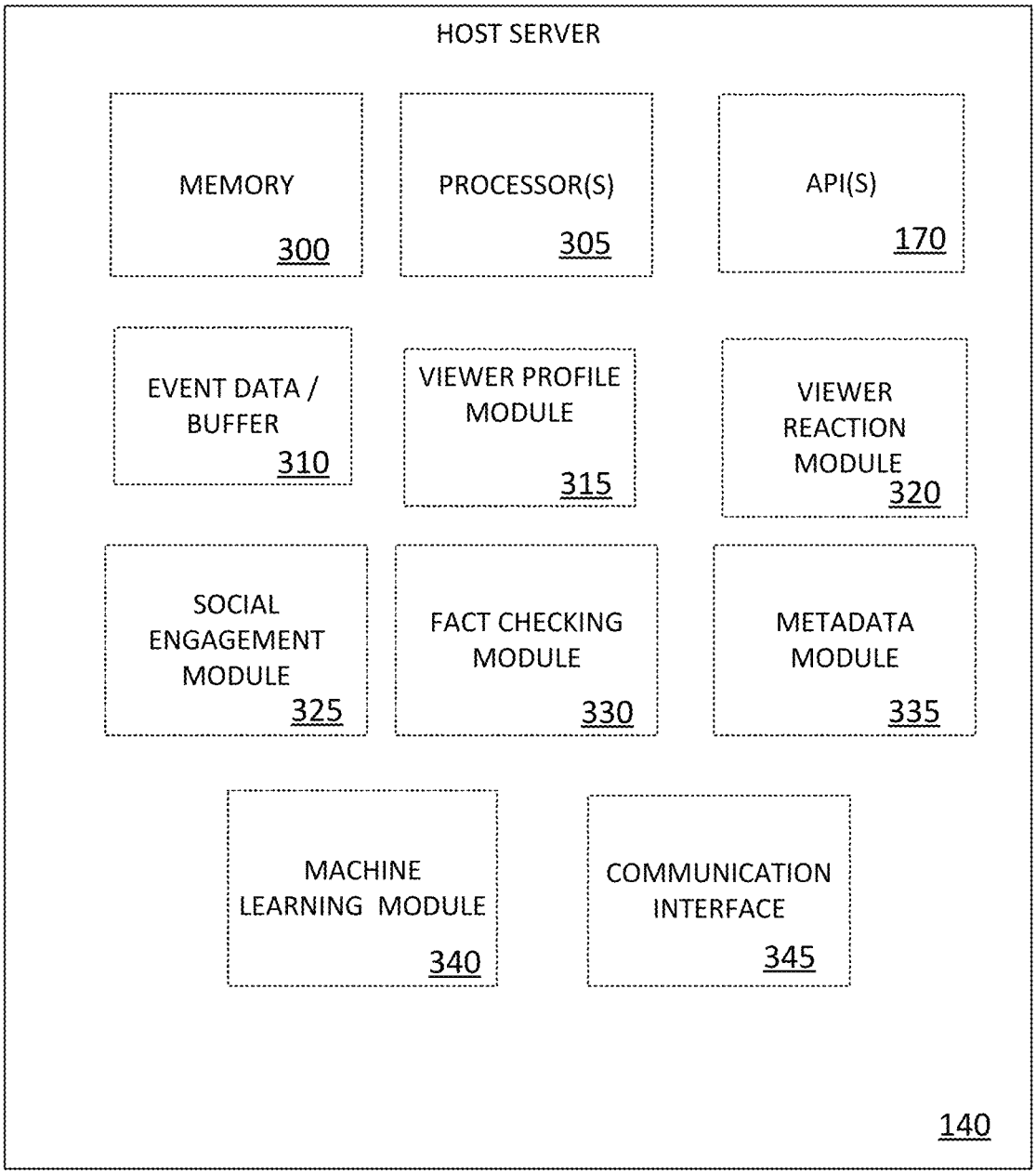
HOST SERVER
MEMORY
300
PROCESSOR(S)
305
API(S)
170
EVENT DATA / BUFFER
310
VIEWER PROFILE MODULE
315
VIEWER REACTION MODULE
320
SOCIAL ENGAGEMENT MODULE
325
FACT CHECKING MODULE
330
METADATA MODULE
335
MACHINE LEARNING MODULE
340
COMMUNICATION INTERFACE
345
140

Figure 3

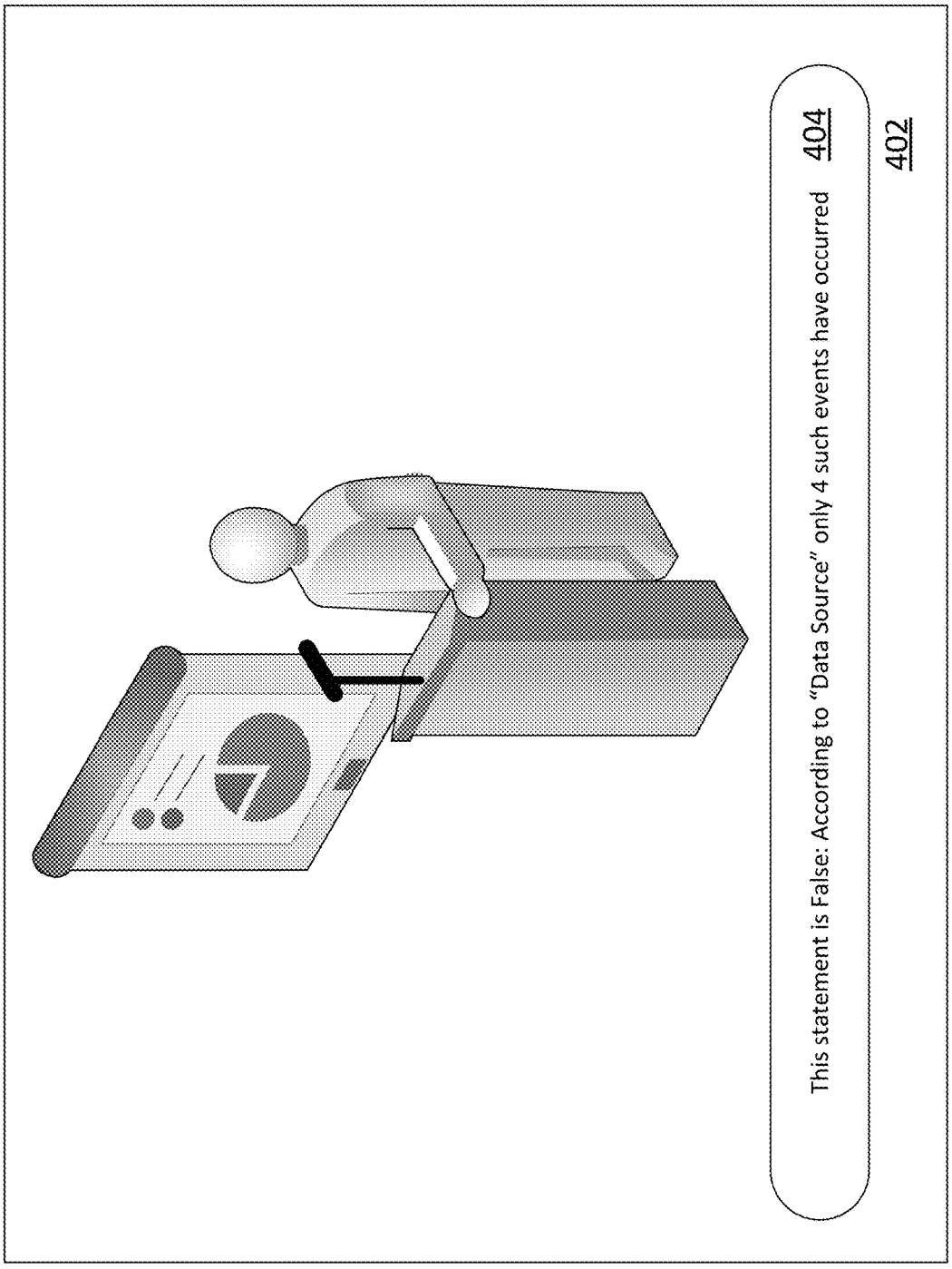
400
This statement is False: According to "Data Source" only 4 such events have occurred
404
402

Figure 4A

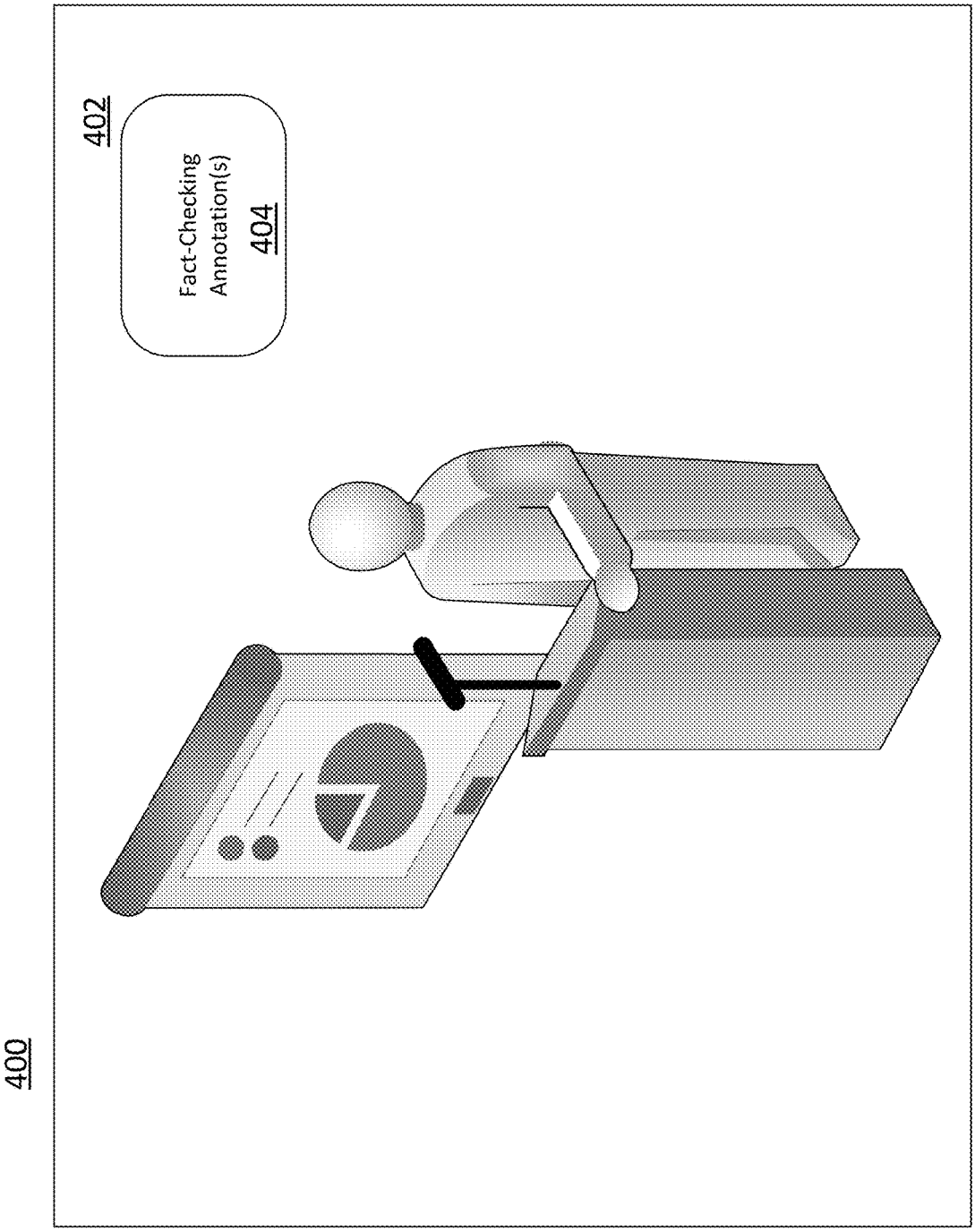

Figure 4B

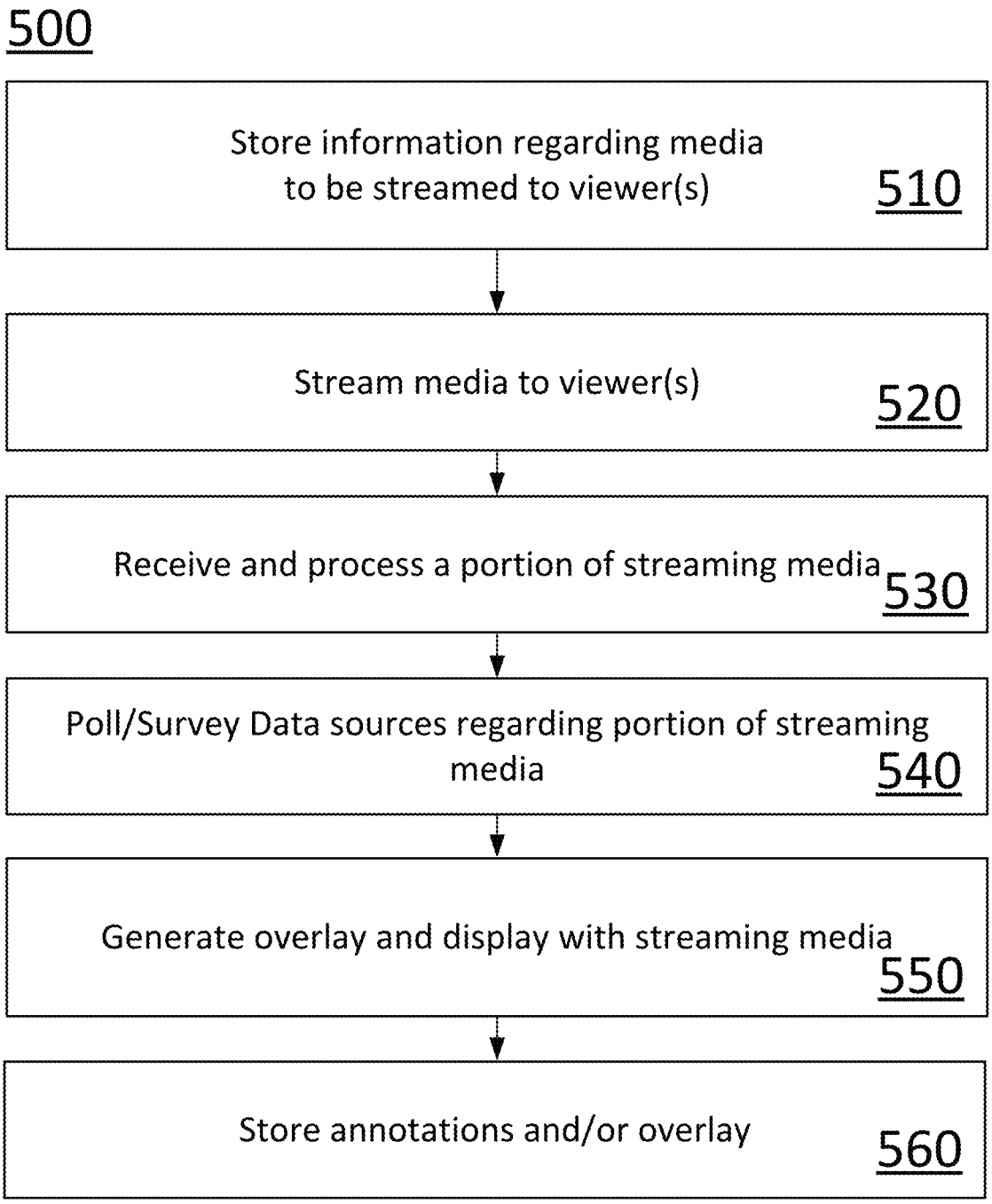
500
Store information regarding media to be streamed to viewer(s)
510
Stream media to viewer(s)
520
Receive and process a portion of streaming media
530
Poll/Survey Data sources regarding portion of streaming media
540
Generate overlay and display with streaming media
550
Store annotations and/or overlay
560

Figure 5

SYSTEMS AND METHODS FOR REAL TIME FACT CHECKING DURING STREAMING VIEWING

CROSS-REFERENCE TO RELATED APPLICATION

The present application is a continuation and claims the priority benefit of U.S. patent application Ser. No. 17/198,059 filed Mar. 10, 2021, now U.S. Pat. No. 11,553,255, the disclosure of which is hereby incorporated by reference.

BACKGROUND

1. Field of Disclosure

The present disclosure generally relates to systems and method for incorporating overlays with crowd-source fact checking and supporting evidence in to streaming media. In particular, the disclosed systems and methods allow viewers to selectively display fact-checking data and supporting evidence over the media stream.

2. Description of the Related Art

Live streaming media, opinion-based programs, and political debates often disseminate large volumes of information. Unfortunately, this information is provided to persuade viewer opinions and is typically provided out of context. As such, there is a desire among viewers to include real-time fact checking and supporting evidence.

SUMMARY OF THE CLAIMED DISCLOSURE

According to one aspect, the present disclosure relates to a method for providing and displaying real-time fact checking to a viewer of streaming media. The method includes storing data regarding the streaming media, displaying the streaming media to the viewer, and receiving and processing a portion of the streaming media. The method also includes polling one or more data source regarding the portion of the streaming media, displaying a fact-checked annotation, and storing the fact-checked annotation.

In one aspect, receiving and processing a portion of the streaming media further includes converting audio data to text and generating one or more search terms based on the text. In another aspect, receiving and processing a portion of the streaming media further includes recognizing text displayed in the streaming media and generating one or more search terms based on the recognized text.

In various aspects, polling one or more data sources further includes searching a content of the data source using one or more search term selected based on the portion of the streaming media and assigning at least one of a confidence score or a veracity score to the fact-checked annotation. In one aspect, the fact-check annotations are displayed in a peripheral portion of the streaming media. In another aspect, displaying the fact-checked annotation further includes generating an overlay that is displayed along with the streaming media. In yet another aspect, the fact-checked overlay further includes data regarding at least one of a veracity score or a confidence score for the fact-checked annotation.

In various aspects, the present disclosure also relates to a system for providing and displaying real-time fact checking to a viewer of streaming media. The system includes a database that stores information regarding the streaming media and stores fact-checked annotations and overlays. The systems also includes a content provider server that provides the streaming media and a host server. The host server stores data regarding the streaming media, displays the streaming media to the viewer, and receives and processes a portion of the streaming media. The host server also polls one or more data source regarding the portion of the streaming media, displays a fact-checked annotation, and stores the fact-checked annotation.

In one aspect, the host server converts audio data to text and generates one or more search terms based on the text. In another aspect, the host server recognizes text displayed in the streaming media, and generates one or more search terms based on the recognized text.

In another aspect, the host server searches a content of the data source using one or more search term selected based on the portion of the streaming media, and assigns at least one of a confidence score or a veracity score to the fact-checked annotation.

In one aspect, the fact-check annotations are displayed in a peripheral portion of the streaming media. In another aspect, displaying the fact-checked annotation further includes generating an overlay that is displayed along with the streaming media. In yet another aspect, the fact-checked overlay further includes data regarding at least one of a veracity score or a confidence score for the fact-checked annotation.

According to various aspects, the aforementioned methods may be embodied as a program or instructions in a non-transitory computer readable medium executable by processor in computing network. The embodied program or portions thereof may be executed on multiple computing devices across a network.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates an exemplary network environment in which a system for viewing and incorporating real time fact checking into streaming media may be implemented.

FIG. **2** is an exemplary viewer device that may be used in context of the system of FIG. **1**.

FIG. **3** is a block diagram of an exemplary host server that may be used in context of the system of FIG. **1**.

FIG. **4**A is an exemplary fact-checking and evidence overlay created during the use of the system of FIG. **1**.

FIG. **4**B is another exemplary fact-checking and evidence overlay created during the use of the system of FIG. **1**.

FIG. **5** is a flowchart illustrating a method of generating a fact-checking overlay using the system of FIG. **1**.

DETAILED DESCRIPTION

The present disclosure describes methods and systems for providing real-time fact checking during the display of streaming media. In particular, a fact-check overlay that is generated to provide fact checking analysis and supporting evidence in response to statements made during a live stream. In one aspect, the live stream may include a political debate or political speech. In various aspects, the systems and methods retrieve data from reputable internet sources or other relevant entities to provide supporting or opposing data and facts and display this data to the viewer. In one aspect, the retrieved data may be obtained through various mechanisms of crowdsourcing.

FIG. **1** illustrates a network environment **100** in which a system for the viewing of a live or otherwise contemporary media stream and incorporating fact-checking capabilities with supporting evidence, if available, into the display of the

media stream may be implemented. The network environment **100** may include a content provider server **110** that provides streaming content (e.g., video), stored in a database **120**, for distribution (e.g., via video on-demand (VOD) services) using one or more content provider server application program interfaces (APIs) **130**. The network environment **100** may also include a content delivery host server **140**, a public network **150**, one or more client devices **160**, and one or more data source server **190**.

Content provider servers **110** may maintain and provide media content available for streaming. Such media content may include not only pre-recorded content (e.g., DVR content), but also streams of live broadcasts (e.g., live news events, live e-sporting events, live political rallies or debates). The content provider servers **110** may be associated with any content provider, such as but not limited to Netflix®, Hulu®, or Amazon Prime, among others that make its content available to be streamed. In various aspects, streaming as used herein may also include the viewing or consumption of media that is downloaded to one or more client devices.

The streaming content from content provider server **110** may be provided through a content provider server API **130**, which allows various types of content sources server **110** to communicate over the public network **150**. The content provider server API **130** may be specific to the particular language, operating system, protocols, etc. of the content provider server **110** providing the streaming content. In a network environment **100** that includes multiple different types of content provider servers **110**, there may likewise be a corresponding number of content provider server APIs **130**.

The content provider server API **130** therefore facilitates direct or indirect access for each of the client devices **160** to the content hosted by the content provider servers **110**. Additional information, such as metadata, about the accessed content can also be provided by the content provider server API **130** to the client device **160**. As described below, the additional information (i.e. metadata) can be usable to provide details about the content being streamed to the client device **160**. Finally, additional services associated with the accessed content such as chat services, ratings and profiles can be provided from the content provider servers **110** to the client device **160** via the content provider server API **130**.

The content provider server API **130** can be accessed by a content delivery host server **140**. The content delivery host server **140** may include a server that provides resources and files related to the media stream, including promotional images and service configurations with client devices **160**. The content delivery host server **140** can also be called upon by the client devices **160** that request to stream or subscribe to specific content.

The content provider server API **130** may be accessed by a host server API **170** in order to obtain information about available streaming content for the client device **160**. As described below, the additional information about the content may include metadata describing the available content (e.g., by author, title, genre). The information may also include a location where the content is stored (e.g., URL) so that the viewer device can proceed with retrieving the content from the content provider server **110**. Furthermore, the host server API **170** may include instructions or graphic viewer interfaces for implementing functionalities (e.g., chat) that would allow viewers at different client devices **160** to interact with each other. Such instructions may be used by the host server API **170** to provide certain functionalities to the client device **160**.

The host server API **170** may be responsible for communicating with the different content provider servers **110** in order to provide that content to the client device **160**. The host server API **170** may carry out instructions, for example, for identifying the format of the media content and formatting the media content to be playable on the client device **160**. Such formatting may include identifying the metadata associated with each of the content then using various different types of conversion techniques so that data stored in one format at the content provider servers **110** may be rendered and displayed on the client devices **160**, which may require a different format. As such, media content of different formats may be provided to and made compatible with client device **160** via the host server API **170**.

The host server **140** further stores and retrieves data from a host database **180**. The host database **180** may stores any fact-checked annotations and/or comments retrieved and displayed during or after consumption of the live streaming media at the client device **160**. The database **180** also stores the metadata associated with the media stream being provided to the client devices **160**. The host server **140** can generate metadata to relevant to the viewers' interactions with the host server **140**. In one example, the metadata can be used to link the fact-checked annotations and commentary to the streaming media.

The public network **150** facilitates communication of the steaming media from the content provider server **110** and the host server **140** with the plurality of client devices **160**. The public network **150** can also include one or more private networks, such as, a local area network (LAN), a wide area network (WAN), or a network of public/private networks, such as the Internet. The Internet is a broad network of interconnected computers and servers allowing for the transmission and exchange of Internet Protocol (IP) data between viewer devices connected through a network service provider. Examples of network service providers include the public switched telephone network, a cable service provider, a provider of digital subscriber line (DSL) services, or a satellite service provider.

The client device **160** may be one or more of a plurality of different types of computing devices. For example, the client device **160** may be any number of different gaming consoles, mobile devices, laptops, and desktops. Such client devices **160** may also be configured to access data from other storage media, such as, but not limited to memory cards or disk drives as may be appropriate in the case of downloaded services. Such client devices **160** may include standard hardware computing components such as, but not limited to network and media interfaces, non-transitory computer-readable storage (memory), and processors for executing instructions that may be stored in memory. These client devices **160** may also run using a variety of different operating systems (e.g., iOS, Android), applications or computing languages (e.g., C++, JavaScript). An exemplary client device **160** is described in detail herein with respect to FIG. **2**.

FIG. **2** is an exemplary computing device **200** that may be used in context of the system of FIG. **1** to view streaming media, among other functionalities. The client device **200** may correspond to client device **160** and/or the data source server **190** of FIG. **1** and may be inclusive of desktop, laptop, tablet, mobile device, console gaming system, etc. The client device **200** is a device that the viewer can utilize to facilitate carrying out features of the present disclosure pertaining to

the watching of streaming media and the incorporation of fact-checked commentary. In particular, the client device **200** allows the viewer to view the streamed media at any location and time remotely.

The client device **200** may include various elements as illustrated in FIG. **2**. It should be noted that the elements are exemplary and that other aspects may incorporate more or less than the elements illustrated. With reference to FIG. **2**, the client device **200** includes a main memory **202**, a central processing unit (CPU) **204**, at least one vector unit **206**, a graphics processing unit **208**, an input/output (I/O) processor **210**, an I/O processor memory **212**, a controller interface **214**, a memory card **216**, a Universal Serial Bus (USB) interface **218**, and an IEEE interface **220**, an auxiliary (AUX) interface **222** for connecting a tracking device **224**, although other bus standards and interfaces may be utilized. The client device **200** further includes an operating system read-only memory (OS ROM) **226**, a sound processing unit **228**, an optical disc control unit **230**, and a hard disc drive **232**, which are connected via a bus **234** to the I/O processor **210**. The client device **200** further includes at least one tracking device **224**.

The tracking device **224** may be a camera, which includes eye-tracking capabilities. The camera may be integrated into or attached as a peripheral device to client device **200**. According to various aspects, typical eye-tracking devices may use infrared non-collimated light reflected from the eye and sensed by a camera or optical sensor. The information is then analyzed to extract eye rotation from changes in reflections. Camera-based trackers focus on one or both eyes and record their movement as the viewer looks at some type of stimulus. Camera-based eye trackers use the center of the pupil and light to create corneal reflections (CRs). The vector between the pupil center and the CR can be used to compute the point of regard on surface or the gaze direction. A simple calibration procedure of the viewer may be needed before using the eye tracker.

In other aspects, trackers that are more sensitive may use reflections from the front of the cornea and that back of the lens of the eye as features to track over time. In yet other aspects, even more sensitive trackers image features from inside the eye, including retinal blood vessels, and follow these features as the eye rotates. Most eye-tracking devices may use a sampling rate of at least 30 Hz, although 50/60 Hz is most common. Some tracking devises may run as high as 240 Hz, which is needed to capture detail of very rapid eye movement. The foregoing describes example eye-tracking technology that may be used in accordance with the present disclosure. In various aspects, any known eye gaze tracking technology that one skilled in the art would be capable of applying could be used.

A range camera may instead be used with the present disclosure to capture gestures made by the viewer and is capable of facial recognition. A range camera is typically used to capture and interpret specific gestures, which allows a hands-free control of an entertainment system. This technology may use an infrared projector, a camera, a depth sensor, and a microchip to track the movement of objects and individuals in three dimensions. This viewer device may also employ a variant of image-based three-dimensional reconstruction.

The tracking device **224** may include a microphone integrated into or attached as a peripheral device to client device **200** that captures voice data. The microphone may conduct acoustic source localization and/or ambient noise suppression. The microphones may be usable to receive verbal instructions from the viewer to schedule, retrieve, and display content on the client device **200**.

Alternatively, tracking device **224** may be the controller of the viewer device **200**. The controller may use a combination of built-in accelerometers and infrared detection to sense its position in 3D space when pointed at the LEDs in a sensor nearby, attached to, or integrated into the console of the entertainment system. This design allows viewers to control functionalities of the client device **200** with physical gestures as well as button-presses. The controller connects to the client device **200** using wireless technology that allows data exchange over short distances (e.g., 30 feet). The controller may additionally include a "rumble" feature (i.e., a shaking of the controller during certain points in the game) and/or an internal speaker.

The controller may additionally or alternatively be designed to capture biometric readings using sensors in the remote to record data including, for example, skin moisture, heart rhythm, and muscle movement. Further still, in various aspects, any technology suitable for measuring and/or capturing motion, facial expressions and/or any other physical or physiological state of a viewer may be used.

As noted above, the client device **200** may be an electronic gaming console. Alternatively, the client device **200** may be implemented as a general-purpose computer, a set-top box, or a hand-held gaming device. Further, similar viewer devices may contain more or less operating components.

The CPU **204**, the vector unit **206**, the graphics-processing unit **208**, and the I/O processor **210** communicate via a system bus **236**. Further, the CPU **204** communicates with the main memory **202** via a dedicated bus **238**, while the vector unit **206** and the graphics-processing unit **208** may communicate through a dedicated bus **240**. The CPU **204** executes programs stored in the OS ROM **226** and the main memory **202**. The main memory **202** may contain pre-stored programs and programs transferred through the I/O Processor **210** from a CD-ROM, DVD-ROM, or other optical disc (not shown) using the optical disc control unit **230**. The I/O processor **210** primarily controls data exchanges between the various devices of the viewer device **200** including the CPU **204**, the vector unit **206**, the graphics processing unit **208**, and the controller interface **214**.

The graphics-processing unit **208** executes graphics instructions received from the CPU **204** and the vector unit **206** to produce images for display on a display device (not shown). For example, the vector unit **206** may transform objects from three-dimensional coordinates to two-dimensional coordinates, and send the two-dimensional coordinates to the graphics-processing unit **208**. Furthermore, the sound processing unit **230** executes instructions to produce sound signals that are outputted to an audio device such as speakers (not shown).

A viewer of the client device **200** provides instructions via the controller interface **214** to the CPU **204**. For example, the viewer may instruct the CPU **204** to store certain information on the memory card **216** or instruct the viewer device **200** to perform some specified action. Example controllers associated with the controller interface **214** may include a touch-screen, keyboards, and game controllers.

Other devices may be connected to the client device **200** via the USB interface **218**, the IEEE interface **220**, and the AUX interface **222**. Specifically, a tracking device **224**, including a camera or a sensor may be connected to the client device **200** via the AUX interface **222**, while a controller may be connected via the USB interface **218**. In some aspects, a VR headset or related hardware equipment

may be communicatively coupled to computing device **200** via one or more computing interfaces. Hardware and related software for implementing an augmented reality (AR) experience may similarly be coupled to computing device **200** via one or more computing interfaces.

FIG. **3** is a block diagram of an exemplary host server **140** that may be used in context of the system of FIG. **1**. The host server **140** may include a plurality of different features that further facilitates the display of streaming media and the incorporation of fact-checked commentary and annotations in to the display of the streaming media. As illustrated in FIG. **3**, the host server **140** may include memory **300**, one or more processor **305**, the host server application program interface (API) **140**, a streaming media storage and buffer **310**, a viewer profile module **315**, a viewer reaction module **320**, a social engagement module **325**, a fact-checking module **330**, a metadata module **335**, a machine learning module **340**, and a communication interfaces **345**.

According to one aspect, the host application program interface (API) **170** allows a host to manage how data, including but not limited to the media stream, is distributed to remote viewers. Using the API **170**, an administrator (e.g., developer, gaming platform provider, streaming media aggregator) can customize and modify how the host server operates with respect to what data is retrieved from the content provider server **110**, how the media stream is presented to the client devices, and how fact-checked annotations and/or commentary are obtained and compiled during viewing of the media stream.

The media storage and buffer **310** may be used to store the streaming media temporarily until it can be processed and distributed to viewers. In another aspect, the media storage and buffer may be used to store the fact-checked comments and annotations temporarily.

The viewer profile module **315** is used to store information about each viewer. In one aspect, viewers may need to create their own profile and sign in to their respective profiles before being allowed to access/view the media content ("streamed media"). The stored viewer profiles would be used by the host server **140** to identify the types of modifications to the media stream or fact-checked comments and annotations that can be carried out to better engage the viewer in the viewing experience.

The viewer profile module **315** may also store viewer preferences about the distribution of the media viewed on their respective client devices **160**. For example, the viewer profile module **315** can customize preferred views, preferred additional information to be displayed, preferred audio, and even preferred advertisements. The viewer profile module **315** also stores privacy settings and preferences for the viewers, as well as viewer preferences for the display of the fact-checked annotations and commentary.

The viewer profile module **315** can also store information about the client devices. This information may identify, for example, the format the media stream would need to be transmitted in order to be compatible with the client device. With all the information about the viewer stored in the viewer profile, the host server **140** would be able to identify the appropriate version of the media stream to be distributed.

The viewer reaction module **320** receives and processes viewer-generated content related to a viewer's reaction to the presented streaming media. The reactions may also include physical movements or facial expressions captured by the tracking device **224**. During viewing of the media stream, the viewer reaction module **320** captures data from the viewer's respective client devices **160**. In one aspect, the viewer reaction module **320** may identify a type of reaction made by the viewer and classify the same as a piqued curiosity, disagreement, or outrage, among others. In this aspect, the viewer reaction module may identify a viewer's reaction to the streaming media, such as a raised eyebrow, a confused expression, or interacting with another mobile device, as a reaction indicating further interest in the streamed media. In response, fact-checked commentary or annotations may be displayed to the viewer along with the streaming media.

The social engagement module **325** facilitates and encourages further engagement with the media stream and social interactions among the viewers at the client devices **160**. In various aspects, the social engagement module **325** may facilitate social interactions between groups of viewers. For example, the social engagement module **325** may generate a video chat among viewers of the media stream. In another aspect, the social engagement module **325** may facilitate communication between viewers using chat, email, video chat, or any other suitable communication modalities.

In one aspect, the fact-checking annotation module **330** performs a fact checking process in response to a user input at the viewer computing device **200** or in response to a viewer reaction. In on example, the fact-checking module may convert an audio track of the streaming media into text or may process close-captioned data into keywords or search terms for verifying statements made the streaming media.

The fact-checking annotation module **330** identifies and processes statements or assertions with in the streaming media and provides fact-checking and veracity confirmation or refutation of the statements and assertions. In conjunction with the machine learning module **340**, the fact-checking module **330** may verify or refute assertions in the live streaming media by searching and retrieving crowd-sourced data, machine learning (e.g. artificial intelligence ("AI")) or referencing a third-party fact checking service or website that may be hosted at a data source server **190**. In one aspect, the fact-checking module **330** may retrieve data from multiple data sources or third-party fact checking sites and compile a consensus answer regarding a point of contention or an assertion in the streaming media.

In another aspect, the fact-checked comments and annotations are then stored in a database and presented in a fact-checking annotation overlay **402** accompanying the streaming media. The viewers may select when the fact-checking overlay **402** is displayed during the streaming of the media title. For example, the viewers may select to display the overlay throughout the entire presentation of the streaming media, or the viewer may toggle the fact-checking overlay one or off. In other aspects, the host server **140** may automatically display the fact-checked commentary and annotations in response to data about the viewer stored in the viewers profile or in response to viewer reactions during the display of the streaming media. The fact-checking module **330** may also incorporate additional evidence in the form of images, video, text, URLs, or other inputs received from the crowd-sourced research or retrieved data from various data source servers **190**, including but not limited to a third-party fact-checking site, that is in to the annotation overlay **402**.

In various aspects, these annotations **404** may be incorporated into an annotation overlay **402**, various examples of the annotation overlay **402** are shown in FIGS. **4**A and **4**B. One example of the annotation overlay **402**, as shown in FIG. **4**A, illustrates that the fact-checked annotations and/or evidence may be presented in the portion of the display **400** normally associated with the display of subtitles. Further, when the viewer desires to view the subtitles, the fact-

checked annotations and/or evidence may be displayed in another peripheral portion of the display **400**.

Another example of the annotation overlay **402** is shown in FIG. **4**B. In this example, the fact-checking annotation module **330** in combination with the machine learning module **340** may identify portions of the streaming media display **400** that are in the background and display the fact-checked annotation and evidence in these areas. Other formats and arrangements for the display of the fact-checked annotations and comments may be used.

In various other aspects, the overlay **402** may be formatted for display over the streamed media without obstructing the streamed media. In another aspect, the overlay **402** may be displayed alongside the streamed media; while in other aspects, the overlay **402** is not displayed to viewer's during the viewing yet may be presented during a pause in the streamed media or after the conclusion of the streamed media. The example annotation overlay **402** is illustrated in FIGS. **4**A and **4**B as a single frame for simplicity. The overlay **402** as stored by the host server **140** may be a composition or, even a distinct streaming media file composed of one or more annotations relevant to the streaming media that are displayed at the corresponding timestamps. In yet another aspect, the overlay **402** and annotations **404** are only displayed at the associated time point or they may be displayed in advance of the timestamp as preferred or pre-determined by the viewer. For example, each viewer may indicate in their profile how much advance warning they would prefer to receive for each annotation.

The social engagement module **325** facilitates and encourages further engagement with the media stream and social interactions among the viewers at the client devices **160**. In various aspects, the social engagement module **325** may facilitate social interactions between the groups of viewers. For example, the social engagement module **325** may generate a video chat among viewers of the media stream. In one aspect, the members of the video chat may be limited to viewers invited to the video chat. In another aspect, the social engagement module **325** may facilitate communication between viewers using chat, email, video chat, or any other suitable communication modalities.

The metadata module **335** generates metadata for the media stream, the fact-checked annotations, and the overlay **402** created during the viewing. Additionally, the generated metadata may be used to synchronize the annotations, evidence, and overlay with the media stream further. The metadata may also be used to recall previous instances of the fact-checked annotations and overlay, and portions thereof.

The machine learning module **340** may be an internal or external artificial intelligence (AI) or other machine learning system trained using any suitable machine learning model, system, or dataset to predict or identify likely viewer preferences and likely actions while viewing the media stream, among others. The machine learning module **340** may also be used to predict viewer reactions and may adjust the tracking device **224** automatically. For example, the machine learning module **340** may determine when a viewer displays interest or skepticism in a particular portion of the streaming media. Based on this determination, the machine learning module **340** may instruct a tracking device **224** of the viewer's client device **160** to zoom-out to capture a predicted whole body reaction. Alternatively, the machine learning module **335** may provide instructions to the tracking device **224** to zoom-in on a viewer's face. The machine learning module **335** may determine the best tracking device **224** settings to capture a likely reaction based upon previous viewer actions, historic viewer reactions from all viewers of the media stream or combinations thereof. As such, the machine leaning module **335** may predict when the viewer desires to view the annotation overlay **402**, if not already selected for display.

The communication interface **345** facilitates communication between the various features of the system of FIG. **1**. For example, this would facilitate transmission of information from the content provider server **110** to the host server **140** and from the host server to the client devices **160**.

FIG. **5** is a flowchart illustrating an exemplary method **500** for real-time fact checking and generating a fact-checking overlay **402** and displaying the overlay during display of a media stream or streaming media. The method **500** may be embodied as executable instructions in a non-transitory computer readable storage medium including but not limited to a CD, DVD, or non-volatile memory such as a hard drive. The instructions of the storage medium may be executed by a processor (or processors) to cause various hardware components of a computing device hosting or otherwise accessing the storage medium to perform or aid in performing the method. The steps identified in FIG. **5** (and the order thereof) are exemplary and may include various alternatives, equivalents, or derivations thereof including but not limited to the order of execution of the same.

In method **500**, information may be stored in memory regarding the media content that may be streamed to the client devices **160**. Viewer input or viewer reactions may be received to initiate a fact-checking process during the display of the streamed media content. The fact-checked annotations and evidence may be composited into an annotation overlay **402** that may be displayed with the streaming media. Additionally, one or more timestamps may be associated with the fact-checked annotations and the streaming media, such that the annotation content and streaming media may be synchronized for later streaming and display. In this aspect, the streaming media and annotation overlay **402** may be viewed again by the viewers.

In step **510**, information may be stored in memory regarding a content provider and a media stream. A host may establish a channel or interface for distributing the media stream from the content provider. The host may require authentication information from viewers (e.g., viewer name, password) that allows an account to be established in association with the content distribution interface. In addition, various other devices in the network may subscribe to receive content distributed through the interface. Information regarding the host, the content provider, data regarding the streamed media, and the viewers of the streaming media may be maintained in memory. Where certain content providers require a specific subscription (e.g., "premium" cable content), the subscriber device may be required to have a subscription associated with the content provider in order to access content through the channel.

In step **520**, the media content (e.g., a specified episode of a television program) may be streamed to the client devices **160**. As discussed herein, the media content may include any type of pre-recorded or live media content available to be streamed over a communication network. Such media content may originate from a content provider server **110**, formatted by content provider server API **130** and they are then provided to the client devices through an interface generate by the host server API **170**. In another aspect, the streaming media may be provided to the client device directly from the content provider server or another source, while the host server API **170** communicates with the content provider server or other source at the backend to

gather data regarding the streaming media and synchronize pre-existing fact-checking content.

In step **530**, one or more portions of the streaming media are processed at the fact-checking module **330** to identify one or more assertion or statement presented in the streaming media. In one aspect, the assertion or statement may include an oral statement or data visually presented as text. Using any suitable means of voice-to-text recognition or text recognition such as but not limited to optical character recognition ("OCR")

At step **540**, the fact-checking module **330** polls one or more data sources to confirm or refute the portion of the streaming media processed by the fact-checking module. In various aspects, the fact-checking module **330** may further quantify a level of confidence, and veracity for the assertion at issue. As such, the fact-checked annotation may be stored with a confidence score and or a veracity score and metadata related to the confidence of the fact-checked annotation and the truthfulness or lack thereof for the assertion or statement. In one aspect, the confidence score is based upon confidence in the data source that was surveyed. For example, a greater confidence score may be given to a university or government entity, while a lower confidence score may be assigned to a social media posting. Similarly, a greater veracity score may be assigned to an assertion that is fully verified; while a lower score may be assigned to an assertion that is an outright fabrication.

In one aspect, the fact-checking module **330** is continuously processing the streaming media and polling or surveying the one or more data sources in real time. As such, according to one aspect, the host server **140** may provide continuous real-time fact checking. In another aspect, while the fact-checking module **330** processes portions of the streaming media and polls external or internal data sources, the display if the fact-checked overlay **402** may be toggled on or off in response to input at the viewer's client device **160** or in response to one or more viewer reaction.

In step **550**, the fact-checked overlays with annotations generated and displayed to the viewers in real time and/or are incorporated into an annotation overlay **402** for display to the viewers. In one aspect, the fact-checking annotations **404** or overlay **402** may be displayed automatically throughout the display of the streaming media. In another aspect, while the fact-checking module **330** processes portions of the streaming media and polls external or internal data sources, the display if the fact-checked overlay **402** may be toggled on or off in response to input at the viewer's client device **160** or in response to one or more viewer reaction.

Lastly, in step **560**, the compiled fact-checked annotations and/or the overlay **402** may be stored and associated with the streaming media for future displays. In additional displays of the streaming media, one or more additional fact-checking annotations may be incorporated into an existing overlay **402**, such that additional information may be provided or previous annotations may be corrected.

The foregoing detailed description of the technology herein has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the technology to the precise form disclosed. Many modifications and variations are possible in light of the above teaching. The described aspects were chosen in order to best explain the principles of the technology and its practical application to thereby enable others skilled in the art to best utilize the technology in various aspects and with various modifications as are suited to the particular use contemplated. It is intended that the scope of the technology be defined by the claim.

What is claimed is:

1. A method for providing real-time annotation in a streaming media system, the method comprising:

at a processor of the streaming media system, monitoring streaming media being streamed over a communication network to a viewer device of a viewer;

instructing a tracking device associated with the viewer device to capture at least one viewer reaction, the viewer reaction being of a type predicted to occur in response to a portion of the streaming media;

classifying, at the processor, a type of the viewer reaction by applying machine learning to data regarding the viewer;

generating an annotation regarding the portion of the streaming media based on the classified type of the viewer reaction; and

updating a display of the viewer device to include the generated annotation, wherein the generated annotation is synchronized to the portion of the streaming media.

2. The method of claim **1**, wherein the tracking device is instructed to adjust a field of view for the tracking device.

3. The method of claim **2**, wherein the field of view is increased in response to a classification of the viewer reaction.

4. The method of claim **2**, wherein the field of view is decreased in response to a classification of the viewer reaction.

5. The method of claim **1**, further comprising:

instructing the tracking device to capture another viewer reaction, the other viewer reaction being predicted to occur based upon the classified type of the viewer reaction.

6. The method of claim **5**, wherein the prediction of the other viewer reaction is also based upon stored data regarding historic viewer reactions.

7. The method of claim **5**, wherein the prediction of the other viewer reaction is also based upon data regarding reactions of other viewers.

8. A system for providing real-time annotation in a streaming media system, the system comprising:

a database in memory that stores data regarding the streaming media, and

a host server that:

provides the streaming media to a viewer device of the viewer;

monitors the streaming media being streamed over a communication network to the viewer device;

instructs a tracking device associated with the viewer device to capture at least one viewer reaction, the viewer reaction being of a type predicted to occur in response to a portion of the streaming media;

classifies a type of the viewer reaction by applying machine learning to data regarding the viewer;

generates an annotation regarding the portion of the streaming media based on the classified type of the viewer reaction; and

updates a display of the viewer device to include the generated annotation, wherein the generated annotation is synchronized to the portion of the streaming media.

9. The system of claim **8**, wherein the host server instructs the tracking device to adjust a field of view for the tracking device.

10. The system of claim **9**, wherein the field of view is increased in response to a classification of the viewer reaction.

11. The system of claim 9, wherein the field of view is decreased in response to a classification of the viewer reaction.

12. The system of claim 8, further comprising:

instructing the tracking device to capture another viewer reaction, the other viewer reaction being predicted to occur based upon the classified type of the viewer reaction.

13. The system of claim 12, wherein the prediction of the other viewer reaction is also based upon stored data regarding historic viewer reactions.

14. The system of claim 12, wherein the prediction of the other viewer reaction is also based upon data regarding reactions of other viewers.

15. A non-transitory computer-readable storage medium having embodied thereon a program, the program being executable by a processor to perform a method for providing real-time annotation in a streaming media system; the method comprising:

storing data regarding the streaming media;

providing the streaming media to the viewer;

monitoring streaming media being streamed over a communication network to a viewer device of a viewer;

instructing a tracking device associated with the viewer device to capture at least one viewer reaction, the viewer reaction being of a type predicted to occur in response to a portion of the streaming media;

classifying a type of the viewer reaction by applying machine learning to data regarding the viewer;

generating an annotation regarding the portion of the streaming media based on the classified type of the viewer reaction; and

updating a display of the viewer device to include the generated annotation, wherein the generated annotation is synchronized to the portion of the streaming media.

16. The non-transitory computer-readable storage medium of claim 15, wherein the tracking device is instructed to adjust a field of view for the tracking device.

17. The non-transitory computer-readable storage medium of claim 16, wherein the field of view is increased in response to a classification of the viewer reaction.

18. The non-transitory computer-readable storage medium of claim 16, wherein the field of view is decreased in response to a classification of the viewer reaction.

19. The non-transitory computer-readable storage medium of claim 15, further comprising:

instructing the tracking device to capture another viewer reaction, the other viewer reaction being predicted to occur based upon the classified type of the viewer reaction.

20. The non-transitory computer-readable storage medium of claim 19, wherein the prediction of the other viewer reaction is also based upon stored data regarding historic viewer reactions.

21. The non-transitory computer-readable storage medium of claim 19, wherein the prediction of the other viewer reaction is also based upon data regarding reactions of other viewers.

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