



(51) International Patent Classification: Not classified

(21) International Application Number:
PCT/US2009/054066(22) International Filing Date:
17 August 2009 (17.08.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/089,732 18 August 2008 (18.08.2008) US
61/231,546 5 August 2009 (05.08.2009) US(71) Applicant (for all designated States except US): **IPHAR-RO MEDIA GMBH** [DE/DE]; Rundeturmstrasse 10, 64283 Darmstadt (DE).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **COHEN, Joshua, S.** [US/DE]; Gutzkowstrasse 43, 60594 Frankfurt (DE). **CAVET, Rene** [DE/DE]; Heinheimerstrasse 29, 64289 Darmstadt (DE). **FABIAN, Peter** [CZ/DE]; Heidelberger Str. 2, 64673 Zwingenberg (DE).(74) Agents: **TREMENTOZZI, Ralph** et al.; Foley & Lardner LLP, 111 Huntington Avenue, Boston, MA 02199 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report (Rule 48.2(g))

(54) Title: SUPPLEMENTAL INFORMATION DELIVERY

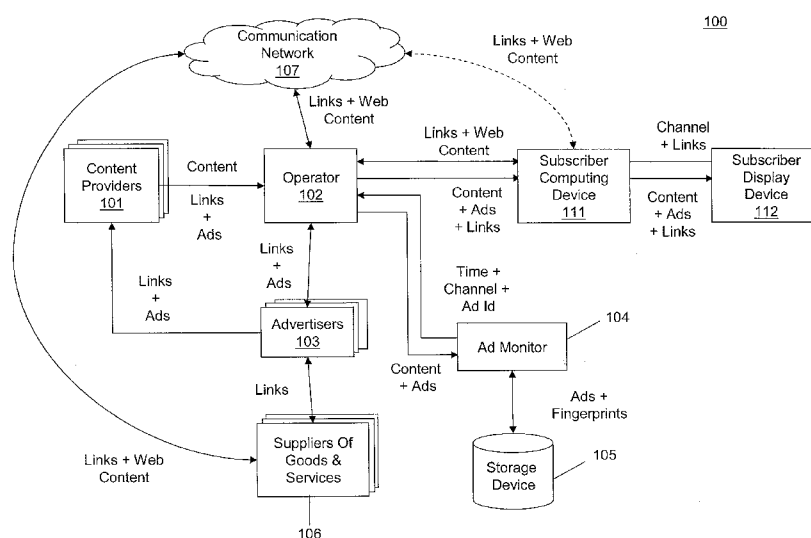


FIG. 1

(57) Abstract: In some examples, the technology identifies media and provides a user with supplemental information (e.g., supplemental media, a selectable link, etc.) based on the identity of the media. In other examples, the technology identifies media and provides a consumer with an option to click on a link associated with the media with a remote control to direct the video stream directly to a website sponsored by the commercial entity associated with the media. In other examples, the technology identifies media displayed on a subscriber's first computing device and displays the same media and/or a related media on the subscriber's second computing device.

SUPPLEMENTAL INFORMATION DELIVERY

RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 61/089,732, filed on August 18, 2008, entitled “System and Method of Implementing an Advertising Campaign using Internet-Enabled Subscriber Devices,” and U.S. Provisional Application No. 61/231,546, filed on August 5, 2009, entitled “Supplemental Media Delivery.” The entire teachings of the above applications are incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to supplemental information (e.g., media, link) delivery, utilizing, for example, media analysis and retrieval. In particular, in some examples, the present invention relates to linking media content to websites and/or other media content based on a media feature detection, identification, and classification system. In particular, in other examples, the present invention relates to delivering media content to a second subscriber computing device based on a media feature detection, identification, and classification system.

BACKGROUND

[0003] The availability of broadband communication channels to user devices combined with a proliferation of user media access devices has enabled ubiquitous media coverage with image, audio, and video content. The increasing amount of media content that is transmitted globally has boosted the need for intelligent content analysis. Providers must organize their content and be able to analyze their content. Similarly, broadcasters and market researchers want to know when and where specific footage has been broadcast. Content monitoring, market trend analysis, copyright protection, and asset management is challenging, if not

impossible, due to the increasing amount of media content. However, a need exists to selectively supplement information delivery, for example, to improve advertising campaigns in this technology field.

SUMMARY OF THE INVENTION

[0004] One approach to supplemental information delivery to a user accessing media data is a computer implemented method. The method includes generating a first descriptor based on first media data, the first media data associated with a first subscriber computing device and identifiable by the first descriptor; comparing the first descriptor and a second descriptor; determining supplemental information based on the comparison of the first descriptor and the second descriptor; and transmitting the supplemental information.

[0005] Another approach to supplemental information delivery to a user accessing media data is a computer implemented method. The method includes receiving a first descriptor from a first subscriber computing device, the first descriptor generated based on first media data and the first media data identifiable by the first descriptor; comparing the first descriptor and a second descriptor; determining supplemental information based on the comparison of the first descriptor and the second descriptor; and transmitting the supplemental information.

[0006] Another approach to supplemental information delivery to a user accessing media data is a system. The system includes a media fingerprint module to generate a first descriptor based on first media data, the first media data associated with a first subscriber computing device and identifiable by the first descriptor; a media comparison module to compare the first descriptor and a second descriptor and determine supplemental information based on the comparison of the first descriptor and the second descriptor; and a communication module to transmit the supplemental information.

[0007] Another approach to supplemental information delivery to a user accessing media data is a system. The system includes a communication module to receive a first descriptor from a first subscriber computing device, the first descriptor

generated based on first media data and the first media data identifiable by the first descriptor and transmit supplemental information; and a media comparison module to compare the first descriptor and a second descriptor and determine the supplemental information based on the comparison of the first descriptor and the second descriptor.

[0008] Another approach to supplemental information delivery to a user accessing media data is a system. The system includes means for generating a first descriptor based on first media data, the first media data associated with a first subscriber computing device and identifiable by the first descriptor; means for comparing the first descriptor and a second descriptor; means for determining supplemental information based on the comparison of the first descriptor and the second descriptor; and means for transmitting the supplemental information.

[0009] Another approach to supplemental information delivery to a user accessing media data is a system. The system includes means for receiving a first descriptor from a first subscriber computing device, the first descriptor generated based on first media data and the first media data identifiable by the first descriptor; means for comparing the first descriptor and a second descriptor; means for determining supplemental information based on the comparison of the first descriptor and the second descriptor; and means for transmitting the supplemental information.

[0010] In other examples, any of the approaches above can include one or more of the following features.

[0011] In some examples, the supplemental information includes second media data and the method further includes transmitting the second media data to a second subscriber computing device.

[0012] In other examples, the first media data includes a video and the second media data includes an advertisement associated with the video.

[0013] In some examples, the first media data includes a first video and the second media data includes a second video, the first video associated with the second video.

[0014] In other examples, the method further includes determining the second media data based on an identity of the first media data and/or an association between the first media data and the second media data.

[0015] In some examples, the method further includes determining the association between the first media data and the second media data from a plurality of associations of media data stored in a storage device.

[0016] In other examples, the method further includes determining a selectable link from a plurality of selectable links based on the second media data; and transmitting the selectable link to the second subscriber computing device.

[0017] In some examples, the first subscriber computing device and the second subscriber computing device are associated with a first subscriber and/or in a same geographic location.

[0018] In other examples, the second media data includes all or part of the first media data and/or the second media data associated with the first media data.

[0019] In some examples, the comparison of the first descriptor and the second descriptor indicative of an association between the first media data and the second media data.

[0020] In other examples, the supplemental information includes a selectable link and the method further includes transmitting the selectable link to the first subscriber computing device.

[0021] In some examples, the selectable link includes a link to reference information.

[0022] In other examples, the method further includes receiving a selection request, the selection request includes the link to the reference information.

[0023] In some examples, the method further includes displaying a website based on the selection request.

[0024] In other examples, the method further includes determining the selectable link based on an identity of the first media data and/or an association between the first media data and the selectable link.

[0025] In some examples, the method further includes determining the association between the first media data and the selectable link from a plurality of associations of selectable links stored in a storage device.

[0026] In other examples, the method further includes determining a selectable link from a plurality of selectable links based on the first media data; and transmitting the selectable link to the first subscriber computing device.

[0027] In some examples, the method further includes transmitting a notification to an advertiser server associated with the selectable link.

[0028] In other examples, the method further includes receiving a purchase request from the first subscriber computing device; and transmitting a purchase notification to an advertiser server based on the purchase request.

[0029] In some examples, the method further includes determining an identity of the first media data based on the first descriptor and a plurality of identities stored in a storage device.

[0030] In other examples, the second descriptor is similar to part or all of the first descriptor.

[0031] In some examples, the first media data includes video, audio, text, an image, or any combination thereof.

[0032] In other examples, the method further includes transmitting a request for the first media data to a content provider server, the request includes information associated with the first subscriber computing device; and receiving the first media data from the content provider server.

[0033] In some examples, the method further includes identifying a first network transmission path associated with the first subscriber computing device; and intercepting the first media data during transmission to the first subscriber computing device via the first network transmission path.

[0034] In other examples, the supplemental information includes second media data and the method further includes transmitting the second media data to a second subscriber computing device.

[0035] In some examples, the supplemental information includes a selectable link and the method further includes transmitting the selectable link to the first subscriber computing device.

[0036] In other examples, a computer program product, tangibly embodied in an information carrier, the computer program product including instructions being operable to cause a data processing apparatus to execute any of the method of any one of the approaches and/or examples described herein.

[0037] The supplemental information delivery techniques described herein can provide one or more of the following advantages. An advantage to the utilization of descriptors in the delivery of supplemental information is that the identification of media is based on unique visual characteristics that are extracted and summarized from the media, thereby increasing the efficiency and the accuracy of the identification of the media. Another advantage to the utilization of descriptors in the delivery of supplemental information is that the identification of media is robust and can operate on any type of content (e.g., high definition video, standard definition video, low resolution video, etc.) without regard to the characteristics of the media, such as format, type, owner, etc., thereby increasing the efficiency and the accuracy of the identification of the media. An additional advantage to the supplemental information delivery is that supplemental information can be simultaneously (or nearly simultaneously) delivered to the subscriber computing device after identification of the media, thereby increasing penetration of advertising and better targeting subscribers for the supplemental information (e.g., targeted advertisements, targeted coupons, etc.).

[0038] Other aspects and advantages of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, illustrating the principles of the invention by way of example only.

BRIEF DESCRIPTION OF THE DRAWINGS

[0039] The foregoing and other objects, features, and advantages of the present invention, as well as the invention itself, will be more fully understood from the

following description of various embodiments, when read together with the accompanying drawings.

[0040] FIG. 1 is a block diagram of an exemplary supplemental link system;

[0041] FIG. 2 is a block diagram of an exemplary supplemental media system;

[0042] FIG. 3 is a block diagram of an exemplary supplemental information system;

[0043] FIGS. 4A-4C illustrate exemplary subscriber computing devices;

[0044] FIG. 5 shows a display of exemplary records of detected ads;

[0045] FIGS. 6A-6D illustrate exemplary subscriber computing devices;

[0046] FIG. 7 is a block diagram of an exemplary content analysis server;

[0047] FIG. 8 is a block diagram of an exemplary subscriber computing device;

[0048] FIG. 9 illustrates an exemplary flow diagram of a generation of a digital video fingerprint;

[0049] FIG. 10 shows an exemplary flow diagram for supplemental link delivery;

[0050] FIG. 11 shows another exemplary flow diagram for supplemental link delivery;

[0051] FIG. 12 shows another exemplary flow diagram for supplemental media delivery;

[0052] FIG. 13 shows another exemplary flow diagram for supplemental media delivery;

[0053] FIG. 14 shows another exemplary flow diagram for supplemental information delivery;

[0054] FIG. 15 is another exemplary system block diagram for supplemental information delivery;

[0055] FIG. 16 illustrates a block diagram of an exemplary multi-channel video monitoring system;

[0056] FIG. 17 illustrates a screen shot of an exemplary graphical user interface (GUI);

[0057] FIG. 18 illustrates an example of a change in a digital image representation subframe;

[0058] FIG. 19 illustrates an exemplary flow chart for the digital video image detection system;

[0059] FIG. 20A illustrates an exemplary traversed set of K-NN nested, disjoint feature subspaces in feature space; and

[0060] FIG. 20B illustrates the exemplary traversed set of K-NN nested, disjoint feature subspaces with a change in a queried image subframe.

DETAILED DESCRIPTION

[0061] It should be appreciated that the particular implementations shown and described herein are examples of the technology and are not intended to otherwise limit the scope of the technology in any way. Further, the techniques are suitable for applications in teleconferencing, robotics vision, unmanned vehicles, and/or any other similar applications.

[0062] As a general overview of the technology, in some examples, when a user is accessing media on a computing device (e.g., television show on a television, movie on a mobile phone, etc.), the technology enables delivery of supplemental information (e.g., a link to a website, a link to other media, a link to a document, etc.) to the computing devices to enhance the user's experience. In other words, if the user is viewing an advertisement about cooking on the user's television, the technology can deliver a link to more information about a local grocery store to the user's television (e.g., a pop-up on the user's display device, direct a web browser to the local grocery store's website, etc.) that may also appeal to the user's taste.

[0063] The technology can identify the media that the user is accessing by generating a descriptor, such as a signature or fingerprint, of the media and comparing the fingerprint with one or more stored fingerprints (for example, identify

that the user is viewing a television show, identify that that user is viewing an advertisement, identify that the user is surfing a vehicle dealership's website, etc.). Based on the identification of the media that the user is viewing and/or accessing on one of the computing devices, the technology can determine a related link (e.g., based on a pre-defined association of the media, based on one or more of dynamically generated associations, based on a content type, based on localization parameters, etc.) and transmit the related link to the computing device for access by the user.

[0064] For example, if the user is watching a cooking show on the user's computer, the technology transmits a local grocery store link (e.g., uniform resource locator (URL)) to the user's computer for viewing by the user. As another example, if the user is viewing a national advertisement for a grocery store on the user's television, the technology transmits a link to a local grocery store's website to the user's television or set-top box for access by the user. As a further example, if the user is watching a grocery store advertisement on the user's mobile phone, the technology transmits the a link to the grocery store's sales ad to the user's mobile phone for access by the user. The technology can determine the identity of the original media by generating a fingerprint of the media, for example at the user's computing device and/or at a centralized location thereby identifying the media without requiring a separate data stream that includes the identification.

[0065] As a further general overview of the technology, in other examples, when a user is using two or more computing devices (e.g., two or more media access devices, a computer and a television, a mobile phone and a television, etc.), one of the computing devices to access media (e.g., website on the computer and television show on the television, movie on the mobile phone and television show on the television), the technology enables delivery of supplemental information (e.g., related media, a video, a movie trailer, a commercial, etc.) to a different one of the user's computing devices to enhance the user's experience. In other words, if the user is viewing an advertisement about cooking on the user's television, the technology can deliver an advertisement about a local grocery store to the user's

computer (e.g., a pop-up on the user's display device, direct a web browser to the local grocery store's website, etc.) that may also appeal to the user's taste.

[0066] The technology can identify the media that the user is accessing by generating an descriptor, such as a signature or fingerprint, of the media and comparing the fingerprint with one or more stored fingerprints (for example, identify that the user is viewing a television show, identify that that user is viewing an advertisement, identify that the user is surfing a vehicle dealership's website, etc.). Based on the identification of the media that the user is viewing and/or accessing on one of the computing devices, the technology can determine related media (e.g., based on a pre-defined association of the media, based on a dynamically generated association, based on a content type, based on localization parameters, etc.) and transmit the related media to the other computing device for viewing by the user. Identification can be based on an exact match or on a match to within a tolerance (i.e., a close match).

[0067] For example, if the user is watching a cooking show on the user's television, the technology transmits a local grocery store advertisement to the user's computer for viewing by the user. As another example, if the user is viewing a national advertisement for a grocery store on the user's television, the technology transmits a local advertisement for the grocery store to the user's mobile phone for viewing by the user. As a further example, if the user is watching a grocery store advertisement on the user's mobile phone, the technology transmits the same grocery store advertisement to the user's computer for viewing by the user. The technology can determine the identity of the original media by generating a fingerprint at the user's computing device and/or at a centralized location thereby identifying the media without requiring a separate data stream that includes the identification.

[0068] FIG. 1 shows a system block diagram of an exemplary system 100 for supplemental link delivery. The system 100 includes one or more content providers 101, an operator 102, one or more advertisers 103, an ad monitor 104, a storage device 105, one or more suppliers of goods & services 106, a communication

network 107, a subscriber computing device 111, and a subscriber display device 112.

[0069] The supplier of one or more of goods and services 106 can retain the advertiser 103 to develop an ad campaign to promote such goods and or services to consumers to promote sales leading to larger profits. The advertisers 103 have often relied upon mass media to convey their persuasive messages to large audiences. In particular, advertisers 103 often rely on broadcast media, by placing advertisements, such as commercial messages, within broadcast programming.

[0070] The operator 102 (e.g., cable network operator, satellite television operator, internet protocol television (IPTV) operator, multimedia streaming operator, etc.) receives broadcast content from the one or more content providers 101. The operator 102 makes the content available to an audience in the form of medial broadcast programming, such as television programming. The operator 102 can be a local, regional, or national television network, or a carrier, such as a satellite dish network, cable service provider, a telephone network provider, or a fiber optic network provider. For situations in which members of the audience purchase such broadcast services, such as cable and satellite dish networks, members of the audience can be referred to as users, subscribers, or customer. The users of the technology described herein can be referred to as users, subscribers, customers, and any other type of designation indicating the usage of the technology described herein. The advertisers 103 provide advertising messages to the one or more content providers 101 and/or to the operator 102. The one or more content providers 101 and/or the operator 102 intersperse such advertising messages with content to form a combined signal including content and advertising messages. Such signals can be provided in the form of channels, allowing a single operator to provide to subscribers more than one channel of such content and advertising messages.

[0071] For network-enabled subscriber terminals, the operator 102 can provide one or more links to additional information available to the subscriber over the communication network 107, such as the Internet. These links can direct subscribers to networked information related to a supplier of goods and/or services 106, such as the supplier's web page. Alternatively or in addition, such links can direct

subscribers to networked information related to a different supplier, such as a competitor. Alternatively or in addition, such links can direct subscribers to networked information related to other information, such as information related to the content, surveys, and more generally, any information that one can choose to make available to subscribers. Such links can be displayed to subscribers in the form of click-through icons. For Worldwide Web applications, the links can include a Uniform Resource Locator (URL) of a hypertext markup language (HTML) Web page, to which a supplier of goods or services chooses to direct subscribers.

[0072] Subscribers generally have some form of a display device 112 or terminal through which they view broadcast media. The display device 112 can be in the form of a television receiver, a simple display device, a mobile display device, a mobile video player, or a computer terminal. In at least some embodiments, the subscriber display device 112 receives such broadcast media through a subscriber computing device 111 (e.g., a set top box, a personal computer, a mobile phone, etc.). The subscriber computing device 111 can include a receiver configured to receive broadcast media through a service provider. For example, the set top box can include a cable box and/or a satellite receiver box. The subscriber computing device 111 can generally be within control of the subscriber and usable to receive the broadcast media, to select from among multiple channels of broadcast media, when available, and/or to provide any sort of unscrambling that can be required to allow a subscriber to view one or more channels.

[0073] In some embodiments, the subscriber computing device 111 and the subscriber display device 112 are configured to provide displayable links to the subscriber. The subscriber, in turn, can select one or more links displayed at the display device to view or otherwise access the linked information. To select the links, one or more of the set top box and the subscriber display device provide the user with a cursor, pointer, or other suitable means to allow for selection and click-through.

[0074] In the exemplary embodiment, the operator 102 receives content from one or more content providers 101. The advertisers 103 can receive one or more links from one or more of the suppliers of goods and services 106. The operator 102 can

also receive the one or more links from the advertisers 103. The advertisers 103 can also provide advertisements to the one or more content providers 101 or to the operator 102, or to both, one or more commercial messages to be included within the broadcast media. The one or more content providers 101 or the operator 102, or both, can combine the content (broadcast programming) with the one or more advertisements into a media broadcast. The operator 102 can also provide the one or more links to the set top box/subscriber computing device 111 in a suitable manner to allow the set top box/subscriber computing device 111 to display to subscribers the one or links associated with a respective advertisement within a media broadcast channel being viewed by the subscriber. Such combination can be in the form of a composite broadcast signal, in which the links are embedded together with the content and advertisements, a sideband signal associated with the broadcast signal, or any other suitable approach for providing subscribers with an Internet television (TV) service.

[0075] The advertisement monitor 104 can receive the same media broadcast of content and advertisements embedded therein. From the received broadcast media, the ad monitor 104 identifies one or more target ads. Exemplary systems and methods for accomplishing such detection are described further below. In some embodiments, the ad monitor 104 receives a sample of a target ad beforehand, and stores the ad itself, or some processed representation of the ad in an accessible manner. For example, the ad and/or processed representation of the ad can be stored in the storage device 105 accessible by the ad monitor 104. Thus, the ad monitor 104 receives the media broadcast of content and ads, identifying any target ads by comparison with a previously stored ad and/or a processed version of the target ad. The ad monitor 104 generates an indication to the operator that the target ad was included in the media broadcast. In some embodiments, the ad monitor 104 generates a record of such an occurrence of the target ad that can include the associated channel, the associated time, and an indication of the target ad.

[0076] Preferably, such an indication is provided to the operator 102 in real time, or at least near real time. The latency between detection of the target ad and provision of the indication of the ad is preferably less than the time of the target

advertisement. Thus, for a typical 30 or 60 second advertisement, the latency is less than about 5 seconds.

[0077] The operator 102, in turn, can include within the media broadcast, or otherwise provides to subscribers therewith, one or more preferred links associated with the target ad. The operator 102 can implement business rules that include one or more links that have been pre-associated with the target advertisement.

[0078] In some embodiments, the operator 102 maintains a record of an association of preferred link(s) to each target advertisement. The advertiser 103, a competitor, the operator 102, or virtually anyone else interested in providing links related to the target advertisement can provide these links. Such an association can be updated or otherwise modified by the operator 102. Any contribution to latency between media broadcast of the target advertisement and display of the associated links is preferably much less than the duration of the target advertisement. Preferably, any additional latency is small enough to preserve the overall latency to not more than about 5 or 10 seconds.

[0079] Table 1 illustrates exemplary associations between the first media identification information and the second media.

Table 1. Exemplary Associations between Media and Link

Media Identification	Subscriber Location	Associated Link
Big Truck National Ad	Boston	Local Boston Big Truck Dealer Website
Big Truck National Ad	New York	Local New York Big Truck Website
Big Truck National Ad	Florida	Local Florida Big Truck Website
Big Truck National Ad	NA	Big Truck Website
Quick Cooking Show	Atlanta	Coupon for Local Atlanta Grocery Store
Little Truck National Ad	NA	Little Truck National Brochure
Best Science Fiction Movie	United States	Commercial for Science Fiction Convention

[0080] In some examples, the ad monitor 104 is capable of identifying any one of multiple advertisements within a prescribed latency period. Each of the multiple target ads can be associated with a different respective supplier of goods and/or services 106. Alternatively or in addition, each of the multiple target ads can be associated with a different advertiser. Alternatively or in addition, each of the multiple target ads can be associated with a different operator. Thus, the ad monitor 104 can monitor more than one media broadcast channels, from one or more operators, searching for and identifying for each, occurrences of one or more advertisements 103 associated with one or more suppliers of goods and/or services 106.

[0081] In some embodiments, the ad monitor 104 maintains a record of the channels, display times of occurrences of a target advertisement. When tracking more than one target advertisement, the ad monitor 104 can maintain such a record in a tabular form.

[0082] In other examples, the subscriber computing device 111 and/or the operator 102 transmit a notification to the advertiser 103 associated with the selectable link. For example, if the subscriber selects a link associated with the Big Truck Website, the subscriber computing device 111 transmits a notification to the advertiser 103 associated with the Big Truck Company notifying the advertiser 103 that the subscriber selected the link.

[0083] In some examples, the operator 102 receives a purchase request from the subscriber computing device 111 (e.g., product information and shipping address for a product, etc.). The operator 102 transmits a purchase notification to the advertiser 103 associated with the product/service based on the purchase request.

[0084] FIG. 2 is a block diagram of an exemplary system 200, such as an advertising campaign system or a supplemental media system. Although the systems described herein are referred to as advertising campaign systems or supplemental media systems, the systems utilized by the technology can manage and/or delivery any type of media, such as advertisements, movies, television shows, trailers, etc.

[0085] The system 200 includes one or more content providers 201 (e.g., a media storage server, a broadcast network server, a satellite provider, etc.), an operator 202 (e.g., a telephone network operator, an IPTV operator, a fiber optic network operator, a cable television network operator, etc.), one or more advertisers 203, an ad monitor 204 (e.g., a content analysis server, a content analysis service, etc.), a storage device 205, subscriber computing devices A 211 and B 213 (e.g., a set top box, a personal computer, a mobile phone, a laptop, a television with integrated computing functionality, etc.), and subscriber display devices A 212 and B 215 (e.g., a television, a computer monitor, a video screen, etc.). The subscriber computing devices A 211 and B 213 and the subscriber display devices A 212 and B 215 can be located, as illustrated, in a subscriber's location 210. The content providers 201, the operator 202, the advertisers 203, and the ad monitor 204 can, for example, implement any of the functionality and/or techniques as described herein.

[0086] The advertisers 203 transmit one or more original ads to the content providers 201 (e.g., a car advertisement for display during a car race, a health food advertisement for display during a cooking show, etc.). The content providers 201 transmit content (e.g., television show, movie, etc.) and/or the original ads (e.g., picture, video, etc.) to the operator 202.

[0087] The operator 202 transmits the content and the original ads to the ad monitor 204. The ad monitor 204 generates a descriptor for each original ad and compares the descriptor with one or more descriptors stored in the storage device 205 to identify ad information (in this example, time, channel, and ad id). The ad monitor 204 transmits the ad information to the operator 202. The operator 202 requests the same ads and/or relevant ads from the advertisers 203 based on the ad information. The advertisers 203 determines one or more new ads based on the ad information (e.g., associates ads together based on subject, associates ads together based on information associated with the supplier of goods and services, etc.) and transmits the one or more new ads to the operator 202.

[0088] The operator 202 transmits the content and the original ads to the subscriber computing device A 211 for display on the subscriber display device A 212. The operator 202 transmits the new ads to the subscriber computing device B 213 for display on the subscriber display device B 214.

[0089] In some examples, the subscriber computing device A 211 generates a descriptor for an original ad and transmits the descriptor to the ad monitor 204. In other examples, the subscriber computing device A 211 requests the determination of the one or more new ads and transmits the new ads to the subscriber computing device B 213 for display on the subscriber display device B 214.

[0090] FIG. 3 is a block diagram of another exemplary campaign advertising system 300. The system 300 includes one or more content providers A 320a, B 320b through Z 320z (hereinafter referred to as content providers 320), a content analyzer, such as a content analysis server 310, a communications network 325, a media database 315, one or more subscriber computing devices A 330a, B 330b through Z 330z (hereinafter referred to as subscriber computing device 330), and an advertisement server 350. The devices, databases, and/or servers communicate with each other via the communication network 325 and/or via connections between the devices, databases, and/or servers (e.g., direct connection, indirect connection, etc.).

[0091] The content analysis server 310 can identify one or more frame sequences for the media stream. The content analysis server 310 can generate a descriptor for each of the one or more frame sequences in the media stream and/or can generate a descriptor for the media stream. The content analysis server 310 compares the descriptors of one or more frame sequences of the media stream with one or more stored descriptors associated with other media. The content analysis server 310 determines media information associated with the frame sequences and/or the media stream.

[0092] In some examples, the content analysis server 310 can generate a descriptor based on the media data (e.g., unique fingerprint of media data, unique fingerprint of part of media data, etc.). The content analysis server 310 can store the media data, and/or the descriptor via a storage device (not shown) and/or the media database 315.

[0093] In other examples, the content analysis server 310 generates a descriptor for each frame in each multimedia stream. The content analysis server 310 can generate the descriptor for each frame sequence (e.g., group of frames, direct sequence of frames, indirect sequence of frames, etc.) for each multimedia stream based on the descriptor from each frame in the frame sequence and/or any other information associated with the frame sequence (e.g., video content, audio content, metadata, etc.).

[0094] In some examples, the content analysis server 310 generates the frame sequences for each multimedia stream based on information about each frame (e.g., video content, audio content, metadata, fingerprint, etc.).

[0095] Although FIG. 3 illustrates the subscriber computing device 330 and the content analysis server 310 as separate, part or all of the functionality and/or components of the subscriber computing device 330 and/or the content analysis server 310 can be integrated into a single device/server (e.g., communicate via intra-process controls, different software modules on the same device/server, different hardware components on the same device/server, etc.) and/or distributed among a plurality of devices/servers (e.g., a plurality of backend processing servers, a plurality of storage devices, etc.). For example, the subscriber computing device 330 can generate descriptors. As another example, the content analysis server 310 includes an user interface (e.g., web-based interface, stand-alone application, etc.) which enables a user to communicate media to the content analysis server 310 for management of the advertisements.

[0096] FIGS. 4A-4C illustrate exemplary subscriber computing devices 410a-410c in exemplary supplemental information systems 400a-400c. FIG. 4A illustrates an exemplary television 410a in an exemplary supplemental link system 400a. The television (TV) 410a includes a subscriber display 412a. The display 412a can be configured to display video content of the media broadcast together with indicia of the one or more associated links 414a (in this example, a link to purchase the advertised product). For displayed advertisements, the one or more links 414a are preferably those links that have been previously associated with the displayed advertisement. The display 412a can also include a cursor 416a or other suitable

pointing device. The cursor/pointer 416a can be controllable from a subscriber remote controller 418a, such that the subscriber can select (e.g., click on) a displayed indicia of a preferred one of the one or more links. In some embodiments, the links 414a can be displayed separately, such as on a separate computer monitor, while the media broadcast is displayed on the subscriber display device 410a as shown.

[0097] FIG. 4B illustrates an exemplary computer 410b in an exemplary supplemental link system 400b. The computer 410b includes a subscriber display 412b. As illustrated, the display 413b displays video and text to the user. The text includes a link 414b (in this example, a link to a local dealership's website).

[0098] FIG. 4C illustrates an exemplary mobile phone 410c in an exemplary supplemental link system 400c. The mobile phone 410c includes a subscriber display 412c. As illustrated, the display 413c displays video and text to the user. The text includes a link 414c (in this example, a link to a national dealership's website).

[0099] FIG. 5 shows a display 500 of exemplary records of detected ads 510 as can be identified and generated by the ad monitor 104 (FIG. 1). The display 500 can be observed at an ad tracking administration console. The exemplary console display can include a list of target ads and a confidence value 530 associated with detection of the respective target ad. Separate confidence values can be included for each of video and audio. Additional details 520 can be included, such as, date and time of detection of the target ad, as well as the particular channel, and/or operator, upon which the ad was detected.

[0100] In some embodiments, the ad monitor console displays detection details, such as a recording of the actual detected ad for later review, comparison. Alternatively or in addition, the ad monitor can generate statistics associated with the target advertisement. Such statistics can include total number of occurrences and/or periodicity of occurrences of the target ad. Such statistics can be tracked on a per channel basis, a per operator basis, and/or some combination of per channel and/or per operator.

[0101] In some embodiments, the system and methods described herein can provide flexibility to an advertiser to execute an ad campaign that includes time sensitive features. For example, subscribers can be presented with one or more links associated with a target ad as a function of one or more of the time of the ad, the channel through which the ad was observed, and a geographic location or region of the subscriber. For example, as part of an advertising strategy to promote greater interest in the target ad, time sensitive links are associated with the target ad.

[0102] These links can include links to promotional information that can include coupons or other incentives to those subscribers that respond to the associated link (e.g., click through) within a given time window. Such time windows can be during and immediately following a displayed ad for a predetermined period. Such strategies can be similar to media broadcast ads that offer similar incentives to subscribers who call into a telephone number provided during the ad. In some embodiments, the linked information can direct a subscriber to an interactive session with an ad representative. Providing the ability to selectively provide associated links based on channel, geography, or other such limitations, allows an advertiser to balance resources according to the number subscribers likely to click-through to the linked information. A more detailed description of embodiments of systems and processes for video fingerprint detection are described in more detail herein.

[0103] FIG. 6A illustrate exemplary subscriber computing devices 604a and 608a utilizing an advertisement management system 600a. The system 600a includes the subscriber computing device 604a, the subscriber computing device 608a, a communication network 625a, a content analysis server 610a, an advertisement server 640a, and a content provider 620a. A user 601a utilizes the subscriber computing devices 604a and 606a to access and/or view media (e.g., a television show, a movie, an advertisement, a website, etc.). As illustrated in screenshot 602a of the subscriber computing device 604a, the subscriber computing device 604a displays a national advertisement for trucks supplied by the content provider 620a. The content analysis server 610a analyzes the national advertisement to determine advertisement information and transmits the advertisement information to the advertisement server 640a.

[0104] The advertisement server 640a determines supplemental information, such as a local advertisement, based on the advertisement information and transmits the local advertisement to the subscriber computing device 606a. The subscriber computing device 606a displays the local advertisement as illustrated in screenshot 608a.

[0105] In some examples, the analysis of the national advertisement by the content analysis server 610a includes generating a descriptor for the national advertisement (in this example, ABD324297) and searching a plurality of descriptors to determine advertisement information associated with the national advertisement. For example, the content analysis server 610a searches a list of descriptors of advertisements to determine that the national advertisement is the national advertisement for Big Truck Company (in this example, ad id = BTCNA). As a further example, the content analysis server 610a transmits the ad id to the advertisement server 640a and the advertisement server 640a determines an advertisement based on the ad id (in this example, ad id = BTCNA). In this example, the advertisement server 640a determines that a local advertisement should be displayed on the subscriber computing device 606a (in this example, the local advertisement is associated with the ad id = BTCNA and the subscriber's geographic location) and identifies a local advertisement associated with the national advertisement for Big Truck Company (in this example, local advertisement for the Local Dealership of the Big Truck Company).

[0106] In some examples, the advertisement server 640a receives additional information, such as location information (e.g., global positioning satellite (GPS) location, street address for the subscriber, etc.), from the subscriber computing device 604a, the content analysis server 610a, and/or the content provider 620a to determine other data, such as the location of the subscriber, for the local advertisement.

[0107] Although FIG. 6A depicts the subscriber computing devices displaying the national advertisement and the local advertisement, the content analysis server 610a can analyze any type of media (e.g., television, streaming media, movie, audio, radio, etc.) and transmit identification information to the advertisement server 640a.

The advertisement server 640a can determine any type of media for display on the second subscriber device 606a. For example, the first subscriber device 604a displays a television show (e.g., cooking show, football game, etc.) and the advertisement server 640a transmits an advertisement (e.g., local grocery store, local sports bar, etc.) associated with the television show for display on the second subscriber device 606a.

[0108] Table 2 illustrates exemplary associations between the first media identification information and the second media.

Table 2. Exemplary Associations between Media

First Media Identification	Subscriber Location	Associated Second Media
Big Truck National Ad	Boston	Local Boston Big Truck Regional Ad
Big Truck National Ad	New York	Local New York Big Truck Regional Ad
Big Truck National Ad	Florida	Local Florida Big Truck Regional Ad
Big Truck National Ad	NA	Big Truck National Ad
Quick Cooking Show	Atlanta	Local Atlanta Grocery Store
Little Truck National Ad	NA	Little Truck National Ad
Best Science Fiction Movie	United States	Advertisement for Science Fiction Convention

[0109] FIG. 6B illustrate exemplary subscriber computing devices 604b and 608b utilizing an advertisement management system 600b. The system 600b includes the subscriber computing device 604b, the subscriber computing device 608b, a communication network 625b, a content analysis server 610b, an advertisement server 640b, and a content provider 620b. A user 601b utilizes the subscriber computing devices 604b and 606b to access and/or view media (e.g., a television show, a movie, an advertisement, a website, etc.). As illustrated in screenshot 602b of the subscriber computing device 604b, the subscriber computing device 604b displays a national advertisement for trucks supplied by the content provider 620b and a link 603b supplied by the content analysis server 610b (in this example, the link 603b is a uniform resource locator (URL) to the website of the Big Truck

Company). The link 603b is determined utilizing any of the techniques as described herein. The content analysis server 610b analyzes the national advertisement to determine advertisement information and transmits the advertisement information to the advertisement server 640b.

[0110] The advertisement server 640b determines a local advertisement based on the advertisement information and transmits the local advertisement to the subscriber computing device 606b. A link 609b is supplied by the content analysis server 610b (in this example, the link 609b is a URL to the website of the local dealership of the Big Truck Company). The subscriber computing device 606b displays the local advertisement and the link 609b as illustrated in screenshot 608b. The link 609b is determined utilizing any of the techniques as described herein.

[0111] FIG. 6C illustrate exemplary subscriber computing devices 604c and 608c utilizing an advertisement management system 600c. The system 600c includes the subscriber computing device 604c, the subscriber computing device 608c, a communication network 625c, a content analysis server 610c, an advertisement server 640c, and a content provider 620c. A user 601c utilizes the subscriber computing devices 604c and 606c to access and/or view media (e.g., a television show, a movie, an advertisement, a website, etc.). As illustrated in screenshot 602c of the subscriber computing device 604c, the subscriber computing device 604c displays a cooking show trailer supplied by the content provider 620c. The content analysis server 610c analyzes the cooking show trailer to determine information (in this example, trailer id = CookTrailerAB342) and transmits the information to the advertisement server 640c.

[0112] The advertisement server 640c determines a local advertisement based on the information (in this example, a direct relationship between the cooking show trailer and location information of the subscriber to the local advertisement) and transmits the local advertisement to the subscriber computing device 606c. The subscriber computing device 606c displays the local advertisement as illustrated in screenshot 608c.

[0113] FIG. 6D illustrate exemplary subscriber computing devices 604d and 608d utilizing a supplemental media delivery system 600d. The system 600d includes the subscriber computing device 604d, the subscriber computing device 608d, a communication network 625d, a content analysis server 610d, a content provider A 620d, and a content provider B 640d. A user 601d utilizes the subscriber computing devices 604d and 606d to access and/or view media (e.g., a television show, a movie, an advertisement, a website, etc.). As illustrated in screenshot 602d of the subscriber computing device 604d, the subscriber computing device 604d displays a cooking show trailer supplied by the content provider A 620d. The content analysis server 610d analyzes the cooking show trailer to determine information (in this example, trailer id = CookTrailerAB342) and transmits the information to the content provider B 640d.

[0114] The content provider B 640d determines a related trailer based on the information (in this example, a database lookup of the trailer id to identify the related trailer) and transmits the related trailer to the subscriber computing device 606d. The subscriber computing device 606d displays the related trailer as illustrated in screenshot 608d.

[0115] FIG. 7 is a block diagram of an exemplary content analysis server 710 in a advertisement management system 700. The content analysis server 710 includes a communication module 711, a processor 712, a video frame preprocessor module 713, a video frame conversion module 714, a media fingerprint module 715, a media fingerprint comparison module 716, a link module 717, and a storage device 718.

[0116] The communication module 711 receives information for and/or transmits information from the content analysis server 710. The processor 712 processes requests for comparison of multimedia streams (e.g., request from a user, automated request from a schedule server, etc.) and instructs the communication module 711 to request and/or receive multimedia streams. The video frame preprocessor module 713 preprocesses multimedia streams (e.g., remove black border, insert stable borders, resize, reduce, selects key frame, groups frames together, etc.). The video frame conversion module 714 converts the multimedia streams (e.g., luminance normalization, RGB to Color9, etc.).

[0117] The media fingerprint module 715 generates a fingerprint (generally referred to as a descriptor or signature) for each key frame selection (e.g., each frame is its own key frame selection, a group of frames have a key frame selection, etc.) in a multimedia stream. The media fingerprint comparison module 716 compares the frame sequences for multimedia streams to identify similar frame sequences between the multimedia streams (e.g., by comparing the fingerprints of each key frame selection of the frame sequences, by comparing the fingerprints of each frame in the frame sequences, etc.).

[0118] The link module 717 determines a link (e.g., URL, computer readable location indicator, etc.) for media based on one or more stored links and/or requests a link from an advertisement server (not shown). The storage device 718 stores a request, media, metadata, a descriptor, a frame selection, a frame sequence, a comparison of the frame sequences, and/or any other information associated with the association of metadata.

[0119] In some examples, the video frame conversion module 714 determines one or more boundaries associated with the media data. The media fingerprint module 715 generates one or more descriptors based on the media data and the one or more boundaries. Table 3 illustrates the boundaries determined by the video frame conversion module 714 for an advertisement “Big Dog Food is Great!”

Table 3. Exemplary Boundaries and Descriptors for Advertisement

Boundary Start	Boundary End	Descriptor
00:00:00	03:34:43	Alpha45c
03:34:44	05:42:22	Alpha45d
05:42:23	06:42:22	Alpha45e
06:42:23	08:23:23	Alpha45g

[0120] In other examples, the media fingerprint comparison module 716 compares the one or more descriptors and one or more other descriptors. Each of the one or more other descriptors can be associated with one or more other boundaries associated with the other media data. For example, the media fingerprint comparison module 716 compares the one or more descriptors (e.g., Alpha 45e, Alpha 45g, etc.) with stored descriptors. The comparison of the descriptors can be, for example, an exact comparison (e.g., text to text comparison, bit to bit comparison, etc.), a similarity comparison (e.g., descriptors are within a specified range, descriptors are within a percentage range, etc.), and/or any other type of comparison. The media fingerprint comparison module 716 can, for example, determine an identification about the media data based on exact matches of the descriptors and/or can associate part or all of the identification about the media data based on a similarity match of the descriptors. Table 4 illustrates the comparison of the descriptors with other descriptors.

Table 4. Exemplary Comparison of Descriptors

Descriptor	Stored Descriptors	Stored Identification	Result	Associated Identification
Alpha45g	Alpha45a	Advertisement: "Big Dog Food is Great!"; Part A	Similar	Advertisement: "Big Dog Food is Great!"
	Alpha45b	Advertisement: "Big Dog Food is Great!"; Part B	Similar	Advertisement: "Big Dog Food is Great!"
	Beta34a	Television Show "Why Cats are Great"; Part A	No Match	NA
	Beta34b	Television Show "Why Cats are Great"; Part B	No Match	NA
	Alpha45g	Advertisement: "Big Dog Food is Great!"; Part G	Match	Advertisement: "Big Dog Food is Great!"
Beta45c	Alpha45a	Advertisement: "Big Dog Food is Great!"; Part A	No Match	NA
	Alpha45b	Advertisement: "Big Dog Food is Great!"; Part B	No Match	NA
	Beta34a	Television Show "Why Cats are Great"; Part A	Similar	Television Show "Why Cats are Great"
	Beta34b	Television Show "Why Cats are Great"; Part B	Similar	Television Show "Why Cats are Great"
	Alpha45g	Advertisement: "Big Dog Food is Great!"; Part G	No Match	NA

[0121] In other examples, the video frame conversion module 714 separates the media data into one or more media data sub-parts based on the one or more boundaries. In some examples, the media fingerprint comparison module 716 associates at least part of the identification with at least one of the one or more media data sub-parts based on the comparison of the descriptor and the other descriptor. For example, a televised movie can be split into sub-parts based on the movie sub-parts and the commercial sub-parts as illustrated in Table 1.

[0122] In some examples, the communication module 711 receives the media data and the identification associated with the media data. The media fingerprint module 715 generates the descriptor based on the media data. For example, the communication module 711 receives the media data, in this example, a movie, from a digital video disc (DVD) player and the metadata from an internet movie database. In this example, the media fingerprint module 715 generates a descriptor of the movie and associates the identification with the descriptor.

[0123] In other examples, the media fingerprint comparison module 716 associates at least part of the identification with the descriptor. For example, the television show name is associated with the descriptor, but not the first air date.

[0124] In some examples, the storage device 718 stores the identification, the first descriptor, and/or the association of the at least part of the identification with the first descriptor. The storage device 718 can, for example, retrieve the stored identification, the stored first descriptor, and/or the stored association of the at least part of the identification with the first descriptor.

[0125] In some examples, the media fingerprint comparison module 716 determines new and/or supplemental identification for media by accessing third party information sources. The media fingerprint comparison module 716 can request identification associated with media from an internet database (e.g., internet movie database, internet music database, etc.) and/or a third party commercial database (e.g., movie studio database, news database, etc.). For example, the identification associated with media (in this example, a movie) includes the title “All Dogs go to Heaven” and the movie studio “Dogs Movie Studio.” Based on the identification, the media fingerprint comparison module 716 requests additional identification from the movie studio database, receives the additional identification (in this example, release date: “June 1, 1995”; actors: Wof Gang McRuff and Ruffus T. Bone; running time: 2:03:32), and associates the additional identification with the media.

[0126] FIG. 8 is a block diagram of an exemplary subscriber computing device 870 in a advertisement management system 800. The subscriber computing device 870 includes a communication module 871, a processor 872, an advertisement

module 873, a media fingerprint module 874, a display device 875 (e.g., a monitor, a mobile device screen, a television, etc.), and a storage device 876.

[0127] The communication module 871 receives information for and/or transmits information from the subscriber computing device 870. The processor 872 processes requests for comparison of media streams (e.g., request from a user, automated request from a schedule server, etc.) and instructs the communication module 871 to request and/or receive media streams. The advertisement module 873 requests advertisements from an advertisement server (not shown) and/or transmits requests for comparison of descriptors to a content analysis server (not shown).

[0128] The media fingerprint module 874 generates a fingerprint for each key frame selection (e.g., each frame is its own key frame selection, a group of frames have a key frame selection, etc.) in a media stream. The media fingerprint module 874 associates identification with media and/or determines the identification from media (e.g., extracts metadata from media, determines metadata for media, etc.). The display device 875 displays a request, media, identification, a descriptor, a frame selection, a frame sequence, a comparison of the frame sequences, and/or any other information associated with the association of identification. The storage device 876 stores a request, media, identification, a descriptor, a frame selection, a frame sequence, a comparison of the frame sequences, and/or any other information associated with the association of identification.

[0129] In other examples, the subscriber computing device 870 utilizes media editing software and/or hardware (e.g., Adobe Premiere available from Adobe Systems Incorporate, San Jose, California; Corel VideoStudio® available from Corel Corporation, Ottawa, Canada, etc.) to manipulate and/or process the media. The editing software and/or hardware can include an application link (e.g., button in the user interface, drag and drop interface, etc.) to transmit the media being edited to the content analysis server to associate the applicable identification with the media, if possible.

[0130] FIG. 9 illustrates a flow diagram 900 of an exemplary process for generating a digital video fingerprint. The content analysis units fetch the recorded data chunks (e.g., multimedia content) from the signal buffer units directly and

extract fingerprints prior to the analysis. Any type of video comparison technique for identifying video can be utilized for supplemental information delivery as described herein. The content analysis server 310 of FIG. 3 receives one or more video (and more generally audiovisual) clips or segments 970, each including a respective sequence of image frames 971. Video image frames are highly redundant, with groups frames varying from each other according to different shots of the video segment 970. In the exemplary video segment 970, sampled frames of the video segment are grouped according to shot: a first shot 972', a second shot 972'', and a third shot 972'''. A representative frame, also referred to as a key frame 974', 974'', 974''' (generally 974) is selected for each of the different shots 972', 972'', 972''' (generally 972). The content analysis server 100 determines a respective digital signature 976', 976'', 976''' (generally 976) for each of the different key frames 974. The group of digital signatures 976 for the key frames 974 together represent a digital video fingerprint 978 of the exemplary video segment 970.

[0131] In some examples, a fingerprint is also referred to as a descriptor. Each fingerprint can be a representation of a frame and/or a group of frames. The fingerprint can be derived from the content of the frame (e.g., function of the colors and/or intensity of an image, derivative of the parts of an image, addition of all intensity value, average of color values, mode of luminance value, spatial frequency value). The fingerprint can be an integer (e.g., 345, 523) and/or a combination of numbers, such as a matrix or vector (e.g., [a, b], [x, y, z]). For example, the fingerprint is a vector defined by [x, y, z] where x is luminance, y is chrominance, and z is spatial frequency for the frame.

[0132] In some embodiments, shots are differentiated according to fingerprint values. For example in a vector space, fingerprints determined from frames of the same shot will differ from fingerprints of neighboring frames of the same shot by a relatively small distance. In a transition to a different shot, the fingerprints of a next group of frames differ by a greater distance. Thus, shots can be distinguished according to their fingerprints differing by more than some threshold value.

[0133] Thus, fingerprints determined from frames of a first shot 972' can be used to group or otherwise identify those frames as being related to the first shot. Similarly, fingerprints of subsequent shots can be used to group or otherwise identify subsequent shots 972'', 972'''. A representative frame, or key frame 974', 974'', 974''' can be selected for each shot 972. In some embodiments, the key frame is statistically selected from the fingerprints of the group of frames in the same shot (e.g., an average or centroid).

[0134] FIG. 10 shows an exemplary flow diagram 1000 for supplemental link delivery utilizing, for example, the system 100 (FIG 1). The advertisers 103 associate (1010) one or more links with a target advertisement. The content providers 101 combine (1020) the ads together with content in a combined media broadcast of the content and embedded ads. The ad monitor 104 receives the combined media broadcast and searches (1030) for occurrences of a target advertisement. If there is no occurrence of the target ad, the content providers 101 continues to combine (1020) the ads together with content in a combined media broadcast of the content and embedded ads. Upon occurrence of the target ad within the combined media broadcast (e.g., real time, near real time), the operator 102 presents (1040) subscribers of the combined media broadcast with indicia of the one or more links associated with the target ad. Subscribers can click-through or otherwise select (1050) at least one of the one or more links to obtain any information linked therewith utilizing the subscriber computing device 111. If the subscriber selects (1050) the link, the subscriber computing device 111 presents (1060) the subscriber with such linked information. If the subscriber does not select the link, If there is no occurrence of the target ad, the content providers 101 continues to combine (1020) the ads together with content in a combined media broadcast of the content and embedded ads.

[0135] FIG. 11 shows another exemplary flow diagram 1100 for supplemental link delivery utilizing, for example, the system 100 (FIG. 1). The advertisers 103 associate (1110) one or more links with a target advertisement. The ad monitor 103 receives (1120) the target advertisement. In some examples, the ad monitor 103 generates (1130) a descriptor of the target advertisement. In other examples, the ad

monitor 103 receives the descriptor of the target advertisement from the subscriber computing device 111, the content providers 101, and/or the operator 102. At least some such descriptors can be referred to as fingerprints. The fingerprints can include one or more of video and audio information of the target ad. Examples of such fingerprinting are provided herein.

[0136] The ad monitor 103 receives (1140) the media broadcast including content and embedded ads. The ad monitor 103 determines (1150) whether any target ads have been included (i.e., shown) within the media broadcast. Upon detection of a target ad within the media broadcast, or shortly thereafter, the subscriber computing device 111 presents (1160) a subscriber with the one or more links pre-associated with the target advertisement. If no target ad is detected, the ad monitor 103 continues to receive (1140) the media broadcast.

[0137] FIG. 12 shows another exemplary flow diagram 1200 for supplemental media delivery utilizing, for example, the system 200 (FIG. 2). The ad monitor 204 generates (1210) a descriptor (e.g., a fingerprint) based on the first media data (e.g., the content and original ads). The ad monitor 204 compares (1220) the descriptor with one or more stored descriptors to identify the first media data (e.g., advertisement for Little Ben Clocks, local advertisement for National Truck Rentals, movie trailer for Big Dog Little World, etc.). The operator 202 and/or the advertisers 203 determine (1230) second media data (e.g., advertisement for Big Ben Clocks, national advertisement for National Truck Rentals, movie times for Big Dog Little World, etc.) based on the identity of the first media data. The operator 202 transmits (1240) the second media data to the second subscriber computing device B 213. The second subscriber computing device B 213 displays (1250) the second media data on the second subscriber display device B 214.

[0138] FIG. 13 shows another exemplary flow diagram 1300 for supplemental media delivery utilizing, for example, the system 600a (FIG. 6A). The subscriber computing device 604a generates (1310) a descriptor based on the first media data (in this example, a National Big Truck Company Advertisement). The subscriber computing device 604a transmits (1320) the descriptor to the content analysis server 610a. The content analysis server 610a receives (1330) the descriptor and compares

(1340) the descriptor with stored descriptors to identify the first media data (e.g., the descriptor for the first media data is associated with the identity of “National Big Truck Company Advertisement”). The content analysis server 610a transmits (1350) a request for second media data to the advertisement server 640a. The request can include the identity of the first media data and/or the descriptor of the first media data. The advertisement server 640a receives (1360) the request and determines (1370) the second media data based on the request (in this example, the second media data is a video for a local dealership for the Big Truck Company). The advertisement server 640a transmits (1380) the second media data to the second subscriber computing device 606a and the second subscriber computing device 606a displays (1390) the second media data.

[0139] FIG. 14 shows another exemplary flow diagram 1400 for supplemental information delivery utilizing, for example, the system 300 (FIG. 3). The content analysis server 310 generates (1410) a descriptor based on first media data. The content analysis server 310 can receive the first media data from the content provider 320 and/or the subscriber computing device 330. The content analysis server 310 can monitor the communication network 325 and capture the first media data from the communication network 325 (e.g., determine a network path for the communication and intercept the communication via the network path).

[0140] The content analysis server 310 compares (1420) the descriptor with stored descriptors to identify the first media content. The content analysis server 310 determines (1430) supplemental information (e.g., second media data, a link for the first media data, a link for the second media data, etc.) based on the identity of the first media content. In some examples, the content analysis server 310 determines (1432) the second media data based on the identity of the first media data. In other examples, the content analysis server 310 determines (1434) the link for the second media data based on the identity of the first media data. The content analysis server 310 transmits (1440) the supplemental information to the subscriber computing device 330 and the subscriber computing device 330 displays (1450) the supplemental information (e.g., the second media data, the link for the second media data, etc.).

[0141] FIG. 15 is another exemplary system block diagram illustrating a system 1500 for supplemental information delivery. The system includes a sink 1510, a signal processing system 1520, an IPTV platform 1530, a delivery system 1540, an end-user system 1550, a fingerprint analysis server 1560, and a reference clip database 1570. The sink 1510 receives media (e.g., satellite system, network system, cable television system, etc.). The signal processing system 1520 processes the received media (e.g., transcodes, routes, etc.). The IPTV platform 1530 provides television functionality (e.g., personal video recording, content rights management, digital rights management, video on demand, etc.) and/or delivers the processed media to the delivery system 1540. The delivery system 1540 delivers the processed media to the end-user system 1550 (e.g., digital subscriber line (DSL) modem, set-top-box (STB), television (TV), etc.) for access by the user. The fingerprint analysis server 1560 generates fingerprints for the processed media to determine the identity of the media and/or perform other functionality based on the fingerprint (e.g., insert links, determine related media, etc.). The fingerprint analysis server 1560 can compare the fingerprints to fingerprints stored on the reference clip database 1570.

[0142] FIG. 16 illustrates a block diagram of an exemplary multi-channel video monitoring system 1600. The system 1600 includes (i) a signal, or media acquisition subsystem 1642, (ii) a content analysis subsystem 1644, (iii) a data storage subsystem 446, and (iv) a management subsystem 1648.

[0143] The media acquisition subsystem 1642 acquires one or more video signals 1650. For each signal, the media acquisition subsystem 1642 records it as data chunks on a number of signal buffer units 1652. Depending on the use case, the buffer units 1652 can perform fingerprint extraction as well, as described in more detail herein. This can be useful in a remote capturing scenario in which the very compact fingerprints are transmitted over a communications medium, such as the Internet, from a distant capturing site to a centralized content analysis site. The video detection system and processes can also be integrated with existing signal acquisition solutions, as long as the recorded data is accessible through a network connection.

[0144] The fingerprint for each data chunk can be stored in a media repository 1658 portion of the data storage subsystem 1646. In some embodiments, the data storage subsystem 1646 includes one or more of a system repository 1656 and a reference repository 1660. One or more of the repositories 1656, 1658, 1660 of the data storage subsystem 1646 can include one or more local hard-disk drives, network accessed hard-disk drives, optical storage units, random access memory (RAM) storage drives, and/or any combination thereof. One or more of the repositories 1656, 1658, 1660 can include a database management system to facilitate storage and access of stored content. In some embodiments, the system 1640 supports different SQL-based relational database systems through its database access layer, such as Oracle and Microsoft-SQL Server. Such a system database acts as a central repository for all metadata generated during operation, including processing, configuration, and status information.

[0145] In some embodiments, the media repository 1658 serves as the main payload data storage of the system 1640 storing the fingerprints, along with their corresponding key frames. A low quality version of the processed footage associated with the stored fingerprints is also stored in the media repository 1658. The media repository 1658 can be implemented using one or more RAID systems that can be accessed as a networked file system.

[0146] Each of the data chunk can become an analysis task that is scheduled for processing by a controller 1662 of the management subsystem 1648. The controller 1662 is primarily responsible for load balancing and distribution of jobs to the individual nodes in a content analysis cluster 1654 of the content analysis subsystem 1644. In at least some embodiments, the management subsystem 1648 also includes an operator/administrator terminal, referred to generally as a front-end 1664. The operator/administrator terminal 1664 can be used to configure one or more elements of the video detection system 1640. The operator/administrator terminal 1664 can also be used to upload reference video content for comparison and to view and analyze results of the comparison.

[0147] The signal buffer units 1652 can be implemented to operate around-the-clock without any user interaction necessary. In such embodiments, the continuous video data stream is captured, divided into manageable segments, or chunks, and stored on internal hard disks. The hard disk space can be implanted to function as a circular buffer. In this configuration, older stored data chunks can be moved to a separate long term storage unit for archival, freeing up space on the internal hard disk drives for storing new, incoming data chunks. Such storage management provides reliable, uninterrupted signal availability over very long periods of time (e.g., hours, days, weeks, etc.). The controller 1662 is configured to ensure timely processing of all data chunks so that no data is lost. The signal acquisition units 1652 are designed to operate without any network connection, if required, (e.g., during periods of network interruption) to increase the system's fault tolerance.

[0148] In some embodiments, the signal buffer units 1652 perform fingerprint extraction and transcoding on the recorded chunks locally. Storage requirements of the resulting fingerprints are trivial compared to the underlying data chunks and can be stored locally along with the data chunks. This enables transmission of the very compact fingerprints including a storyboard over limited-bandwidth networks, to avoid transmitting the full video content.

[0149] In some embodiments, the controller 1662 manages processing of the data chunks recorded by the signal buffer units 1652. The controller 1662 constantly monitors the signal buffer units 1652 and content analysis nodes 1654, performing load balancing as required to maintain efficient usage of system resources. For example, the controller 1662 initiates processing of new data chunks by assigning analysis jobs to selected ones of the analysis nodes 1654. In some instances, the controller 1662 automatically restarts individual analysis processes on the analysis nodes 1654, or one or more entire analysis nodes 1654, enabling error recovery without user interaction. A graphical user interface, can be provided at the front end 1664 for monitor and control of one or more subsystems 1642, 1644, 1646 of the system 1600. For example, the graphical user interface allows a user to configure, reconfigure and obtain status of the content analysis 1644 subsystem.

[0150] In some embodiments, the analysis cluster 1644 includes one or more analysis nodes 1654 as workhorses of the video detection and monitoring system. Each analysis node 1654 independently processes the analysis tasks that are assigned to them by the controller 1662. This primarily includes fetching the recorded data chunks, generating the video fingerprints, and matching of the fingerprints against the reference content. The resulting data is stored in the media repository 1658 and in the data storage subsystem 1646. The analysis nodes 1654 can also operate as one or more of reference clips ingestion nodes, backup nodes, or RetroMatch nodes, in case the system performing retrospective matching. Generally, all activity of the analysis cluster is controlled and monitored by the controller.

[0151] After processing several such data chunks 1670, the detection results for these chunks are stored in the system database 1656. Beneficially, the numbers and capacities of signal buffer units 1652 and content analysis nodes 1654 can flexibly be scaled to customize the system's capacity to specific use cases of any kind. Realizations of the system 1600 can include multiple software components that can be combined and configured to suit individual needs. Depending on the specific use case, several components can be run on the same hardware. Alternatively or in addition, components can be run on individual hardware for better performance and improved fault tolerance. Such a modular system architecture allows customization to suit virtually every possible use case. From a local, single-PC solution to nationwide monitoring systems, fault tolerance, recording redundancy, and combinations thereof.

[0152] FIG. 17 illustrates a screen shot of an exemplary graphical user interface (GUI) 1700. The GUI 1700 can be utilized by operators, data annalists, and/or other users of the system 300 of FIG. 3 to operate and/or control the content analysis server 110. The GUI 1700 enables users to review detections, manage reference content, edit clip metadata, play reference and detected multimedia content, and perform detailed comparison between reference and detected content. In some embodiments, the system 1600 includes or more different graphical user interfaces, for different functions and/or subsystems such as the a recording selector, and a controller front-end 1664.

[0153] The GUI 1700 includes one or more user-selectable controls 1782, such as standard window control features. The GUI 1700 also includes a detection results table 1784. In the exemplary embodiment, the detection results table 1784 includes multiple rows 1786, one row for each detection. The row 1786 includes a low-resolution version of the stored image together with other information related to the detection itself. Generally, a name or other textual indication of the stored image can be provided next to the image. The detection information can include one or more of: date and time of detection; indicia of the channel or other video source; indication as to the quality of a match; indication as to the quality of an audio match; date of inspection; a detection identification value; and indication as to detection source. In some embodiments, the GUI 1700 also includes a video viewing window 1788 for viewing one or more frames of the detected and matching video. The GUI 1700 can include an audio viewing window 1789 for comparing indicia of an audio comparison.

[0154] FIG. 18 illustrates an example of a change in a digital image representation subframe. A set of one of: target file image subframes and queried image subframes 1800 are shown, wherein the set 1800 includes subframe sets 1801, 1802, 1803, and 1804. Subframe sets 1801 and 1802 differ from other set members in one or more of translation and scale. Subframe sets 1802 and 1803 differ from each other, and differ from subframe sets 1801 and 1802, by image content and present an image difference to a subframe matching threshold.

[0155] FIG. 19 illustrates an exemplary flow chart 1900 for the digital video image detection system 1600 of FIG. 16. The flow chart 1900 initiates at a start point A with a user at a user interface configuring the digital video image detection system 126, wherein configuring the system includes selecting at least one channel, at least one decoding method, and a channel sampling rate, a channel sampling time, and a channel sampling period. Configuring the system 126 includes one of: configuring the digital video image detection system manually and semi-automatically. Configuring the system 126 semi-automatically includes one or more of: selecting channel presets, scanning scheduling codes, and receiving scheduling feeds.

[0156] Configuring the digital video image detection system 126 further includes generating a timing control sequence 127, wherein a set of signals generated by the timing control sequence 127 provide for an interface to an MPEG video receiver.

[0157] In some embodiments, the method flow chart 1900 for the digital video image detection system 300 provides a step to optionally query the web for a file image 131 for the digital video image detection system 300 to match. In some embodiments, the method flow chart 1900 provides a step to optionally upload from the user interface 100 a file image for the digital video image detection system 300 to match. In some embodiments, querying and queuing a file database 133b provides for at least one file image for the digital video image detection system 300 to match.

[0158] The method flow chart 1900 further provides steps for capturing and buffering an MPEG video input at the MPEG video receiver and for storing the MPEG video input 171 as a digital image representation in an MPEG video archive.

[0159] The method flow chart 1900 further provides for steps of: converting the MPEG video image to a plurality of query digital image representations, converting the file image to a plurality of file digital image representations, wherein the converting the MPEG video image and the converting the file image are comparable methods, and comparing and matching the queried and file digital image representations. Converting the file image to a plurality of file digital image representations is provided by one of: converting the file image at the time the file image is uploaded, converting the file image at the time the file image is queued, and converting the file image in parallel with converting the MPEG video image.

[0160] The method flow chart 1900 provides for a method 142 for converting the MPEG video image and the file image to a queried RGB digital image representation and a file RGB digital image representation, respectively. In some embodiments, converting method 142 further comprises removing an image border 143 from the queried and file RGB digital image representations. In some embodiments, the converting method 142 further comprises removing a split screen 143 from the queried and file RGB digital image representations. In some embodiment, one or more of removing an image border and removing a split screen

143 includes detecting edges. In some embodiments, converting method 142 further comprises resizing the queried and file RGB digital image representations to a size of 128 x 128 pixels.

[0161] The method flow chart 1900 further provides for a method 144 for converting the MPEG video image and the file image to a queried COLOR9 digital image representation and a file COLOR9 digital image representation, respectively. Converting method 144 provides for converting directly from the queried and file RGB digital image representations.

[0162] Converting method 144 includes steps of: projecting the queried and file RGB digital image representations onto an intermediate luminance axis, normalizing the queried and file RGB digital image representations with the intermediate luminance, and converting the normalized queried and file RGB digital image representations to a queried and file COLOR9 digital image representation, respectively.

[0163] The method flow chart 1900 further provides for a method 151 for converting the MPEG video image and the file image to a queried 5-segment, low resolution temporal moment digital image representation and a file 5-segment, low resolution temporal moment digital image representation, respectively. Converting method 151 provides for converting directly from the queried and file COLOR9 digital image representations.

[0164] Converting method 151 includes steps of: sectioning the queried and file COLOR9 digital image representations into five spatial, overlapping sections and non-overlapping sections, generating a set of statistical moments for each of the five sections, weighting the set of statistical moments, and correlating the set of statistical moments temporally, generating a set of key frames or shot frames representative of temporal segments of one or more sequences of COLOR9 digital image representations.

[0165] Generating the set of statistical moments for converting method 151 includes generating one or more of: a mean, a variance, and a skew for each of the five sections. In some embodiments, correlating a set of statistical moments

temporally for converting method 151 includes correlating one or more of a means, a variance, and a skew of a set of sequentially buffered RGB digital image representations.

[0166] Correlating a set of statistical moments temporally for a set of sequentially buffered MPEG video image COLOR9 digital image representations allows for a determination of a set of median statistical moments for one or more segments of consecutive COLOR9 digital image representations. The set of statistical moments of an image frame in the set of temporal segments that most closely matches the a set of median statistical moments is identified as the shot frame, or key frame. The key frame is reserved for further refined methods that yield higher resolution matches.

[0167] The method flow chart 1900 further provides for a comparing method 152 for matching the queried and file 5-section, low resolution temporal moment digital image representations. In some embodiments, the first comparing method 151 includes finding an one or more errors between the one or more of: a mean, variance, and skew of each of the five segments for the queried and file 5-section, low resolution temporal moment digital image representations. In some embodiments, the one or more errors are generated by one or more queried key frames and one or more file key frames, corresponding to one or more temporal segments of one or more sequences of COLOR9 queried and file digital image representations. In some embodiments, the one or more errors are weighted, wherein the weighting is stronger temporally in a center segment and stronger spatially in a center section than in a set of outer segments and sections.

[0168] Comparing method 152 includes a branching element ending the method flow chart 2500 at 'E' if the first comparing results in no match. Comparing method 152 includes a branching element directing the method flow chart 1900 to a converting method 153 if the comparing method 152 results in a match.

[0169] In some embodiments, a match in the comparing method 152 includes one or more of: a distance between queried and file means, a distance between queried and file variances, and a distance between queried and file skews registering a smaller metric than a mean threshold, a variance threshold, and a skew threshold,

respectively. The metric for the first comparing method 152 can be any of a set of well known distance generating metrics.

[0170] A converting method 153a includes a method of extracting a set of high resolution temporal moments from the queried and file COLOR9 digital image representations, wherein the set of high resolution temporal moments include one or more of: a mean, a variance, and a skew for each of a set of images in an image segment representative of temporal segments of one or more sequences of COLOR9 digital image representations.

[0171] Converting method 153a temporal moments are provided by converting method 151. Converting method 153a indexes the set of images and corresponding set of statistical moments to a time sequence. Comparing method 154a compares the statistical moments for the queried and the file image sets for each temporal segment by convolution.

[0172] The convolution in comparing method 154a convolves the queried and filed one or more of: the first feature mean, the first feature variance, and the first feature skew. In some embodiments, the convolution is weighted, wherein the weighting is a function of chrominance. In some embodiments, the convolution is weighted, wherein the weighting is a function of hue.

[0173] The comparing method 154a includes a branching element ending the method flow chart 1900 if the first feature comparing results in no match. Comparing method 154a includes a branching element directing the method flow chart 1900 to a converting method 153b if the first feature comparing method 153a results in a match.

[0174] In some embodiments, a match in the first feature comparing method 153a includes one or more of: a distance between queried and file first feature means, a distance between queried and file first feature variances, and a distance between queried and file first feature skews registering a smaller metric than a first feature mean threshold, a first feature variance threshold, and a first feature skew threshold, respectively. The metric for the first feature comparing method 153a can be any of a set of well known distance generating metrics.

[0175] The converting method 153b includes extracting a set of nine queried and file wavelet transform coefficients from the queried and file COLOR9 digital image representations. Specifically, the set of nine queried and file wavelet transform coefficients are generated from a grey scale representation of each of the nine color representations includes the COLOR9 digital image representation. In some embodiments, the grey scale representation is approximately equivalent to a corresponding luminance representation of each of the nine color representations includes the COLOR9 digital image representation. In some embodiments, the grey scale representation is generated by a process commonly referred to as color gamut sphering, wherein color gamut sphering approximately eliminates or normalizes brightness and saturation across the nine color representations includes the COLOR9 digital image representation.

[0176] In some embodiments, the set of nine wavelet transform coefficients are one of: a set of nine one-dimensional wavelet transform coefficients, a set of one or more non-collinear sets of nine one-dimensional wavelet transform coefficients, and a set of nine two-dimensional wavelet transform coefficients. In some embodiments, the set of nine wavelet transform coefficients are one of: a set of Haar wavelet transform coefficients and a two-dimensional set of Haar wavelet transform coefficients.

[0177] The method flow chart 1900 further provides for a comparing method 154b for matching the set of nine queried and file wavelet transform coefficients. In some embodiments, the comparing method 154b includes a correlation function for the set of nine queried and filed wavelet transform coefficients. In some embodiments, the correlation function is weighted, wherein the weighting is a function of hue; that is, the weighting is a function of each of the nine color representations includes the COLOR9 digital image representation.

[0178] The comparing method 154b includes a branching element ending the method flow chart 1900 if the comparing method 154b results in no match. The comparing method 154b includes a branching element directing the method flow chart 1900 to an analysis method 155a-156b if the comparing method 154b results in a match.

[0179] In some embodiments, the comparing in comparing method 154b includes one or more of: a distance between the set of nine queried and file wavelet coefficients, a distance between a selected set of nine queried and file wavelet coefficients, and a distance between a weighted set of nine queried and file wavelet coefficients.

[0180] The analysis method 155a-156b provides for converting the MPEG video image and the file image to one or more queried RGB digital image representation subframes and file RGB digital image representation subframes, respectively, one or more grey scale digital image representation subframes and file grey scale digital image representation subframes, respectively, and one or more RGB digital image representation difference subframes. The analysis method 155a-156b provides for converting directly from the queried and file RGB digital image representations to the associated subframes.

[0181] The analysis method 155a-156b provides for the one or more queried and file grey scale digital image representation subframes 155a, including: defining one or more portions of the queried and file RGB digital image representations as one or more queried and file RGB digital image representation subframes, converting the one or more queried and file RGB digital image representation subframes to one or more queried and file grey scale digital image representation subframes, and normalizing the one or more queried and file grey scale digital image representation subframes.

[0182] The method for defining includes initially defining identical pixels for each pair of the one or more queried and file RGB digital image representations. The method for converting includes extracting a luminance measure from each pair of the queried and file RGB digital image representation subframes to facilitate the converting. The method of normalizing includes subtracting a mean from each pair of the one or more queried and file grey scale digital image representation subframes.

[0183] The analysis method 155a-156b further provides for a comparing method 155b-156b. The comparing method 155b-156b includes a branching element ending the method flow chart 2500 if the second comparing results in no match. The

comparing method 155b-156b includes a branching element directing the method flow chart 2500 to a detection analysis method 325 if the second comparing method 155b-156b results in a match.

[0184] The comparing method 155b-156b includes: providing a registration between each pair of the one or more queried and file grey scale digital image representation subframes 155b and rendering one or more RGB digital image representation difference subframes and a connected queried RGB digital image representation dilated change subframe 156a-b.

[0185] The method for providing a registration between each pair of the one or more queried and file grey scale digital image representation subframes 155b includes: providing a sum of absolute differences (SAD) metric by summing the absolute value of a grey scale pixel difference between each pair of the one or more queried and file grey scale digital image representation subframes, translating and scaling the one or more queried grey scale digital image representation subframes, and repeating to find a minimum SAD for each pair of the one or more queried and file grey scale digital image representation subframes. The scaling for method 155b includes independently scaling the one or more queried grey scale digital image representation subframes to one of: a 128 x 128 pixel subframe, a 64 x 64 pixel subframe, and a 32 x 32 pixel subframe.

[0186] The scaling for method 155b includes independently scaling the one or more queried grey scale digital image representation subframes to one of: a 720 x 480 pixel (480i/p) subframe, a 720 x 576 pixel (576 i/p) subframe, a 1280 x 720 pixel (720p) subframe, a 1280 x 1080 pixel (1080i) subframe, and a 1920 x 1080 pixel (1080p) subframe, wherein scaling can be made from the RGB representation image or directly from the MPEG image.

[0187] The method for rendering one or more RGB digital image representation difference subframes and a connected queried RGB digital image representation dilated change subframe 156a-b includes: aligning the one or more queried and file grey scale digital image representation subframes in accordance with the method for providing a registration 155b, providing one or more RGB digital image

representation difference subframes, and providing a connected queried RGB digital image representation dilated change subframe.

[0188] The providing the one or more RGB digital image representation difference subframes in method 56a includes: suppressing the edges in the one or more queried and file RGB digital image representation subframes, providing a SAD metric by summing the absolute value of the RGB pixel difference between each pair of the one or more queried and file RGB digital image representation subframes, and defining the one or more RGB digital image representation difference subframes as a set wherein the corresponding SAD is below a threshold.

[0189] The suppressing includes: providing an edge map for the one or more queried and file RGB digital image representation subframes and subtracting the edge map for the one or more queried and file RGB digital image representation subframes from the one or more queried and file RGB digital image representation subframes, wherein providing an edge map includes providing a Sobol filter.

[0190] The providing the connected queried RGB digital image representation dilated change subframe in method 56a includes: connecting and dilating a set of one or more queried RGB digital image representation subframes that correspond to the set of one or more RGB digital image representation difference subframes.

[0191] The method for rendering one or more RGB digital image representation difference subframes and a connected queried RGB digital image representation dilated change subframe 156a-b includes a scaling for method 156a-b independently scaling the one or more queried RGB digital image representation subframes to one of: a 128 x 128 pixel subframe, a 64 x 64 pixel subframe, and a 32 x 32 pixel subframe.

[0192] The scaling for method 156a-b includes independently scaling the one or more queried RGB digital image representation subframes to one of: a 720 x 480 pixel (480 i/p) subframe, a 720 x 576 pixel (576 i/p) subframe, a 1280 x 720 pixel (720p) subframe, a 1280 x 1080 pixel (1080i) subframe, and a 1920 x 1080 pixel (1080p) subframe, wherein scaling can be made from the RGB representation image or directly from the MPEG image.

[0193] The method flow chart 1900 further provides for a detection analysis method 325. The detection analysis method 325 and the associated classify detection method 124 provide video detection match and classification data and images for the display match and video driver 125, as controlled by a user interface. The detection analysis method 325 and the classify detection method 124 further provide detection data to a dynamic thresholds method 335, wherein the dynamic thresholds method 335 provides for one of: automatic reset of dynamic thresholds, manual reset of dynamic thresholds, and combinations thereof.

[0194] The method flow chart 1900 further provides a third comparing method 340, providing a branching element ending the method flow chart 1900 if the file database queue is not empty.

[0195] FIG. 20A illustrates an exemplary traversed set of K-NN nested, disjoint feature subspaces in feature space 2000. A queried image 805 starts at A and is funneled to a target file image 831 at D, winnowing file images that fail matching criteria 851 and 852, such as file image 832 at threshold level 813, at a boundary between feature spaces 850 and 860.

[0196] FIG. 20B illustrates the exemplary traversed set of K-NN nested, disjoint feature subspaces with a change in a queried image subframe. The a queried image 805 subframe 861 and a target file image 831 subframe 862 do not match at a subframe threshold at a boundary between feature spaces 860 and 830. A match is found with file image 832, and a new subframe 832 is generated and associated with both file image 831 and the queried image 805, wherein both target file image 831 subframe 961 and new subframe 832 comprise a new subspace set for file target image 832.

[0197] In some examples, the content analysis server 310 of FIG. 3 is a Web portal. The Web portal implementation allows for flexible, on demand monitoring offered as a service. With need for little more than web access, a web portal implementation allows clients with small reference data volumes to benefit from the advantages of the video detection systems and processes of the present invention. Solutions can offer one or more of several programming interfaces using Microsoft .Net Remoting for seamless in-house integration with existing applications.

Alternatively or in addition, long-term storage for recorded video data and operative redundancy can be added by installing a secondary controller and secondary signal buffer units.

[0198] Fingerprint extraction is described in more detail in International Patent Application Serial No. PCT/US2008/060164, Publication No. WO2008/128143, entitled “Video Detection System And Methods,” incorporated herein by reference in its entirety. Fingerprint comparison is described in more detail in International Patent Application Serial No. PCT/US2009/035617, entitled “Frame Sequence Comparisons in Multimedia Streams,” incorporated herein by reference in its entirety.

[0199] The above-described systems and methods can be implemented in digital electronic circuitry, in computer hardware, firmware, and/or software. The implementation can be as a computer program product (i.e., a computer program tangibly embodied in an information carrier). The implementation can, for example, be in a machine-readable storage device, for execution by, or to control the operation of, data processing apparatus. The implementation can, for example, be a programmable processor, a computer, and/or multiple computers.

[0200] A computer program can be written in any form of programming language, including compiled and/or interpreted languages, and the computer program can be deployed in any form, including as a stand-alone program or as a subroutine, element, and/or other unit suitable for use in a computing environment. A computer program can be deployed to be executed on one computer or on multiple computers at one site.

[0201] Method steps can be performed by one or more programmable processors executing a computer program to perform functions of the invention by operating on input data and generating output. Method steps can also be performed by and an apparatus can be implemented as special purpose logic circuitry. The circuitry can, for example, be a FPGA (field programmable gate array) and/or an ASIC (application-specific integrated circuit). Modules, subroutines, and software agents can refer to portions of the computer program, the processor, the special circuitry, software, and/or hardware that implements that functionality.

[0202] Processors suitable for the execution of a computer program include, by way of example, both general and special purpose microprocessors, and any one or more processors of any kind of digital computer. Generally, a processor receives instructions and data from a read-only memory or a random access memory or both. The essential elements of a computer are a processor for executing instructions and one or more memory devices for storing instructions and data. Generally, a computer can include, can be operatively coupled to receive data from and/or transfer data to one or more mass storage devices for storing data (e.g., magnetic, magneto-optical disks, or optical disks).

[0203] Data transmission and instructions can also occur over a communications network. Information carriers suitable for embodying computer program instructions and data include all forms of non-volatile memory, including by way of example semiconductor memory devices. The information carriers can, for example, be EPROM, EEPROM, flash memory devices, magnetic disks, internal hard disks, removable disks, magneto-optical disks, CD-ROM, and/or DVD-ROM disks. The processor and the memory can be supplemented by, and/or incorporated in special purpose logic circuitry.

[0204] To provide for interaction with a user, the above described techniques can be implemented on a computer having a display device. The display device can, for example, be a cathode ray tube (CRT) and/or a liquid crystal display (LCD) monitor. The interaction with a user can, for example, be a display of information to the user and a keyboard and a pointing device (e.g., a mouse or a trackball) by which the user can provide input to the computer (e.g., interact with a user interface element). Other kinds of devices can be used to provide for interaction with a user. Other devices can, for example, be feedback provided to the user in any form of sensory feedback (e.g., visual feedback, auditory feedback, or tactile feedback). Input from the user can, for example, be received in any form, including acoustic, speech, and/or tactile input.

[0205] The above described techniques can be implemented in a distributed computing system that includes a back-end component. The back-end component can, for example, be a data server, a middleware component, and/or an application

server. The above described techniques can be implemented in a distributing computing system that includes a front-end component. The front-end component can, for example, be a client computer having a graphical user interface, a Web browser through which a user can interact with an example implementation, and/or other graphical user interfaces for a transmitting device. The components of the system can be interconnected by any form or medium of digital data communication (e.g., a communication network). Examples of communication networks include a local area network (LAN), a wide area network (WAN), the Internet, wired networks, and/or wireless networks.

[0206] The system can include clients and servers. A client and a server are generally remote from each other and typically interact through a communication network. The relationship of client and server arises by virtue of computer programs running on the respective computers and having a client-server relationship to each other.

[0207] Packet-based networks can include, for example, the Internet, a carrier internet protocol (IP) network (e.g., local area network (LAN), wide area network (WAN), campus area network (CAN), metropolitan area network (MAN), home area network (HAN)), a private IP network, an IP private branch exchange (IPBX), a wireless network (e.g., radio access network (RAN), 802.11 network, 802.16 network, general packet radio service (GPRS) network, HiperLAN), and/or other packet-based networks. Circuit-based networks can include, for example, the public switched telephone network (PSTN), a private branch exchange (PBX), a wireless network (e.g., RAN, bluetooth, code-division multiple access (CDMA) network, time division multiple access (TDMA) network, global system for mobile communications (GSM) network), and/or other circuit-based networks.

[0208] The display device can include, for example, a computer, a computer with a browser device, a telephone, an IP phone, a mobile device (e.g., cellular phone, personal digital assistant (PDA) device, laptop computer, electronic mail device), and/or other communication devices. The browser device includes, for example, a computer (e.g., desktop computer, laptop computer) with a world wide web browser (e.g., Microsoft® Internet Explorer® available from Microsoft Corporation,

Mozilla® Firefox available from Mozilla Corporation). The mobile computing device includes, for example, a personal digital assistant (PDA).

[0209] Comprise, include, and/or plural forms of each are open ended and include the listed parts and can include additional parts that are not listed. And/or is open ended and includes one or more of the listed parts and combinations of the listed parts.

[0210] While the invention has been described in connection with the specific embodiments thereof, it will be understood that it is capable of further modification. Furthermore, this application is intended to cover any variations, uses, or adaptations of the invention, including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains, and as fall within the scope of the appended claims.

[0211] All publications, patents, and patent applications mentioned in this specification are herein incorporated by reference to the same extent as if each individual publication, patent, or patent application was specifically and individually indicated to be incorporated by reference.

WHAT IS CLAIMED IS:

1. A computer implemented method for supplemental information delivery to a user accessing media data, the method comprising:

generating a first descriptor based on first media data, the first media data associated with a first subscriber computing device and identifiable by the first descriptor;

comparing the first descriptor and a second descriptor;

determining supplemental information based on the comparison of the first descriptor and the second descriptor; and

transmitting the supplemental information.

2. A computer implemented method for supplemental information delivery to a user accessing media data, the method comprising:

receiving a first descriptor from a first subscriber computing device, the first descriptor generated based on first media data and the first media data identifiable by the first descriptor;

comparing the first descriptor and a second descriptor;

determining supplemental information based on the comparison of the first descriptor and the second descriptor; and

transmitting the supplemental information.

3. The method of claim 1 or 2, wherein the supplemental information comprising second media data and further comprising transmitting the second media data to a second subscriber computing device.

4. The method of claim 3, wherein the first media data comprising a video and the second media data comprising an advertisement associated with the video.

5. The method of claim 3, wherein the first media data comprising a first video and the second media data comprising a second video, the first video associated with the second video.
6. The method of any one of claims 3 to 5, further comprising determining the second media data based on an identity of the first media data and/or an association between the first media data and the second media data.
7. The method of claim 6, further comprising determining the association between the first media data and the second media data from a plurality of associations of media data stored in a storage device.
8. The method of any one of claims 3 to 7, further comprising:
determining a selectable link from a plurality of selectable links based on the second media data; and
transmitting the selectable link to the second subscriber computing device.
9. The method of any one of claims 3 to 8, wherein the first subscriber computing device and the second subscriber computing device are associated with a first subscriber and/or in a same geographic location.
10. The method of any one of claims 3 to 9, wherein the second media data comprises all or part of the first media data and/or the second media data associated with the first media data.

11. The method of any one of claims 3 to 10, wherein the comparison of the first descriptor and the second descriptor indicative of an association between the first media data and the second media data.

12. The method of claim 1 or 2, wherein the supplemental information comprising a selectable link and further comprising transmitting the selectable link to the first subscriber computing device.

13. The method of claim 12, wherein the selectable link comprising a link to reference information.

14. The method of any one of claims 12 to 13, further comprising receiving a selection request, the selection request comprising the link to the reference information.

15. The method of any one of claims 12 to 14, further comprising displaying a website based on the selection request.

16. The method of any one of claims 12 to 15, further comprising determining the selectable link based on an identity of the first media data and/or an association between the first media data and the selectable link.

17. The method of claim 16, further comprising determining the association between the first media data and the selectable link from a plurality of associations of selectable links stored in a storage device.

18. The method of any one of claims 12 to 17, further comprising:
determining a selectable link from a plurality of selectable links based on the first media data; and
transmitting the selectable link to the first subscriber computing device.
19. The method of any one of claims 12 to 18, further comprising transmitting a notification to an advertiser server associated with the selectable link.
20. The method of any one of claims 12 to 19, further comprising:
receiving a purchase request from the first subscriber computing device; and
transmitting a purchase notification to an advertiser server based on the purchase request.
21. The method of any one of claims 1 to 20, further comprising determining an identity of the first media data based on the first descriptor and a plurality of identities stored in a storage device.
22. The method of any one of claims 1 to 21, wherein the second descriptor is similar to part or all of the first descriptor.
23. The method of any one of claims 1 to 22, wherein the first media data comprising video, audio, text, an image, or any combination thereof.

24. The method of any one of claims 1 to 23, further comprising:
- transmitting a request for the first media data to a content provider server, the request comprising information associated with the first subscriber computing device; and
 - receiving the first media data from the content provider server.
25. The method of any one of claims 1 to 24, further comprising:
- identifying a first network transmission path associated with the first subscriber computing device; and
 - intercepting the first media data during transmission to the first subscriber computing device via the first network transmission path.
26. A computer program product, tangibly embodied in an information carrier, the computer program product including instructions being operable to cause a data processing apparatus to execute any of the method of any one of claims 1 to 25.
27. A system for supplemental information delivery to a user accessing media data, the system comprising:
- a media fingerprint module to generate a first descriptor based on first media data, the first media data associated with a first subscriber computing device and identifiable by the first descriptor;
 - a media comparison module to compare the first descriptor and a second descriptor and determine supplemental information based on the comparison of the first descriptor and the second descriptor; and
 - a communication module to transmit the supplemental information.

28. A system for supplemental information delivery to a user accessing media data, the system comprising:

a communication module to receive a first descriptor from a first subscriber computing device, the first descriptor generated based on first media data and the first media data identifiable by the first descriptor and transmit supplemental information; and

a media comparison module to compare the first descriptor and a second descriptor and determine the supplemental information based on the comparison of the first descriptor and the second descriptor.

29. The system of claim 27 or 28, wherein the supplemental information comprising second media data and further comprising transmitting the second media data to a second subscriber computing device.

30. The system of claim 27 or 28, wherein the supplemental information comprising a selectable link and further comprising transmitting the selectable link to the first subscriber computing device.

31. A system for supplemental information delivery to a user accessing media data, the system comprising:

means for generating a first descriptor based on first media data, the first media data associated with a first subscriber computing device and identifiable by the first descriptor;

means for comparing the first descriptor and a second descriptor;

means for determining supplemental information based on the comparison of the first descriptor and the second descriptor; and

means for transmitting the supplemental information.

32. A system for supplemental information delivery to a user accessing media data, the system comprising:

means for receiving a first descriptor from a first subscriber computing device, the first descriptor generated based on first media data and the first media data identifiable by the first descriptor;

means for comparing the first descriptor and a second descriptor;

means for determining supplemental information based on the comparison of the first descriptor and the second descriptor; and

means for transmitting the supplemental information.

100

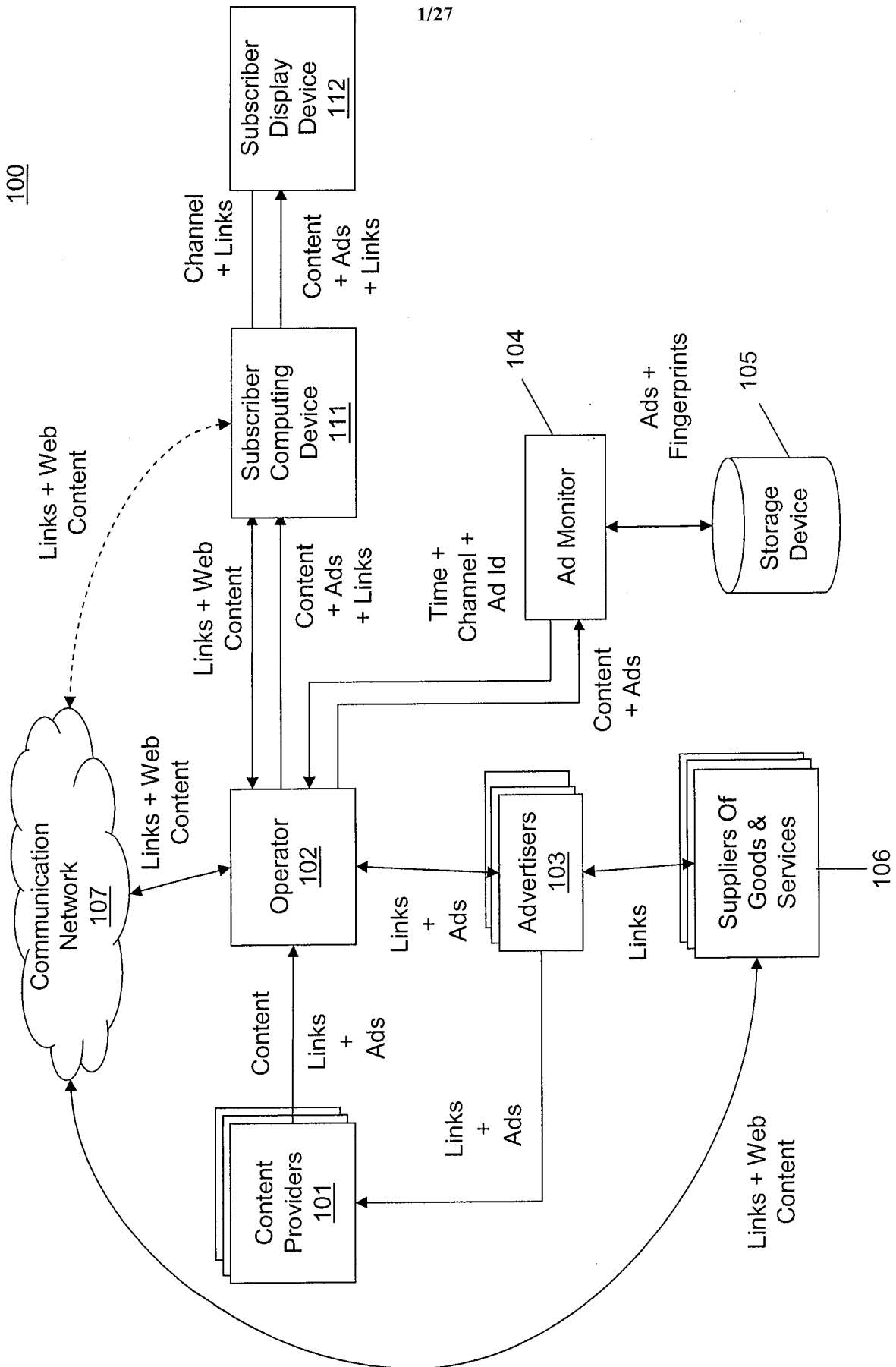


FIG. 1

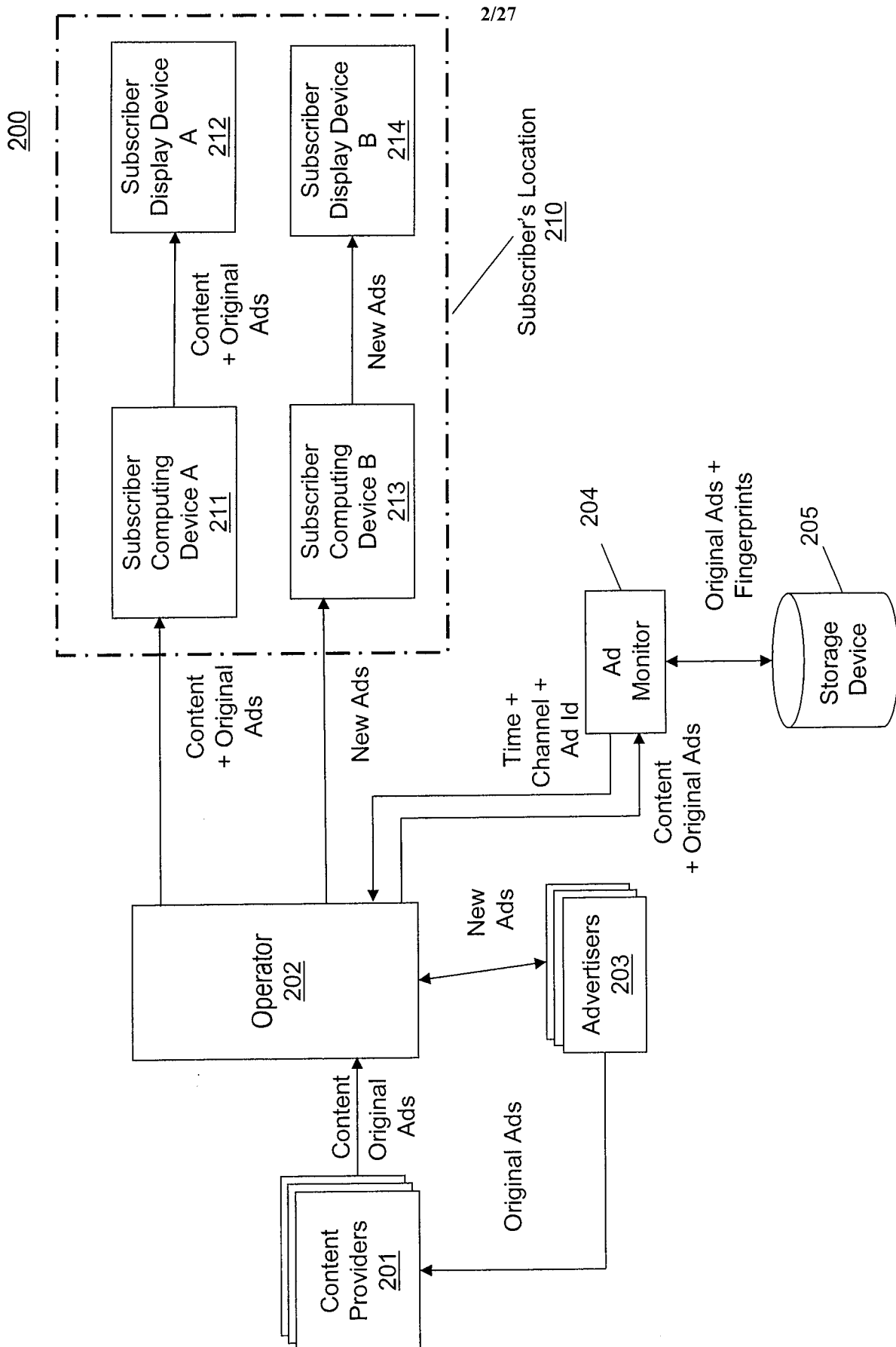


FIG. 2

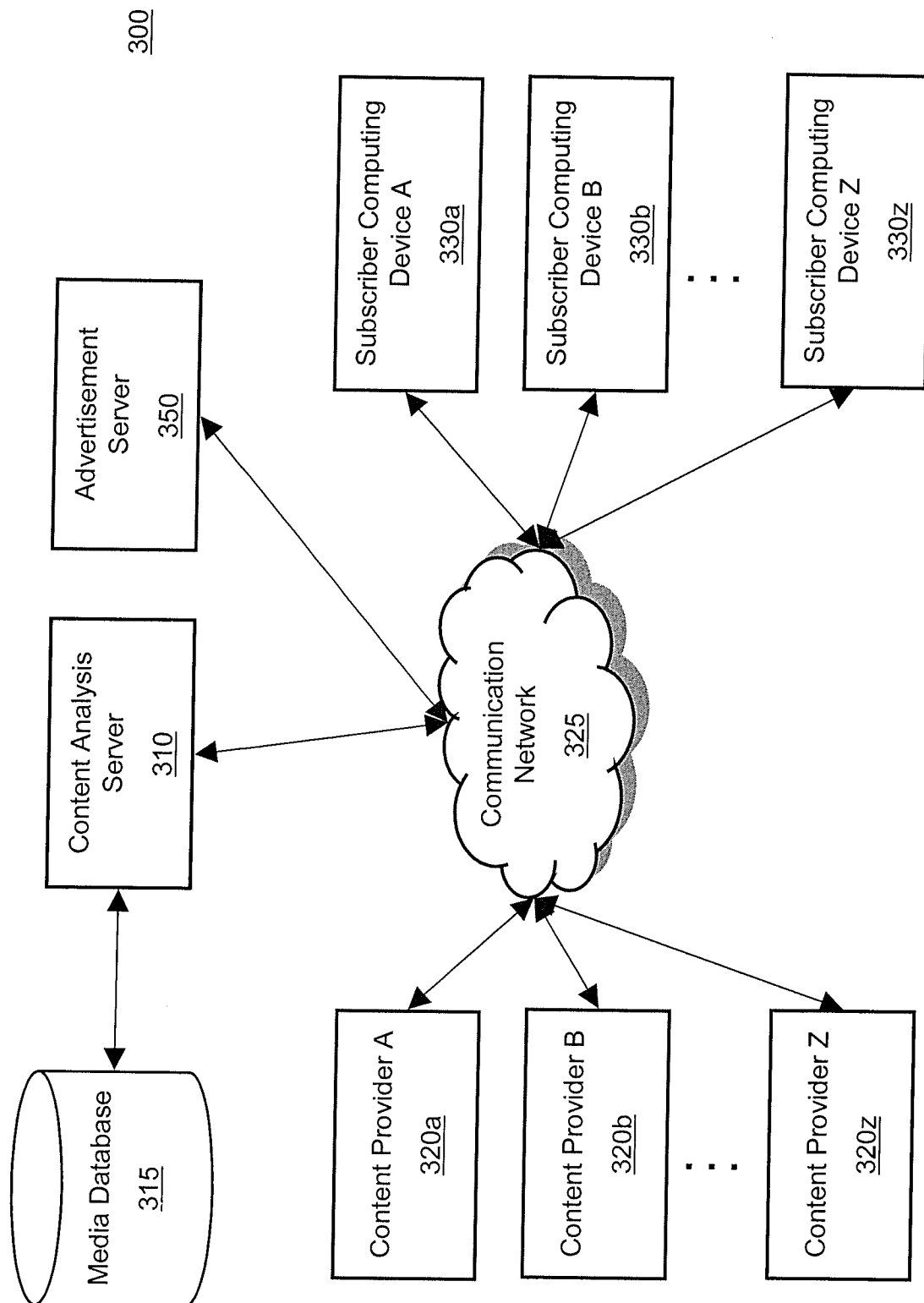
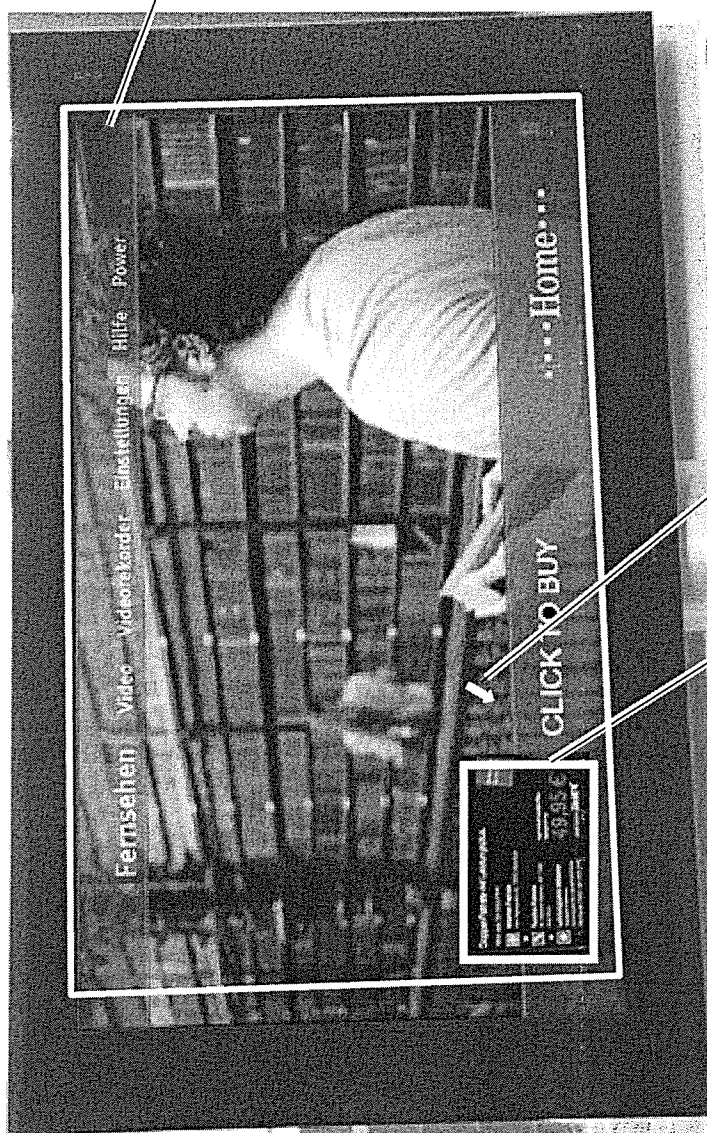


FIG. 3

400a

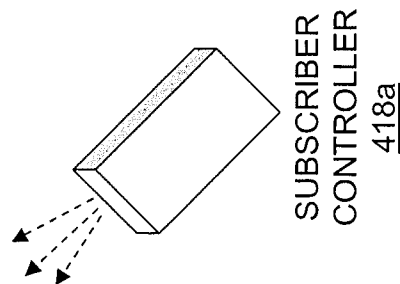
SUBSCRIBER
COMPUTING DEVICE
(TELEVISION)
410a



DISPLAY
(VIDEO +
TEXT
OVERLAY)
412a

CURSOR
416a

LINK(S)
414a



SUBSCRIBER
CONTROLLER
418a

FIG. 4A

400b

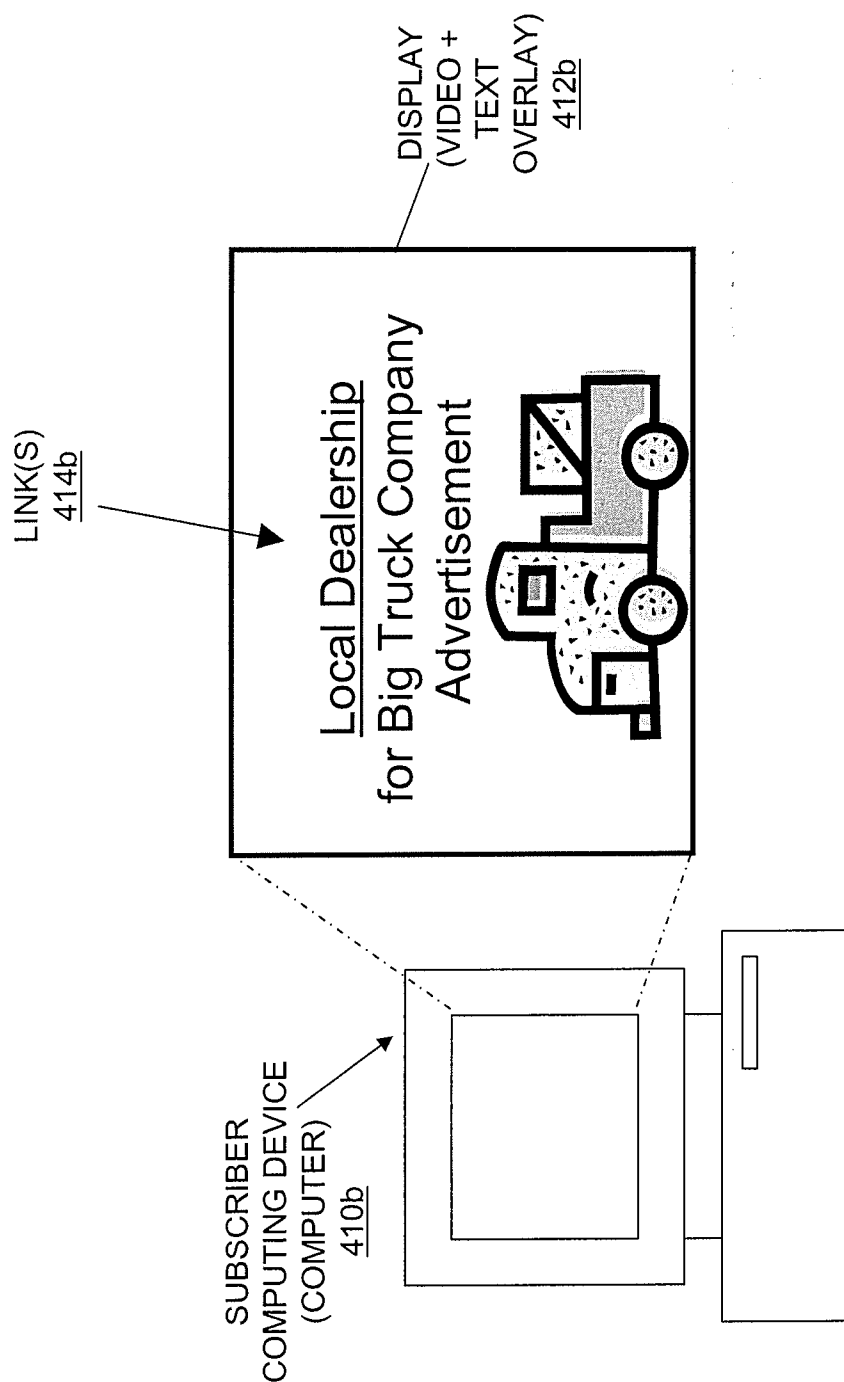


FIG. 4B

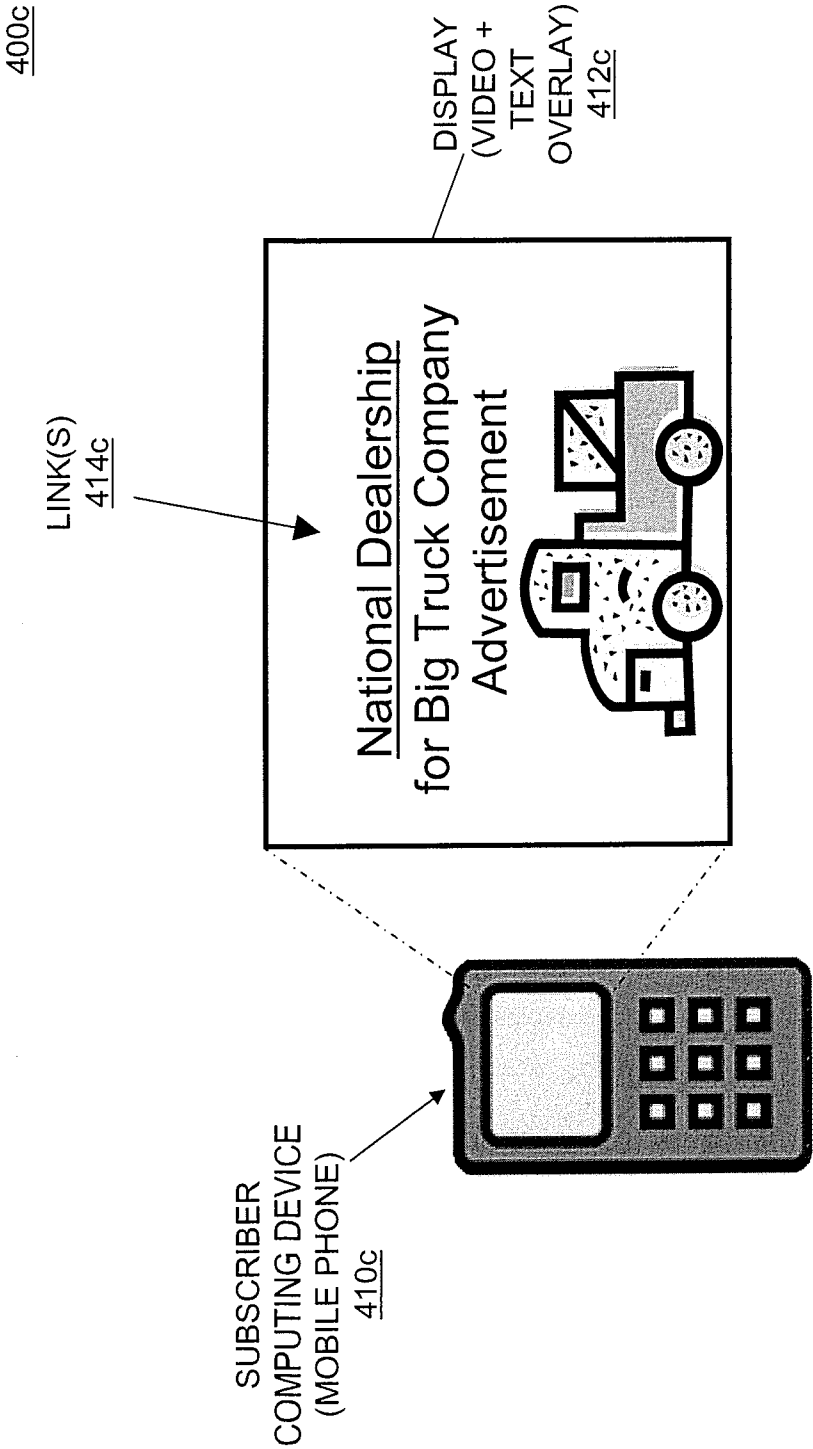


FIG. 4C

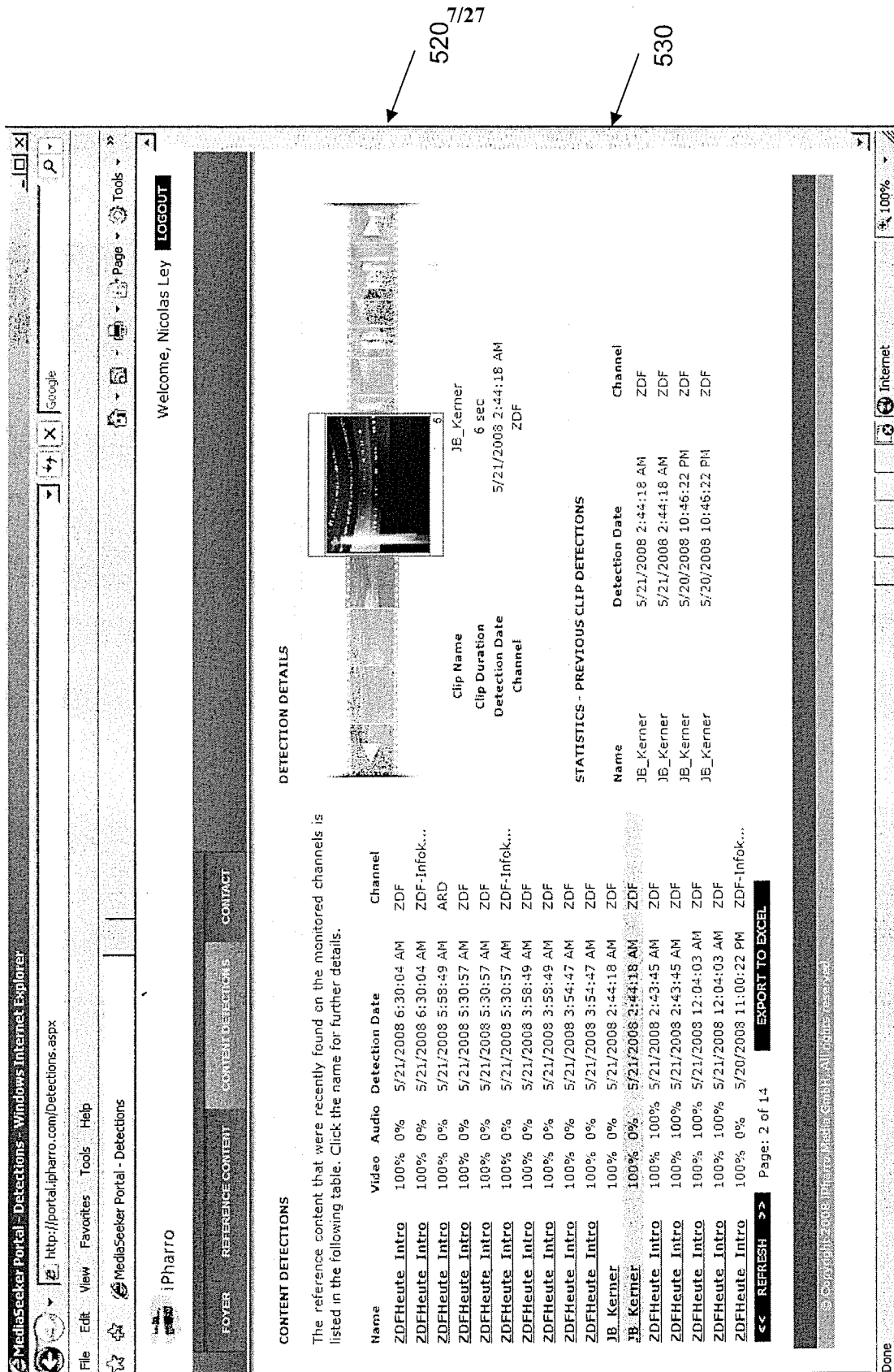


FIG. 5

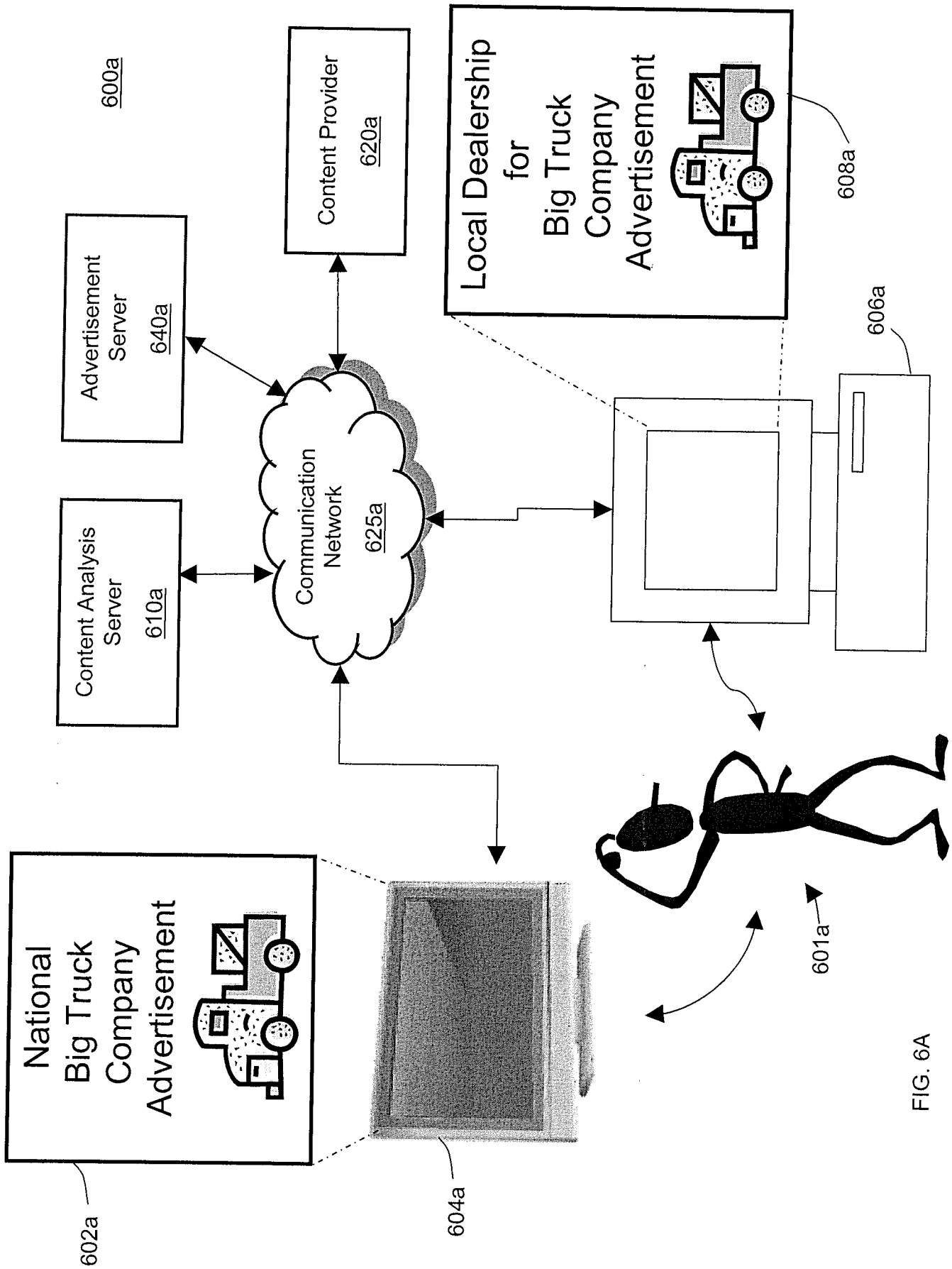


FIG. 6A

9/27

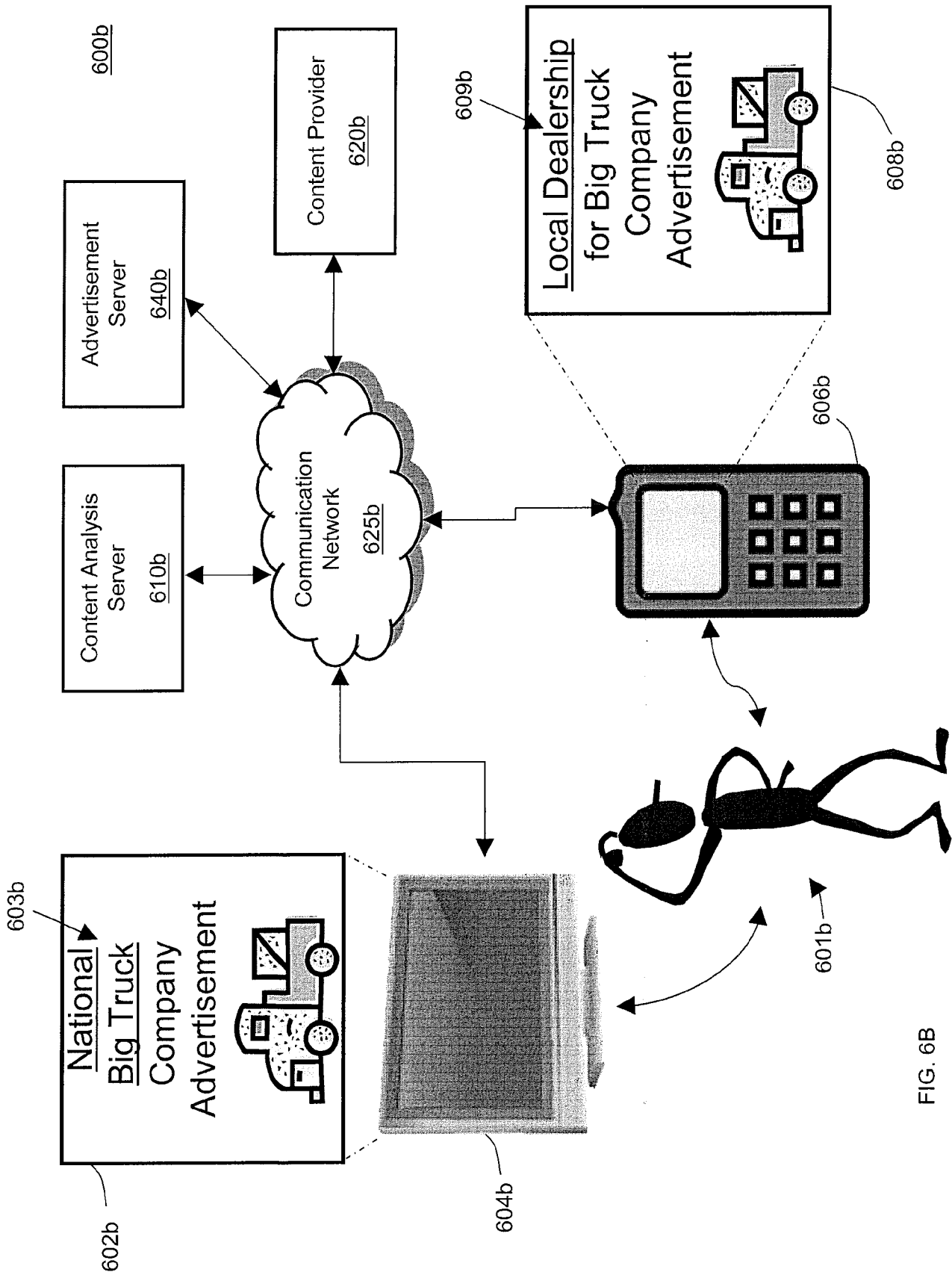


FIG. 6B

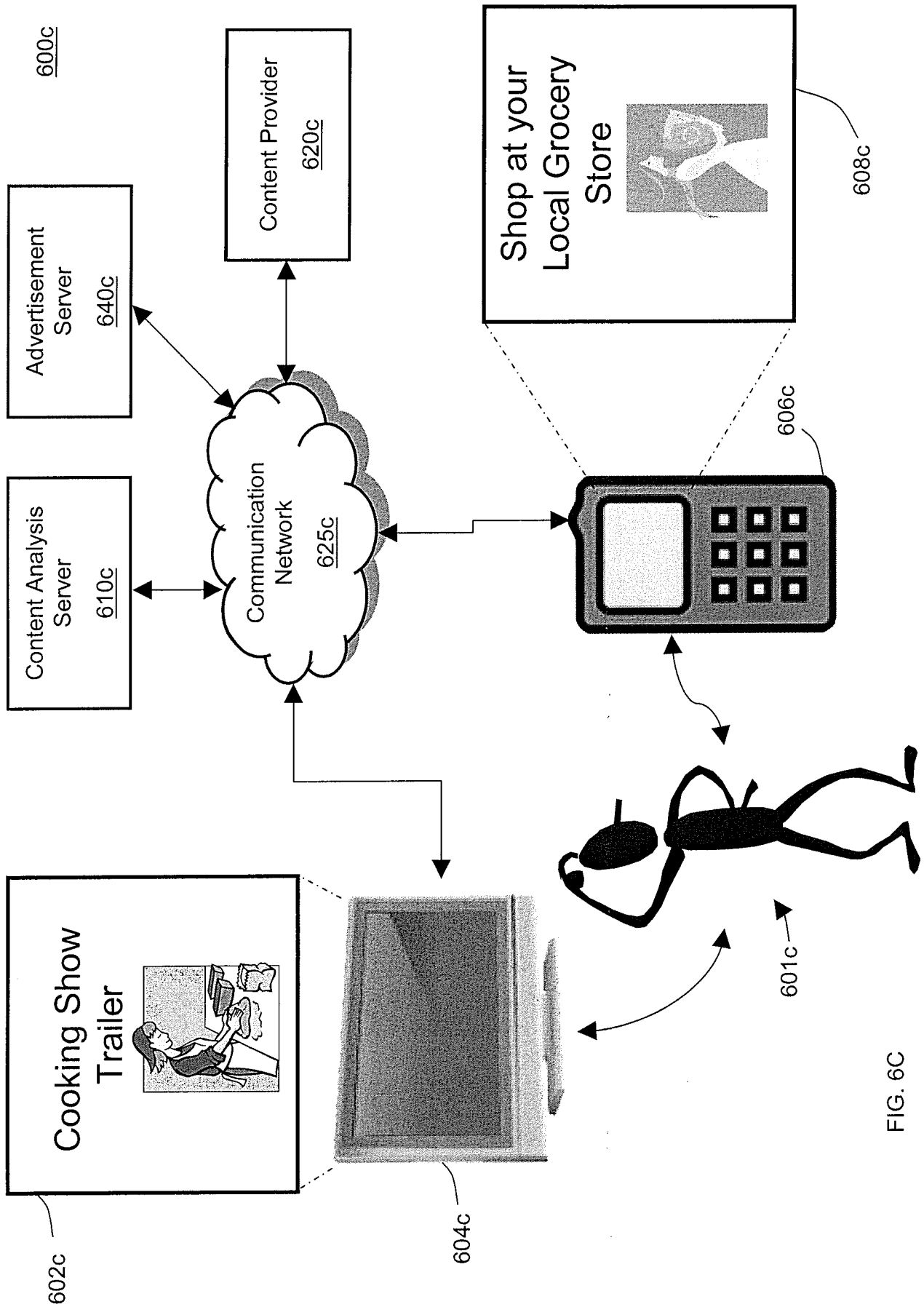


FIG. 6C

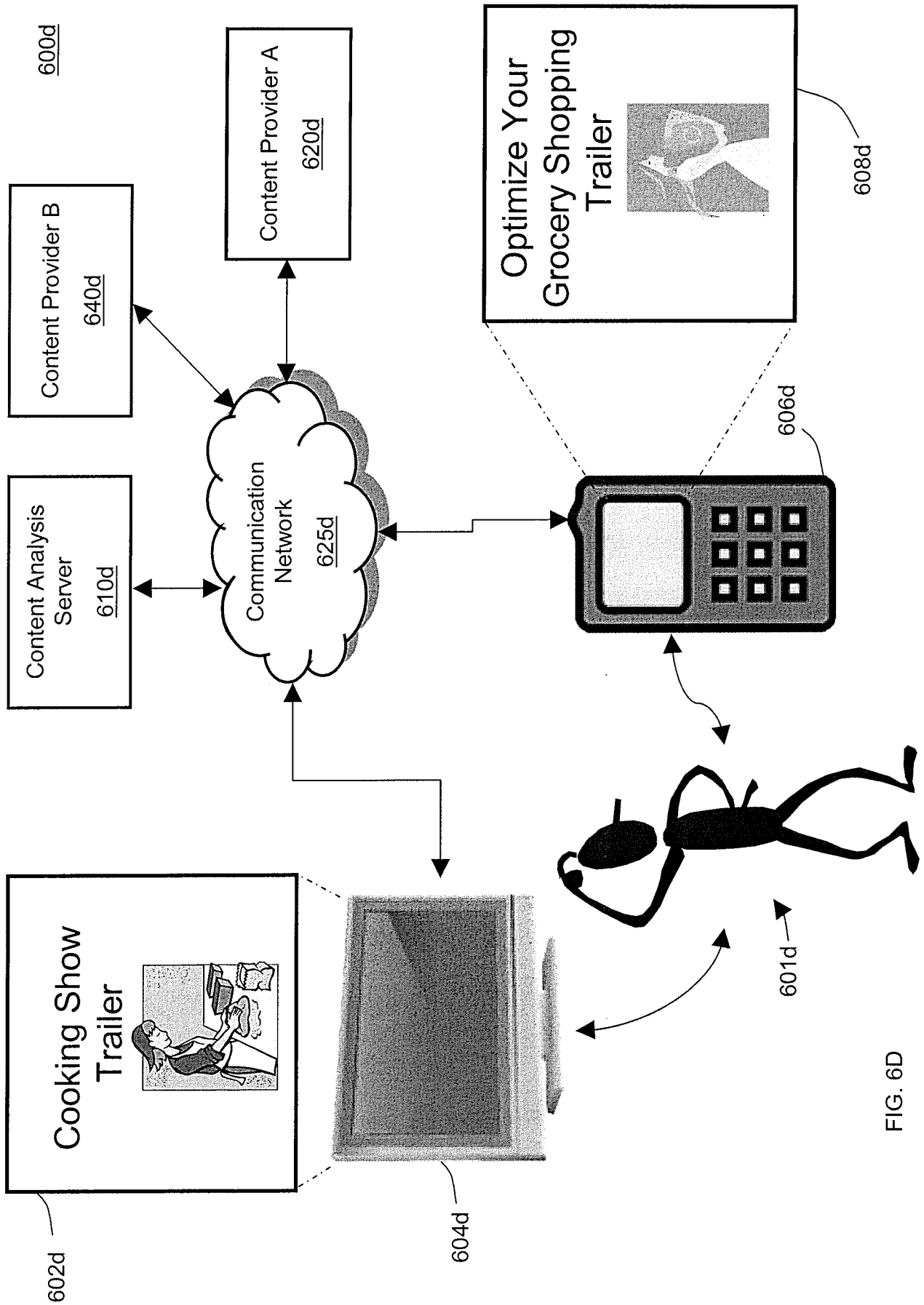


FIG. 6D

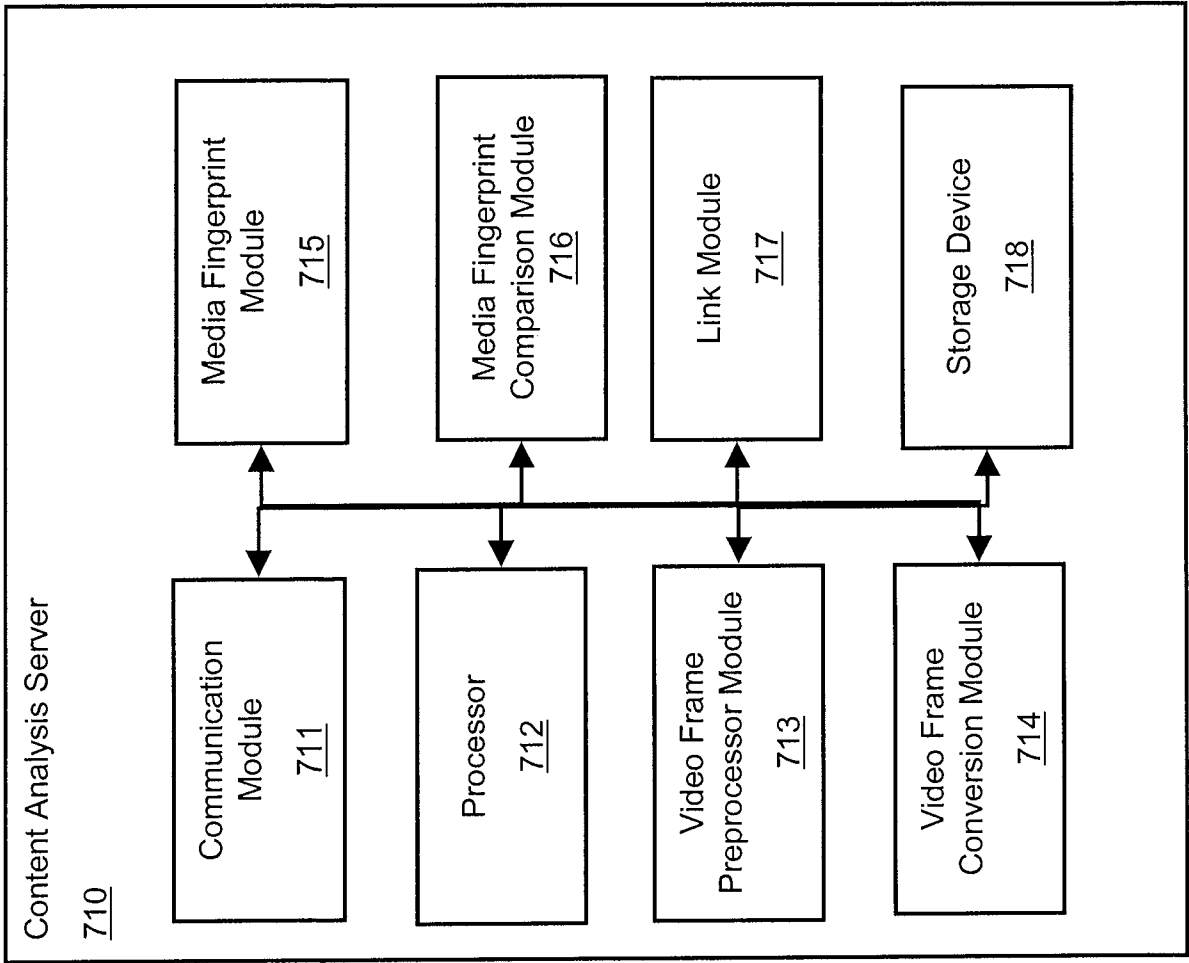


FIG. 7

700

800

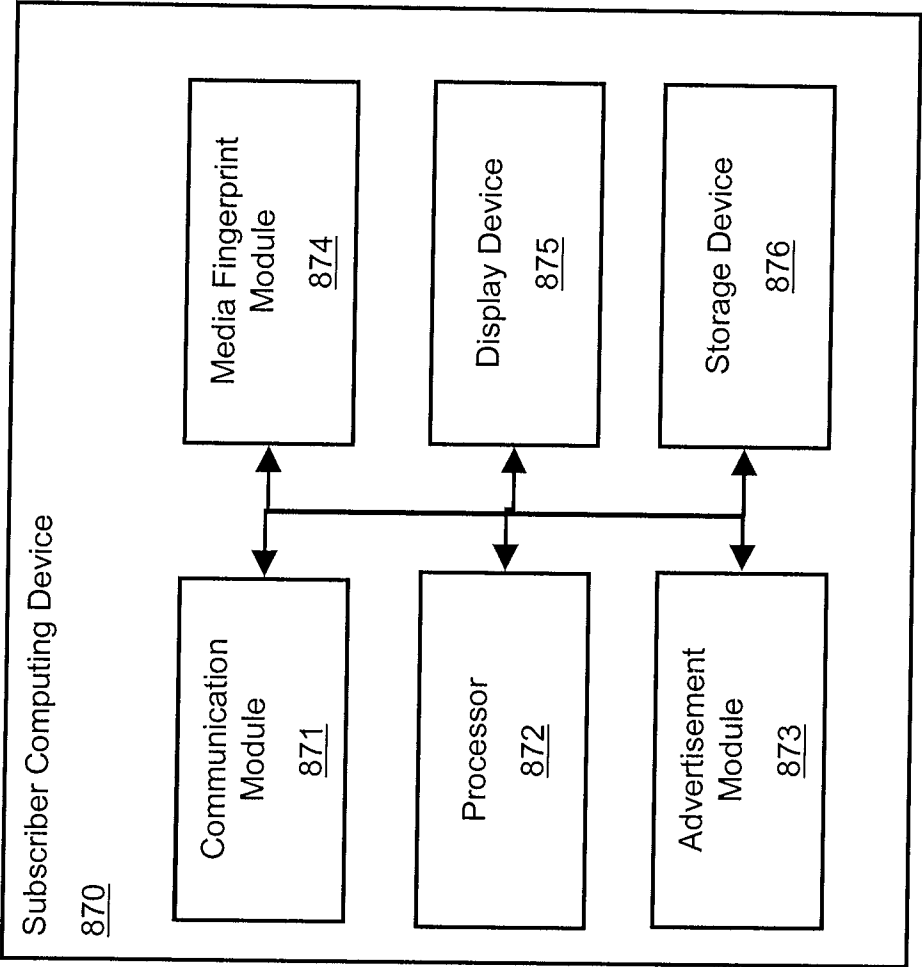


FIG. 8

900

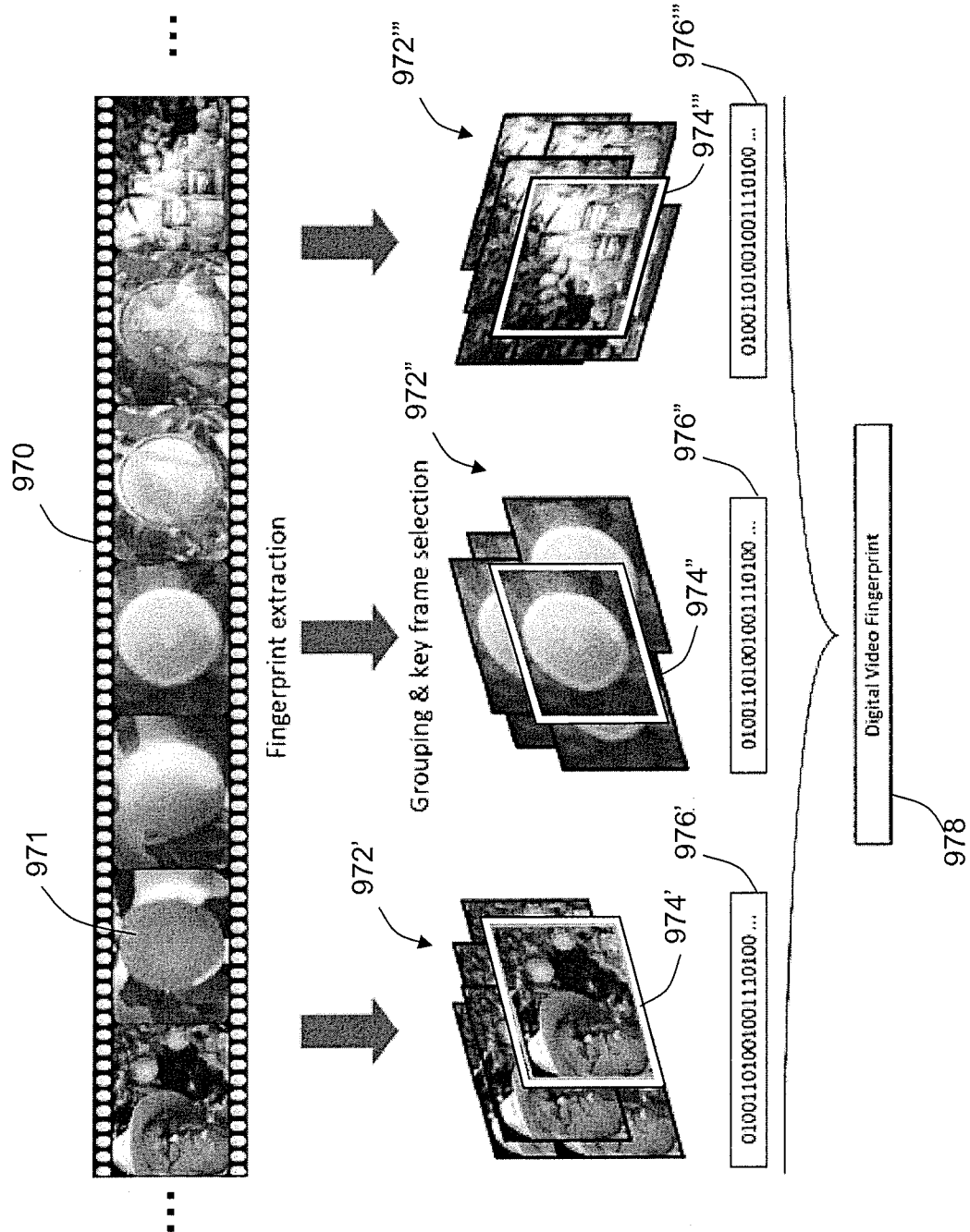


FIG. 9

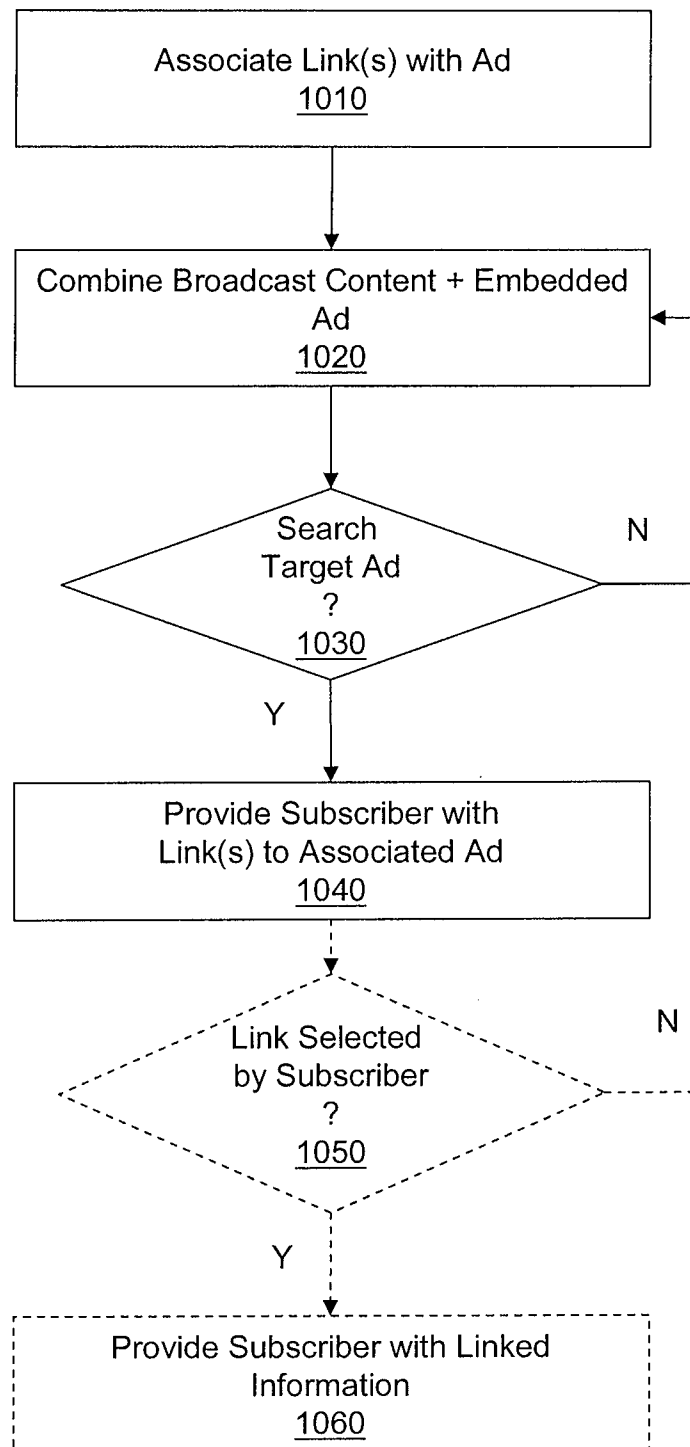
1000

FIG. 10

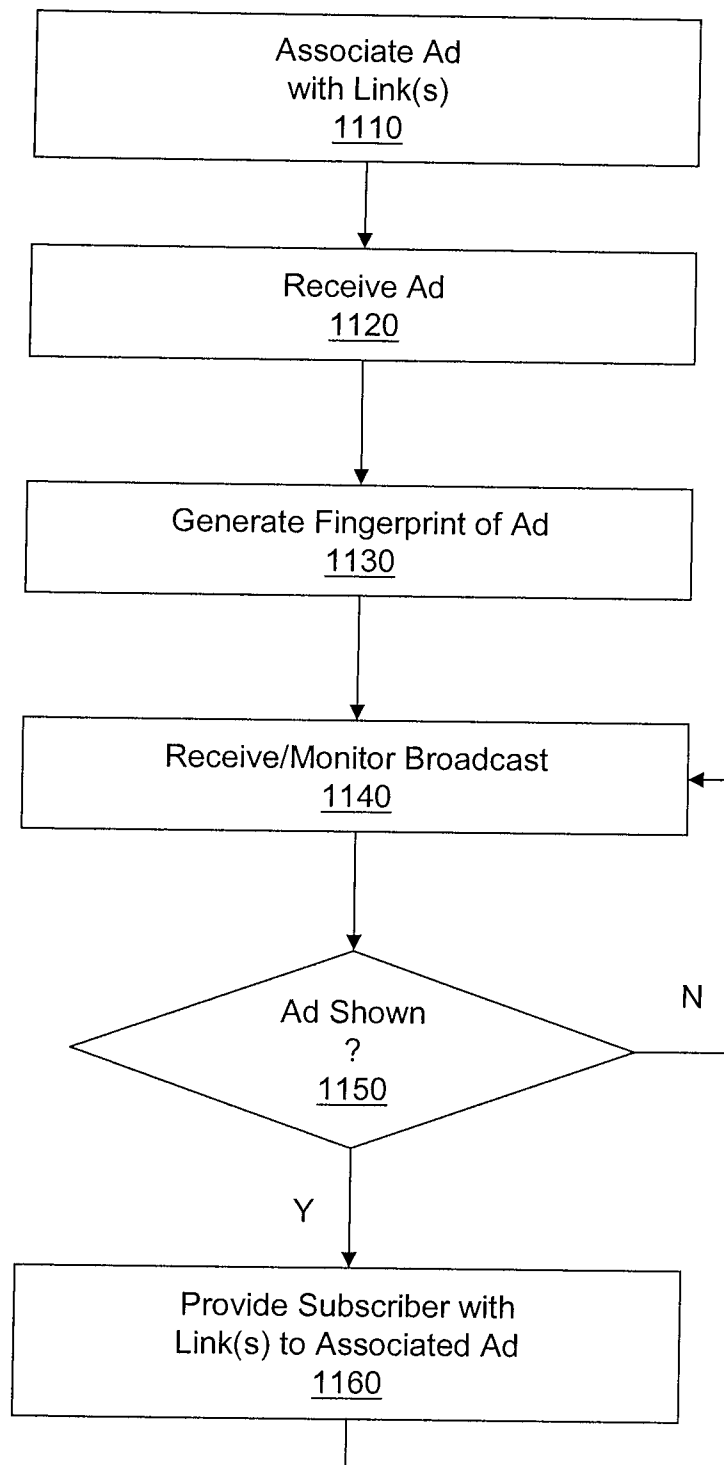
1100

FIG. 11

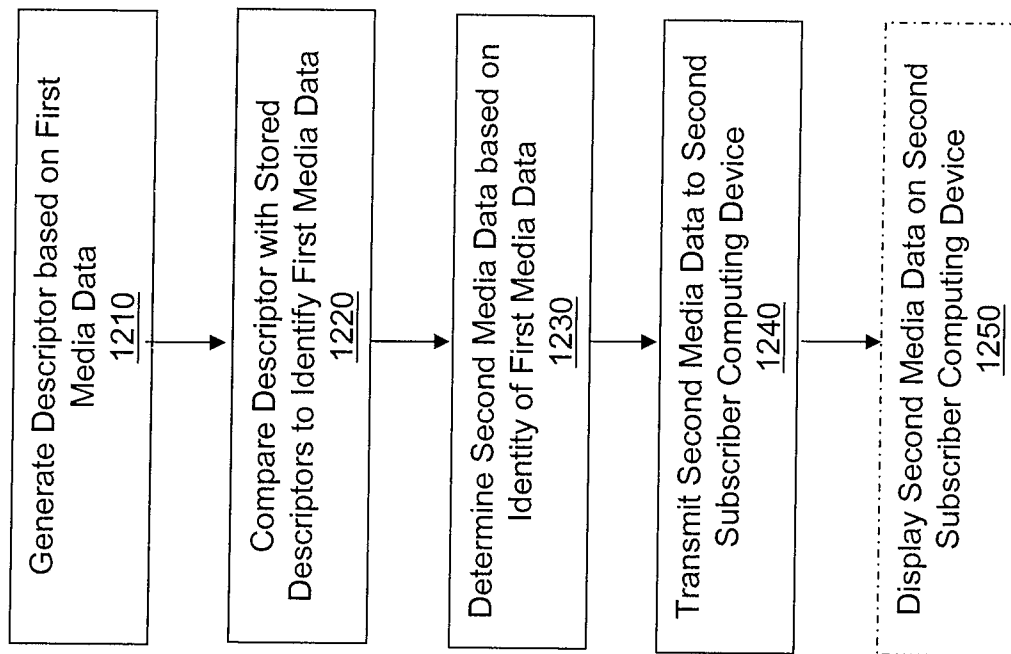
1200

FIG. 12

18/27

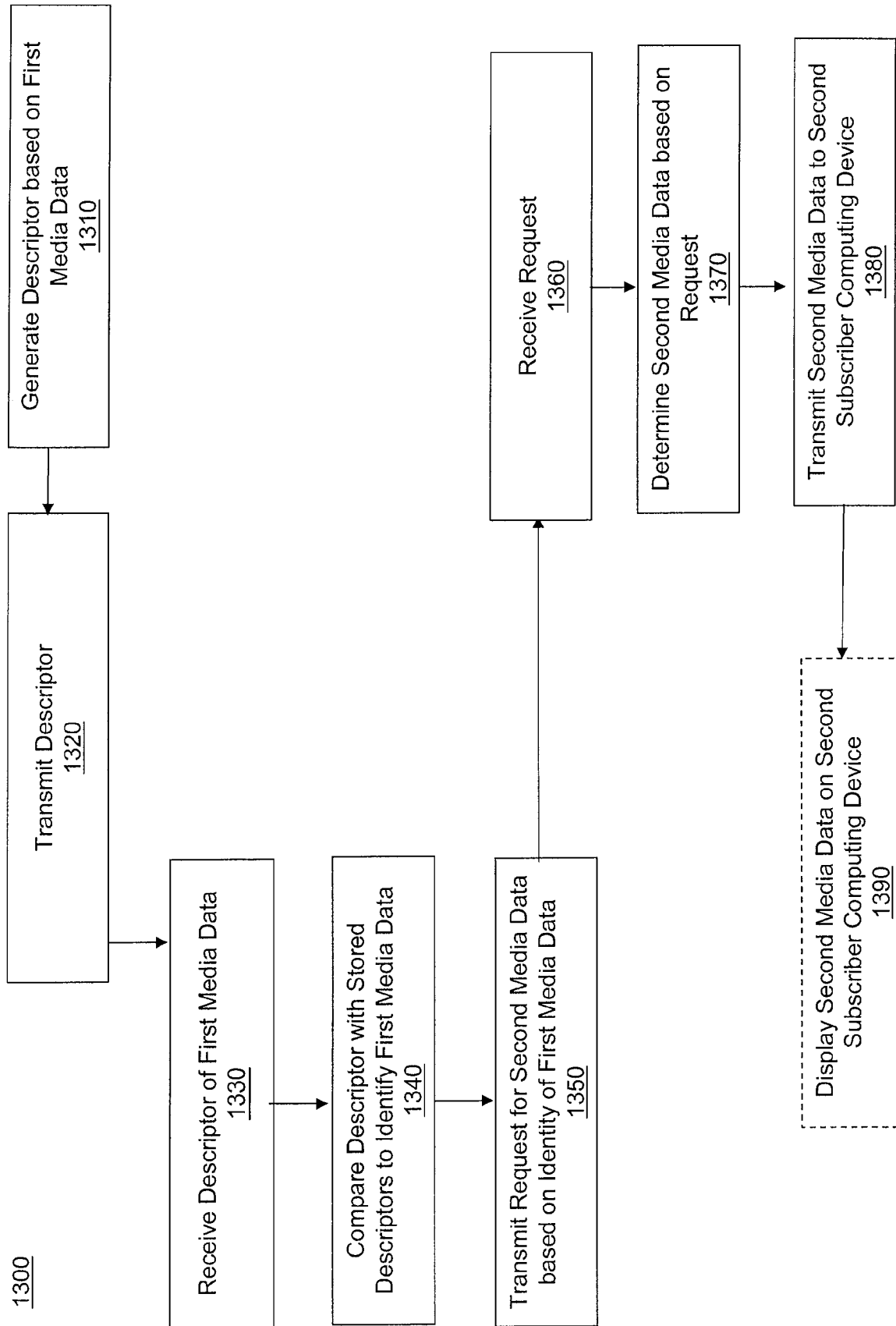


FIG. 13

1400

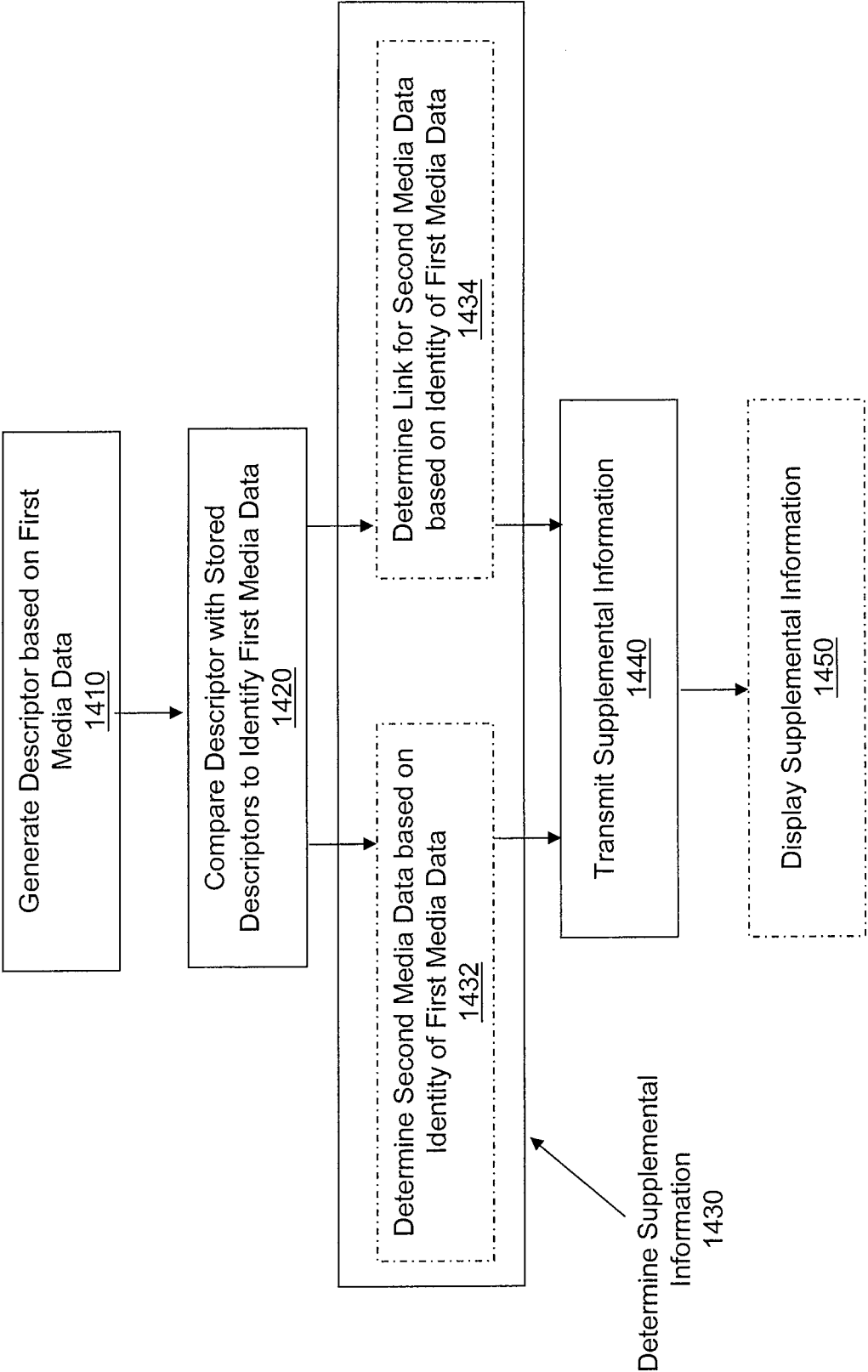


FIG. 14

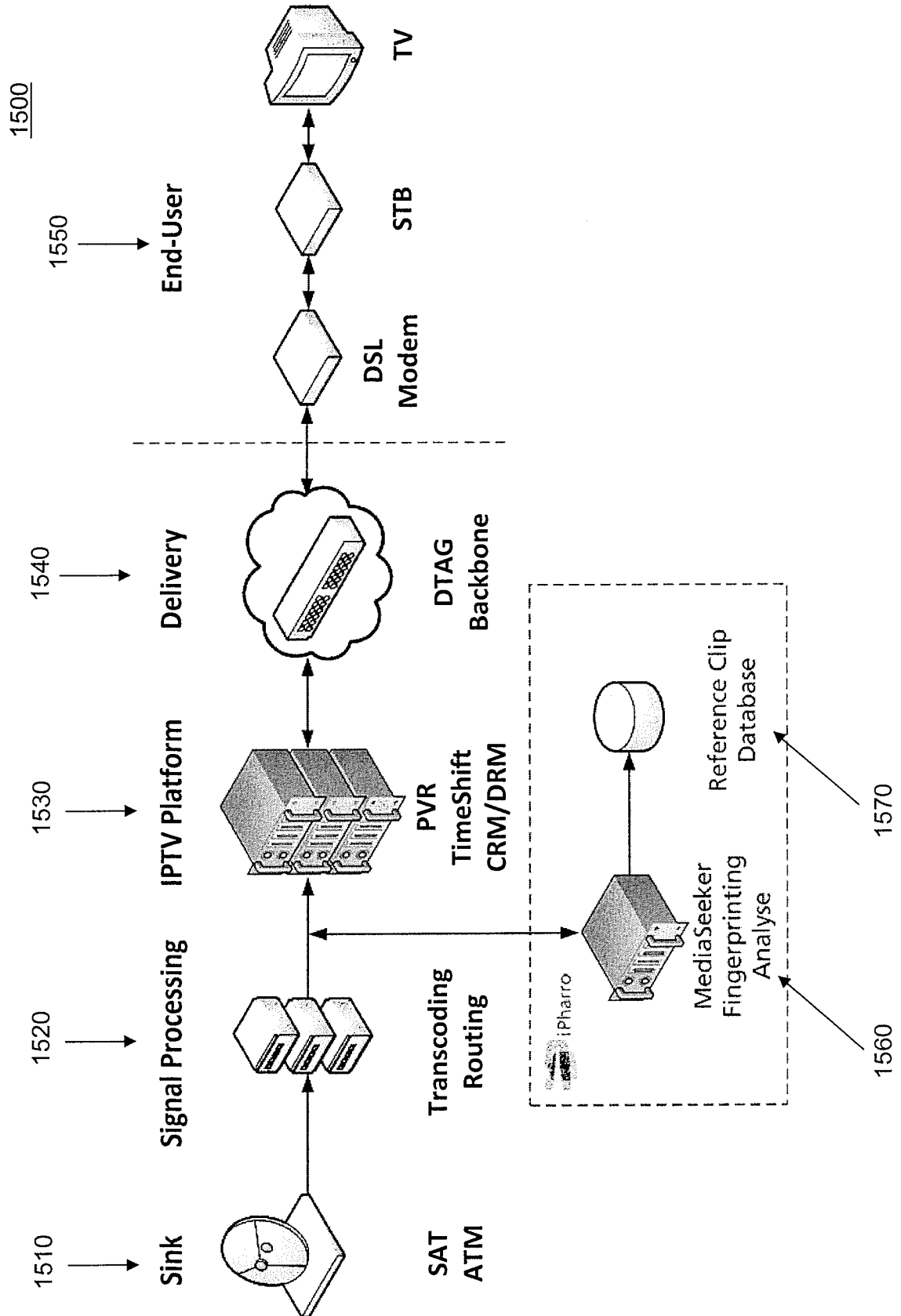


FIG. 15

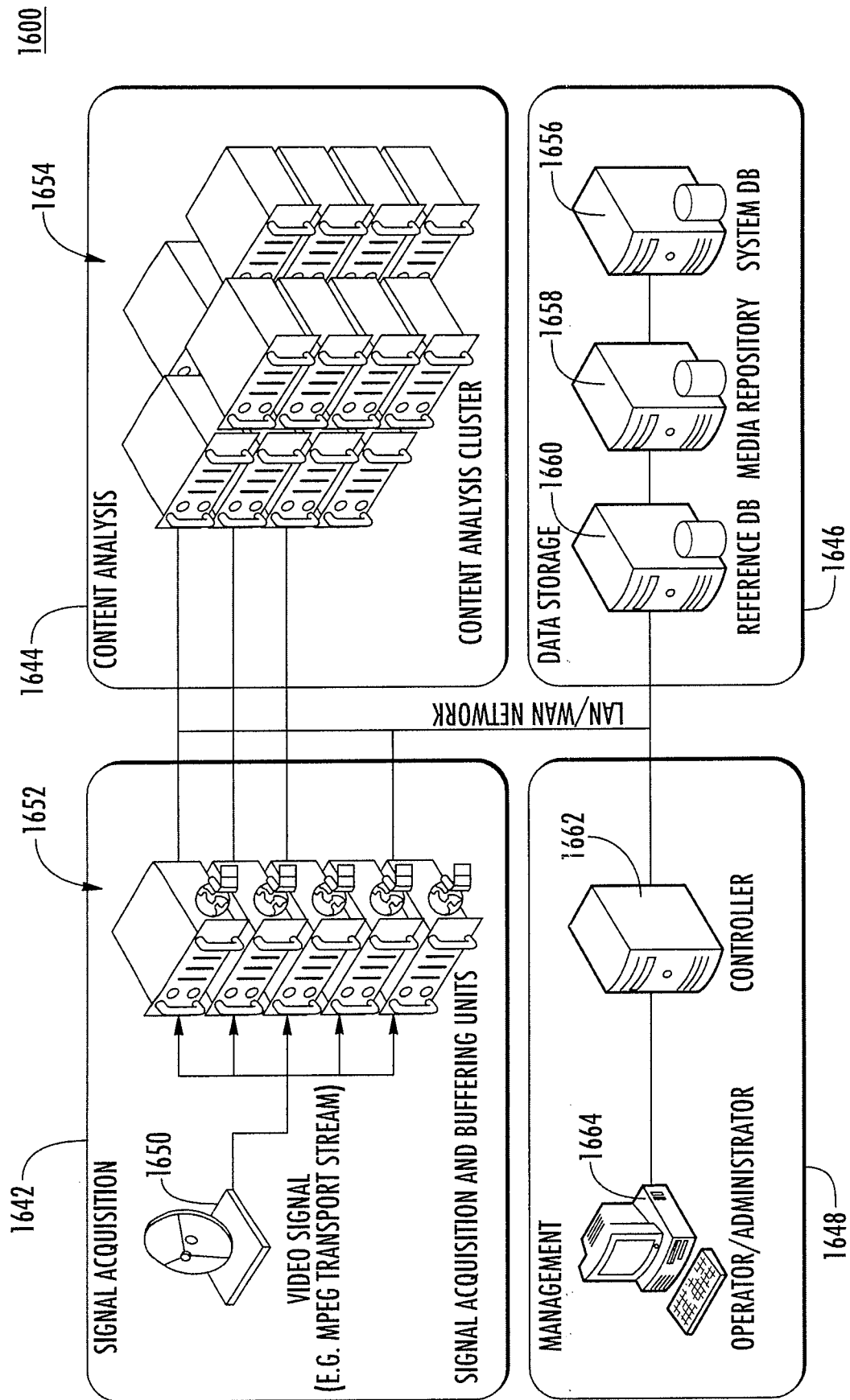


FIG. 16

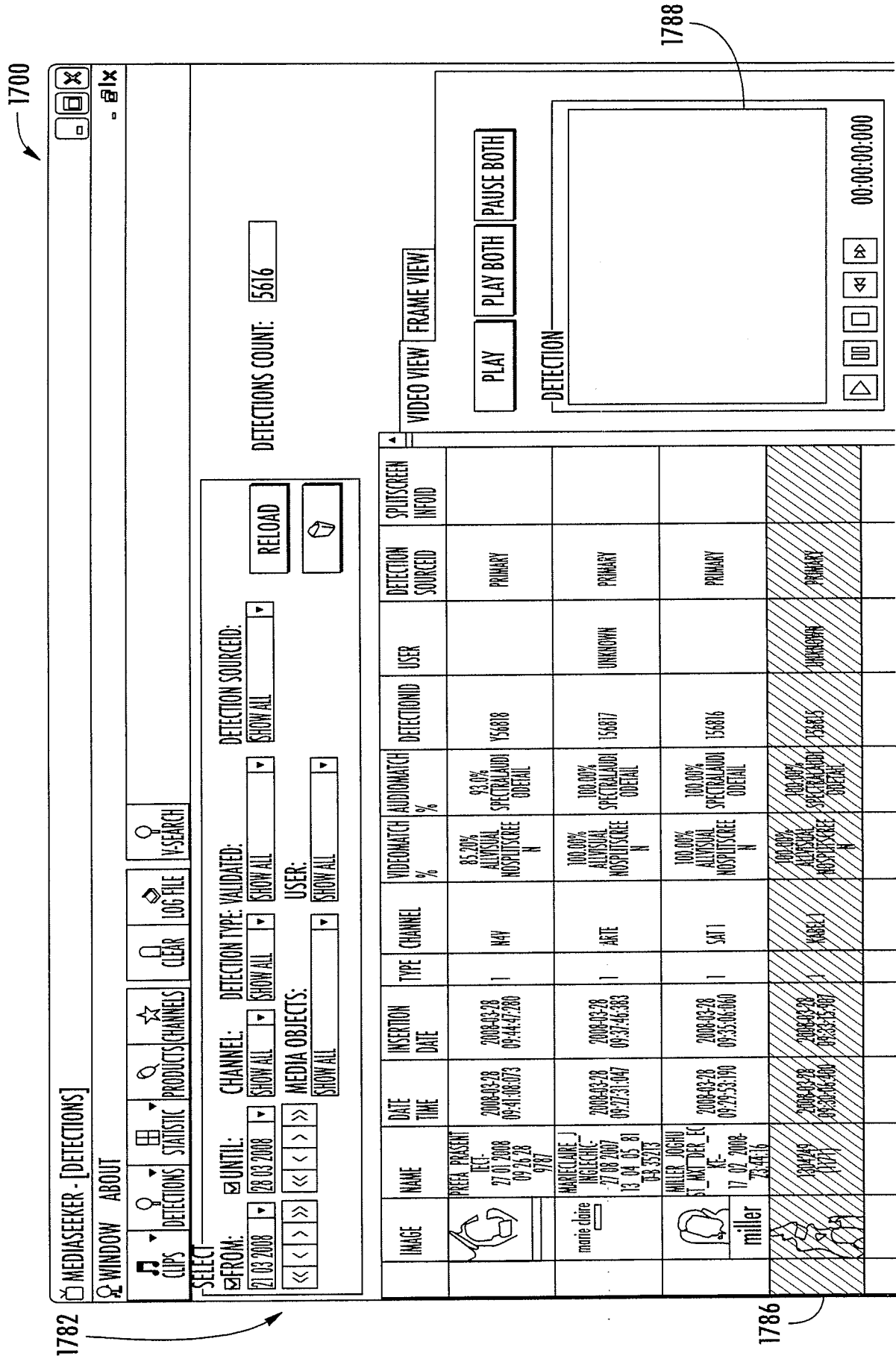


FIG. 17 (CONTINUED)

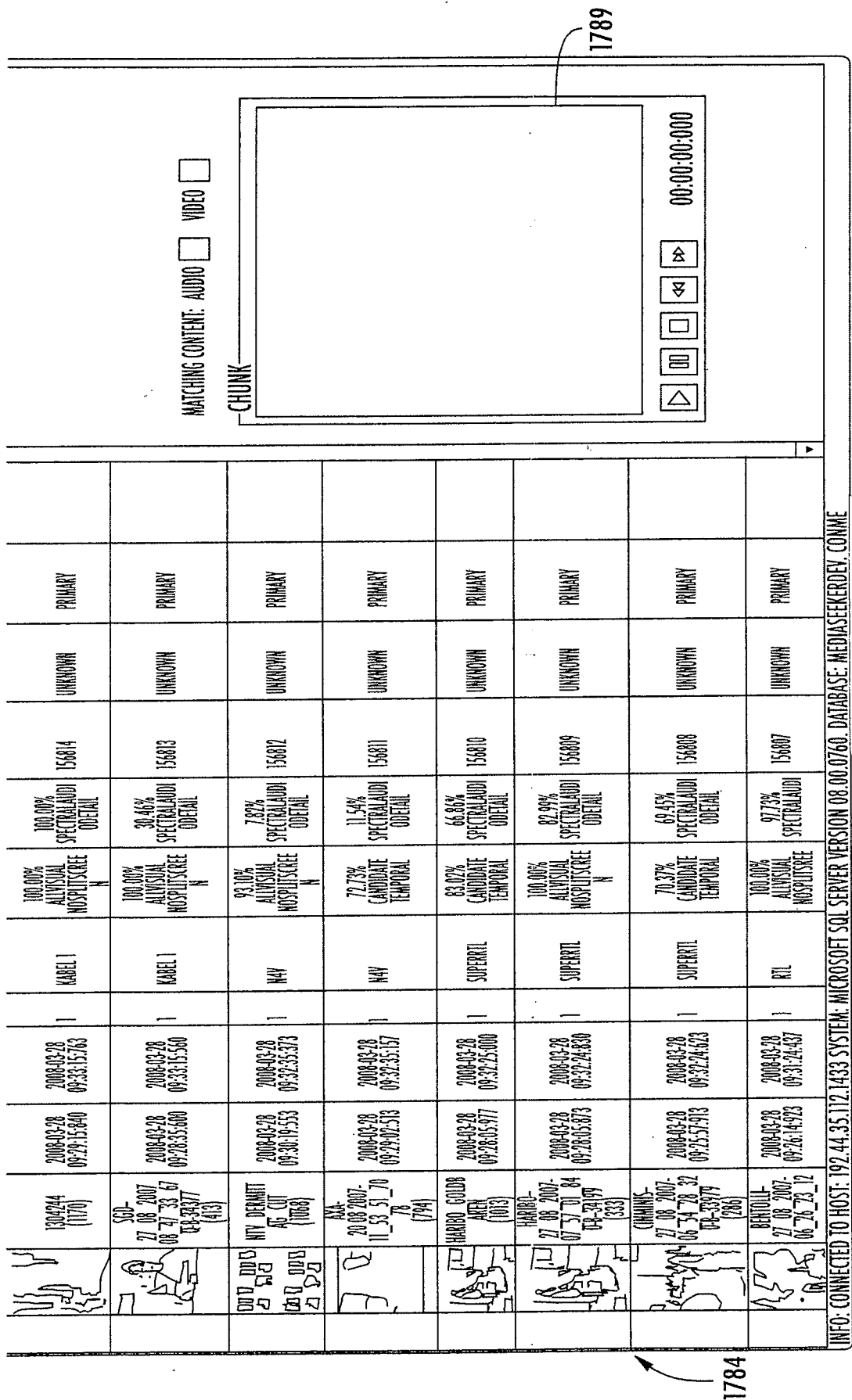


FIG. 17

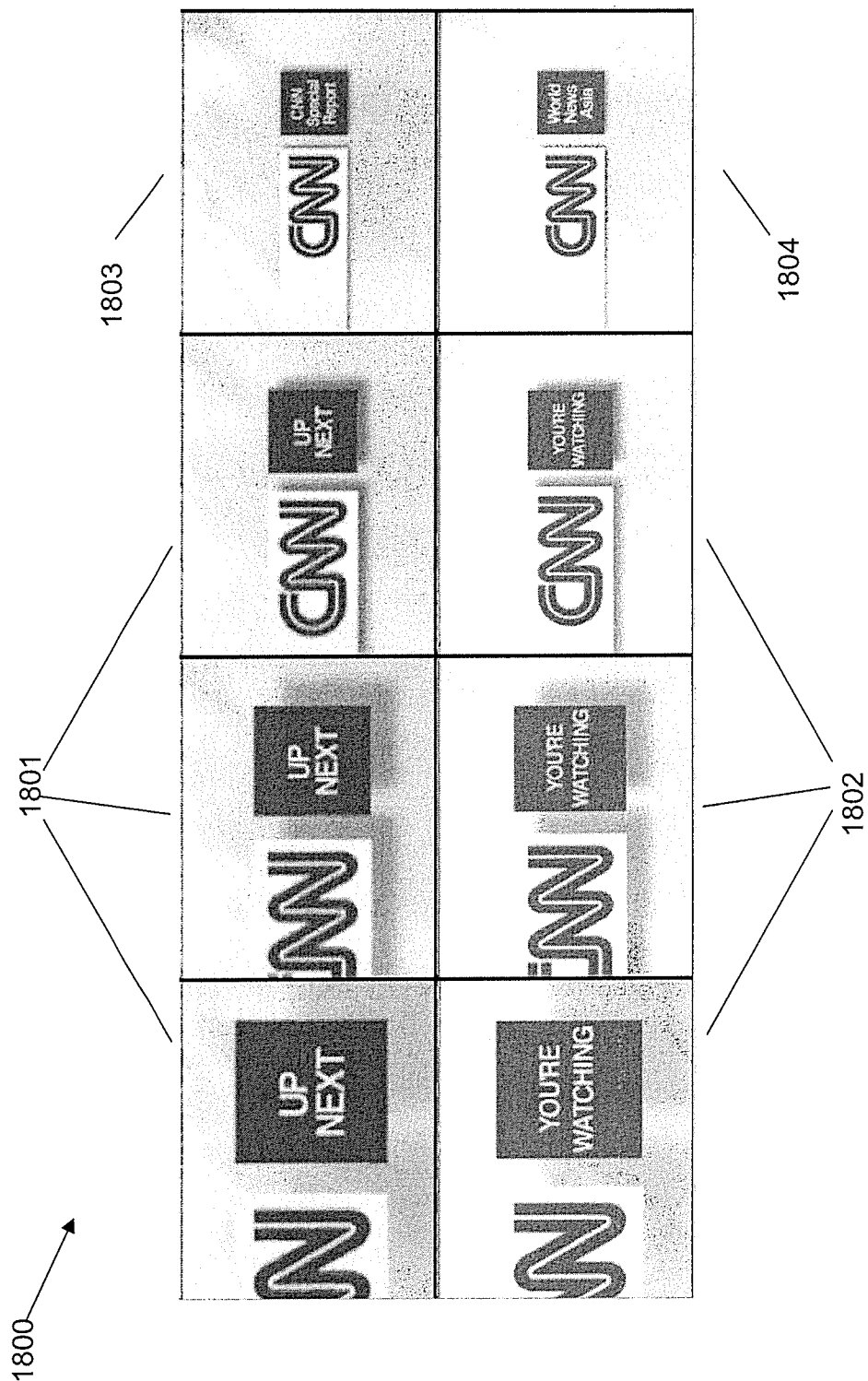


FIG. 18

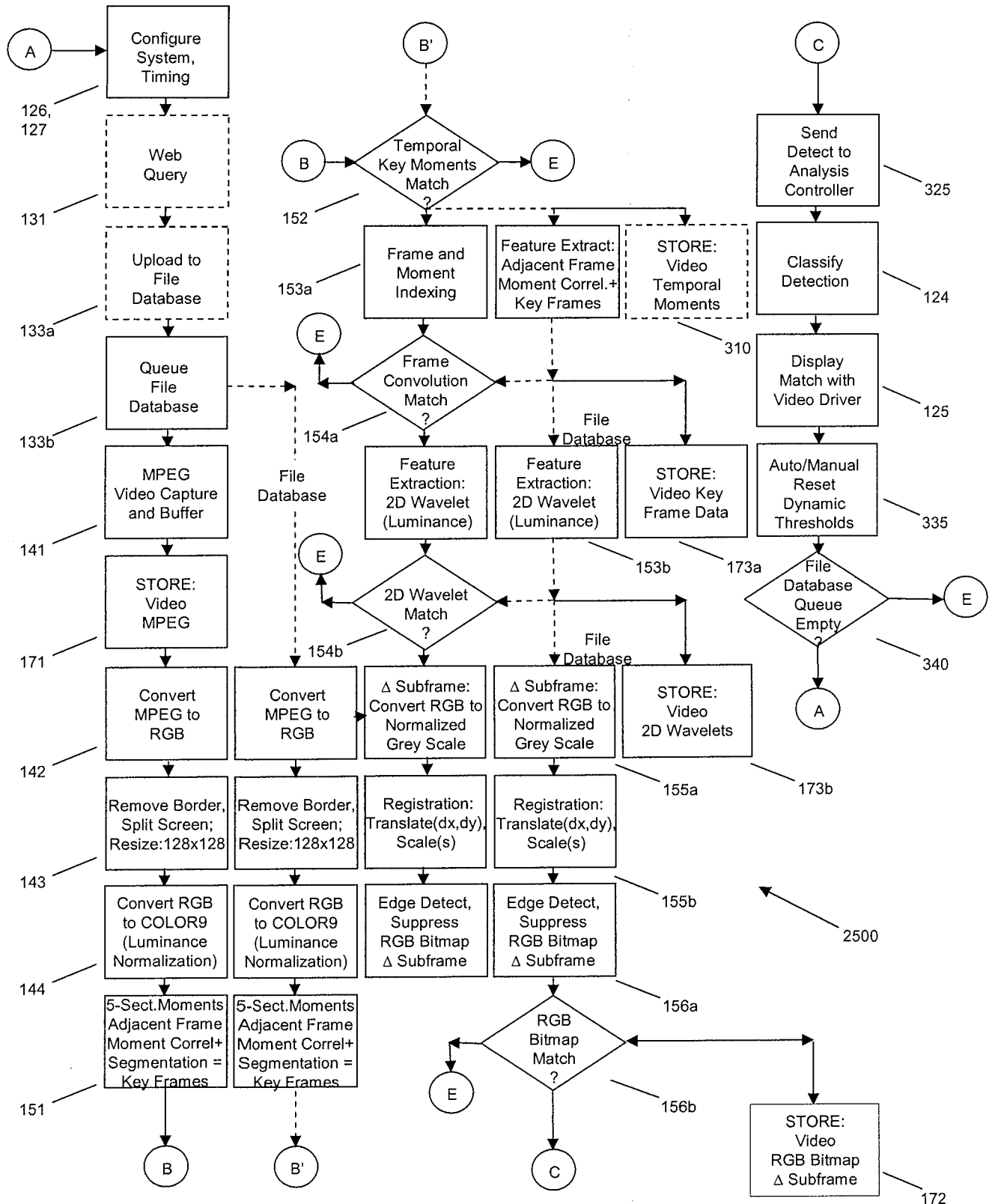


FIG. 19

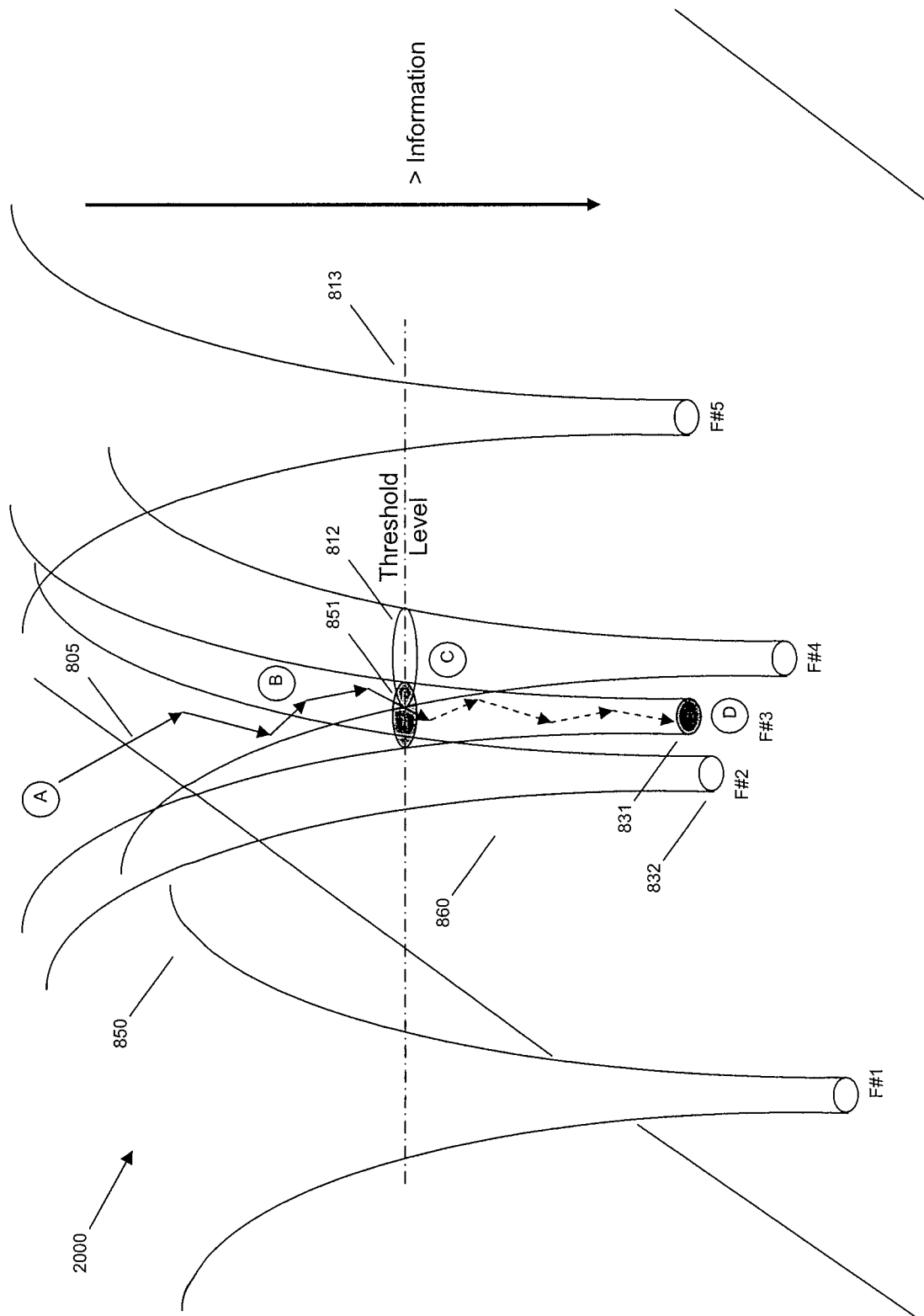


FIG. 20A

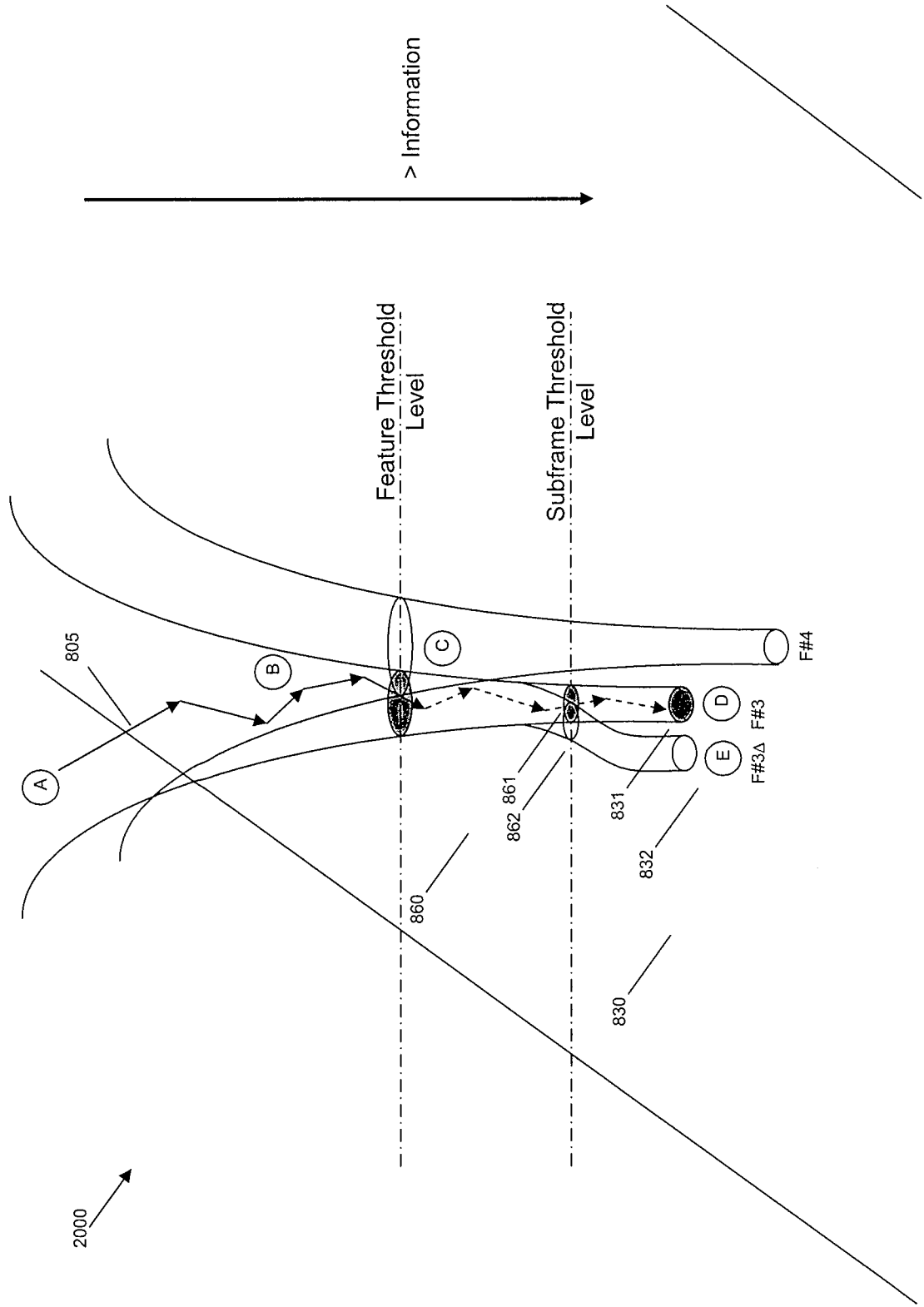


FIG. 20B