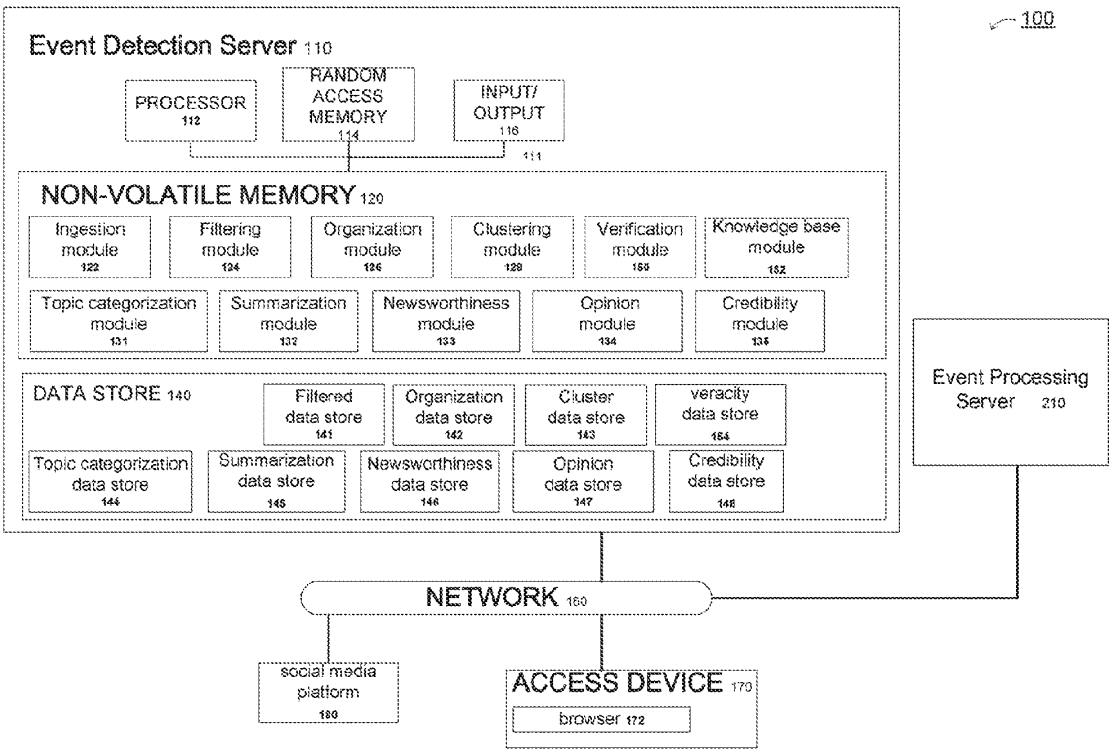

100
Event Detection Server 110
PROCESSOR 112
RANDOM ACCESS MEMORY 114
INPUT/ OUTPUT 116
111
NON-VOLATILE MEMORY 120
Ingestion module 122
Filtering module 124
Organization module 126
Clustering module 128
Verification module 150
Knowledge base module 152
Topic categorization module 131
Summarization module 132
Newsworthiness module 133
Opinion module 134
Credibility module 135
DATA STORE 140
Filtered data store 141
Organization data store 142
Cluster data store 143
veracity data store 154
Topic categorization data store 144
Summarization data store 145
Newsworthiness data store 146
Opinion data store 147
Credibility data store 148
Event Processing Server 210
NETWORK 160
social media platform 180
ACCESS DEVICE 170
browser 172

FIG. 1

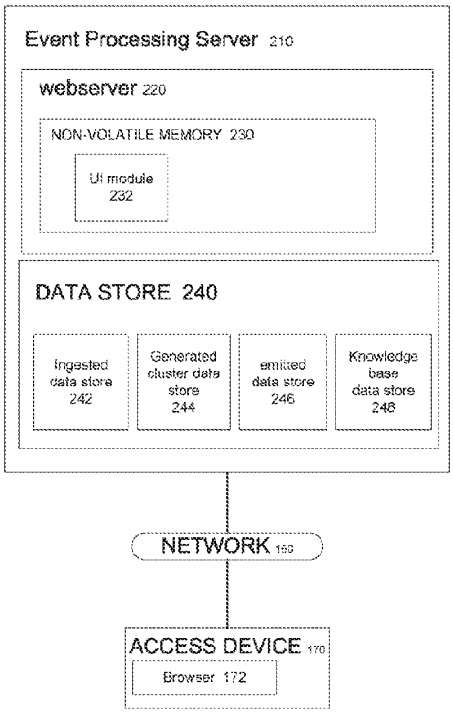
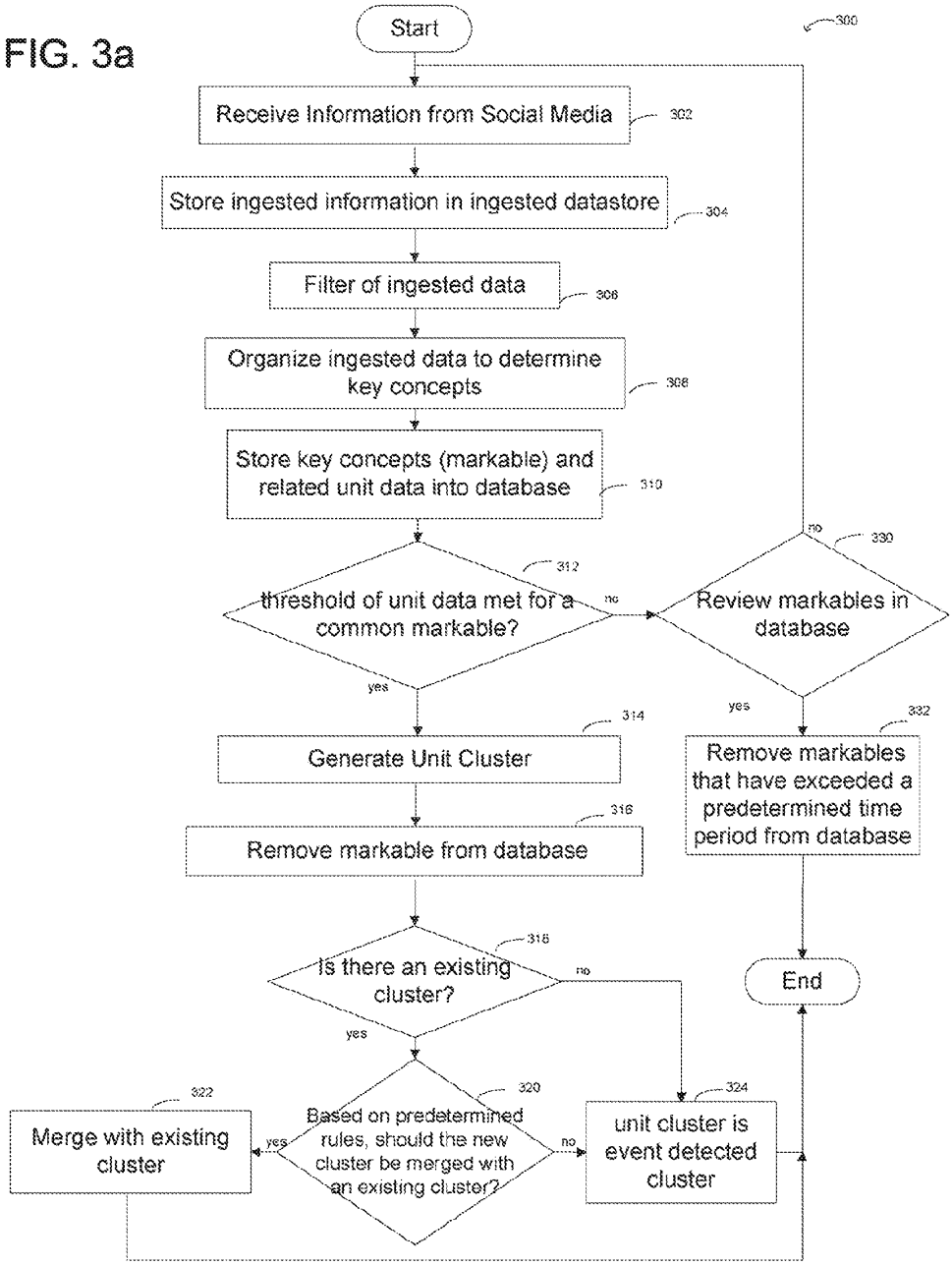

Event Processing Server 210
webserver 220
NON-VOLATILE MEMORY 230
UI module 232
DATA STORE 240
Ingested data store 242
Generated cluster data store 244
emitted data store 246
Knowledge base data store 248
NETWORK 160
ACCESS DEVICE 170
Browser 172

FIG. 2

FIG. 3a


Start
300
Receive Information from Social Media
302
Store ingested information in ingested datastore
304
Filter of ingested data
306
Organize ingested data to determine key concepts
308
Store key concepts (markable) and related unit data into database
310
threshold of unit data met for a common markable?
312
no
yes
Review markables in database
330
no
yes
Generate Unit Cluster
314
Remove markable from database
316
Remove markables that have exceeded a predetermined time period from database
332
Is there an existing cluster?
318
no
yes
End
Based on predetermined rules, should the new cluster be merged with an existing cluster?
320
yes
no
Merge with existing cluster
322
unit cluster is event detected cluster
324

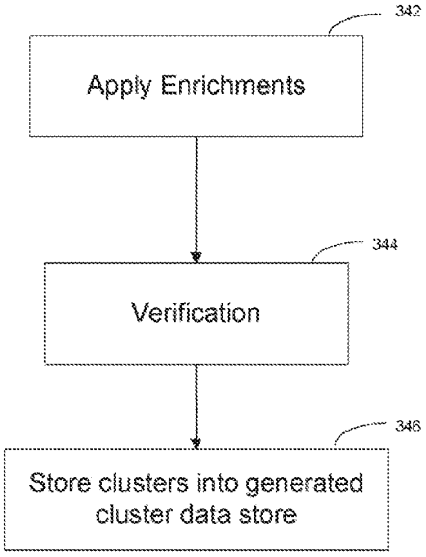

342
Apply Enrichments
344
Verification
346
Store clusters into generated cluster data store

FIG. 3b

Table 1: Description of Features

	Category	Feature Name	Feature Type	Feature Description
402a	User	HAS NAME	boolean	If the author has name
	User	HAS DESCRIPTION	Boolean	If the author has description
	User	USER HAS URL	Boolean	If the author has URL
	User	HAS LOCATION	Boolean	If the author has location
	User	MATCHES CLUSTER LOCATION	Boolean	If the author location matches event location
	User	IS WITNESS	Boolean	If the author is the witness of the event
	User	IS PROTECTED	Boolean	If the author is protected
	User	IS VERIFIED	Boolean	If the author is verified
402b	Tweet-level	HAS MULTIMEDIA	Boolean	If the tweet contains multimedia
	Tweet-level	HAS ELONGATED WORD	Boolean	If the tweet has elongated word
	Tweet-level	TWEET HAS URL	Boolean	If the tweet has url
	Tweet-level	HAS NEWS URL	Boolean	If the tweet has url from news organization
	Tweet-level	NUMBER SENTIMENT POSITIVE WORDS	NUMERICAL	number of positive sentiment word
	Tweet-level	NUMBER SENTIMENT NEGATIVE WORDS	NUMERICAL	number of negative sentiment word
	Tweet-level	SENTIMENT SCORE	NUMERICAL	the sentiment score of the tweet
402c	Event	EVENT TOPIC	CATEGORICAL	The topic of the event
	Event	MOST RETWEET CNT	NUMERICAL	the count of the most retweeted tweets
	Event	RETWEET SUM	NUMERICAL	the sum of number of retweeted tweets
	Event	HASHTAG SUM	NUMERICAL	the sum of number of hastags
	Event	NEGATION FRACTION	NUMERICAL	the fraction of tweets that deny the event
	Event	SUPPORT FRACTION	NUMERICAL	the fraction of tweets that believe the event
	Event	QUESTION FRACTION	NUMERICAL	the fraction of tweets that question the event

FIG. 4a

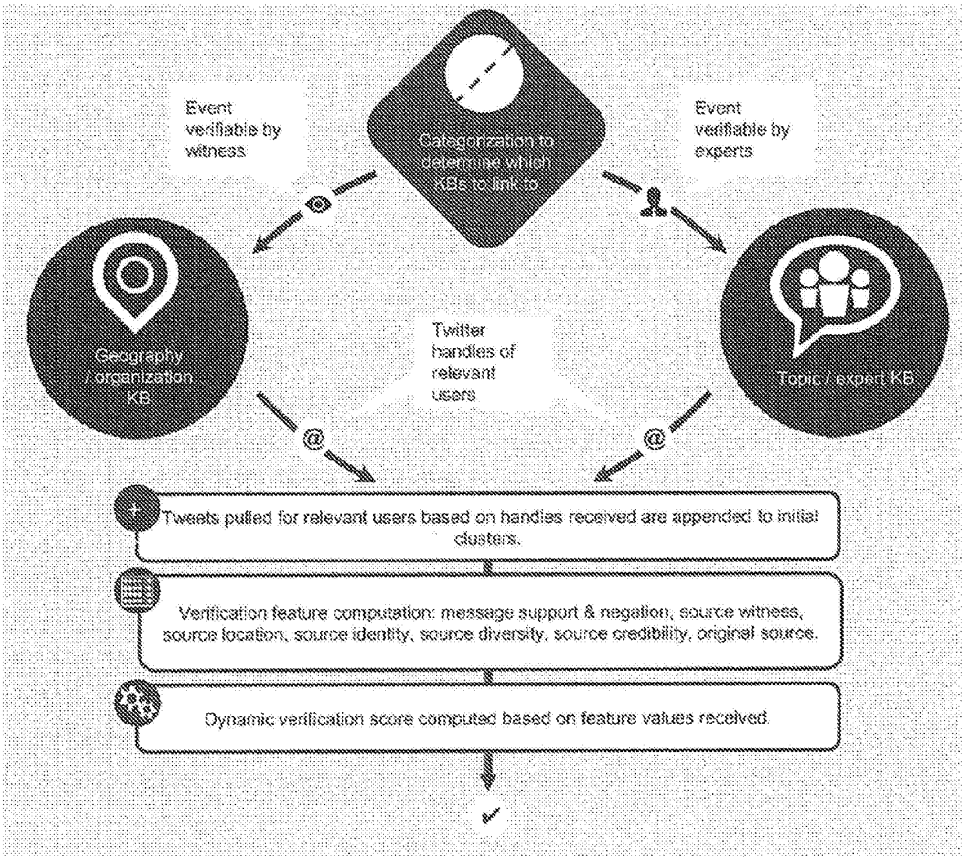

Event verifiable by witness
Categorization to determine which KBs to link to
Event verifiable by experts
Geography /organization KB
Twitter handles of relevant users
Topic / expert KB
Tweets pulled for relevant users based on handles received are appended to initial clusters.
Verification feature computation: message support & negation, source witness, source location, source identity, source diversity, source credibility, original source.
Dynamic verification score computed based on feature values received.

FIG. 4b



FIG. 5a

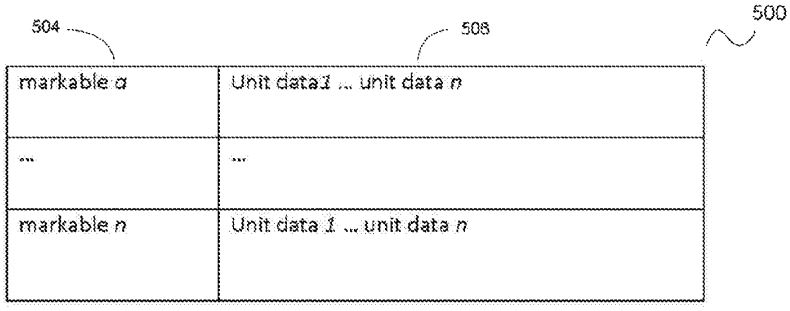


FIG. 5b

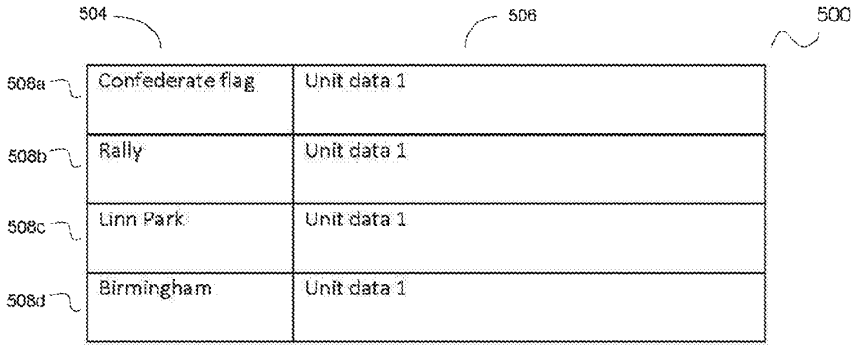


FIG. 5c

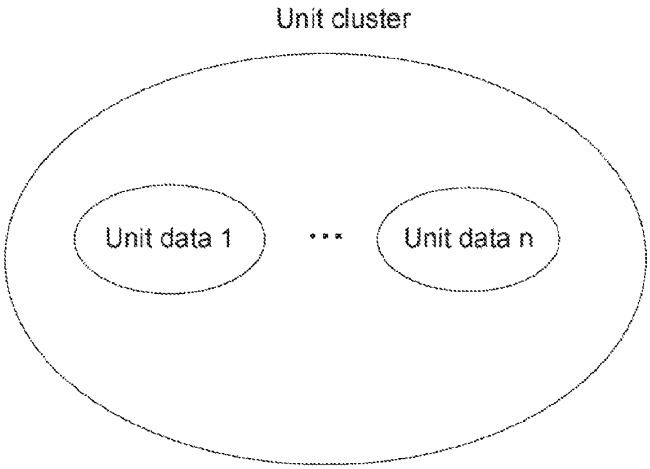

Unit cluster
Unit data 1
...
Unit data n

FIG. 5d

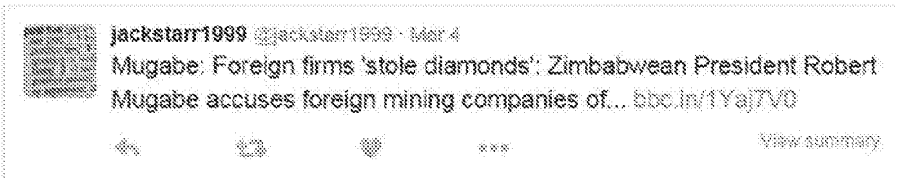

jackstarr1999 @jackstarr1999 · Mar 4
Mugabe: Foreign firms 'stole diamonds': Zimbabwean President Robert Mugabe accuses foreign mining companies of... bbc.in/1Yaj7V0
View summary

FIG. 5e

{
"_index": "blip2016.03.04",
"_type": "twitter",
"_id": "72ea1b70e23411e5a6f5fa163ee42fcd",
"_score": null,
"_source": {
"user_handle": "jackstarr1999",
"friends_count": 9976,
"source": "twitterfeed",
"favorite_count": 0,
"content_type": "Twitter",
"urls": [
{
"expanded_url": "http://bbc.in/1Yaj7V0",
"indices": {
"first": 114,
"second": 137
},
"url": "https://t.co/ZIsuqo6Nri",
"domain": "bbc.in",
"display_url": "bbc.in/1Yaj7V0",
"is_short_url": false
}
],
"followers_count": 13262,
"is_retweet": false,
"text": "Mugabe: Foreign firms 'stole diamonds': Zimbabwean President Robert
Mugabe
accuses foreign mining companies of... https://t.co/ZIsuqo6Nri",
"retweet_count": 0,
"user_id": "268036007",
"id": "72ea1b70e23411e5a6f5fa163ee42fcd",
"language": "en",
"raw": {
"coordinates": null,
"retweeted": false,
"source": "twitterfeed",
"entities": {
"hashtags": [],
"urls": [
{
"url": "https://t.co/ZIsuqo6Nri",

FIG. 5f

"expanded_url": "http://bbc.in/1Yaj7V0",
"display_url": "bbc.in/1Yaj7V0",
"indices": [
114,
137
]
}
],
"user_mentions": [],
"symbols": []
},
"favorite_count": 0,
"in_reply_to_status_id_str": null,
"geo": null,
"id_str": "705817833658142720",
"in_reply_to_user_id": null,
"timestamp_ms": "1457115059662",
"truncated": false,
"text": "Mugabe: Foreign firms 'stole diamonds': Zimbabwean President Robert Mugabe accuses foreign mining companies of... https://t.co/ZIsuqo6Nri",
"retweet_count": 0,
"id": 705817833658142700,
"in_reply_to_status_id": null,
"possibly_sensitive": false,
"filter_level": "low",
"created_at": "Fri Mar 04 18:10:59 +0000 2016",
"place": null,
"favorited": false,
"lang": "en",
"contributors": null,
"in_reply_to_screen_name": null,
"is_quote_status": false,
"in_reply_to_user_id_str": null,
"user": {
"utc_offset": 28800,
"name": "jackstarr1999",
"friends_count": 9976,
"screen_name": "jackstarr1999",
"location": "Looking Ahead Maryland",
"protected": false,
"url": null,

FIG. 5g

"profile_image_url":
"http://pbs.twimg.com/profile_images/3419216884/5fb506f5bfea5ed0b99c2cfa24849c81_normal
.jpeg",
"profile_background_color": "C0DEED",
"profile_use_background_image": true,
"is_translator": false,
"geo_enabled": false,
"description": "buzzing about all kinds of stuff do
say hello trying
to stay positive here",
"profile_link_color": "9EB300",
"id_str": "268036007",
"listed_count": 107,
"default_profile_image": false,
"followers_count": 13262,
"profile_image_url_https":
"https://pbs.twimg.com/profile_images/3419216884/5fb506f5bfea5ed0b99c2cfa24849c81_norm
al.jpeg",
"profile_sidebar_border_color": "EBC1C1",
"profile_background_image_url":
"http://pbs.twimg.com/profile_background_images/219169952/2.jpg",
"favourites_count": 494,
"following": null,
"default_profile": false,
"id": 268036007,
"profile_background_tile": true,
"contributors_enabled": false,
"follow_request_sent": null,
"created_at": "Fri Mar 18 01:18:56 +0000 2011",
"profile_sidebar_fill_color": "DDEEF6",
"lang": "en",
"profile_text_color": "333333",
"notifications": null,
"verified": false,
"time_zone": "Tijuana",
"profile_banner_url": "https://pbs.twimg.com/profile_banners/268036007/1363413391",
"statuses_count": 94782,
"profile_background_image_url_https":
"https://pbs.twimg.com/profile_background_images/219169952/2.jpg"
}
},
"date": "20160304T18:
10:59.000Z",
"possibly_sensitive": false,
"source_id": "705817833658142720",

FIG. 5h

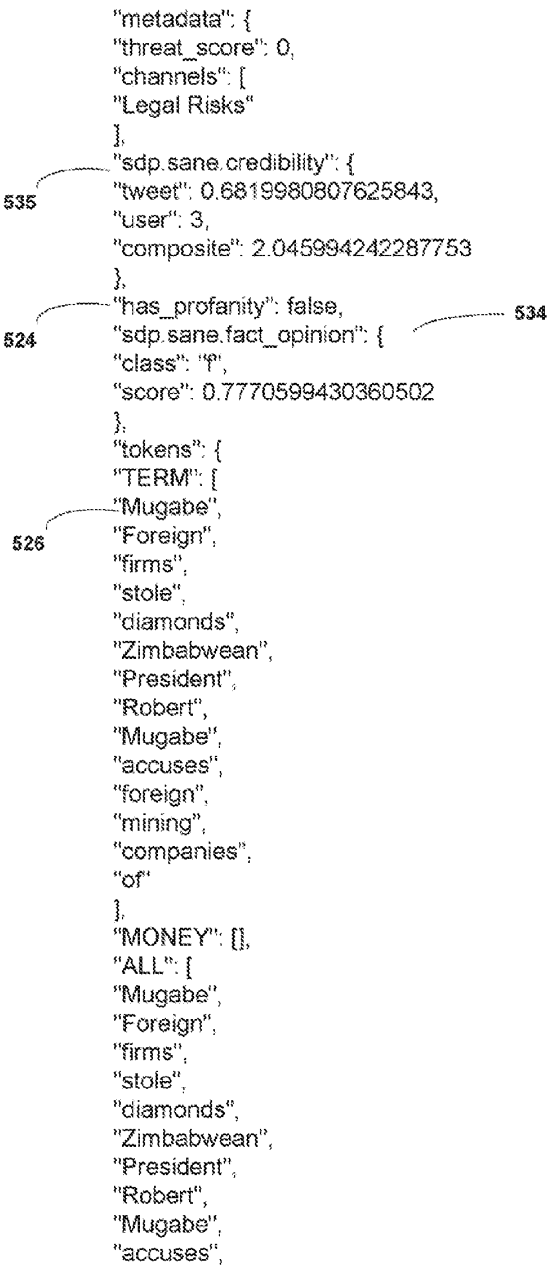

"metadata": {
"threat_score": 0,
"channels": [
"Legal Risks"
],
"sdp.sane.credibility": {
"tweet": 0.6819980807625843,
"user": 3,
"composite": 2.045994242287753
},
"has_profanity": false,
"sdp.sane.fact_opinion": {
"class": "f",
"score": 0.7770599430360502
},
"tokens": {
"TERM": [
"Mugabe",
"Foreign",
"firms",
"stole",
"diamonds",
"Zimbabwean",
"President",
"Robert",
"Mugabe",
"accuses",
"foreign",
"mining",
"companies",
"of"
],
"MONEY": [],
"ALL": [
"Mugabe",
"Foreign",
"firms",
"stole",
"diamonds",
"Zimbabwean",
"President",
"Robert",
"Mugabe",
"accuses",
535
524
534
526

FIG. 5i

"foreign",
"mining",
"companies",
"of",
"https://t.co/ZIsuqp6Nn",
],
"ENTITY": [
"https://t.co/ZIsuqp6Nn"
],
"JUNK": [
],
"EMOTICON": [],
"PUNC": [
],
"EMOJI": [],
"CRISIS": []
},
"origins": [
"onepctpublic",
"onepctfilter"
],
"sdp.sane.spam_category": "news
like"
},

FIG. 5j

"user": {
"name": "jackstarr1999",
"friends_count": 9976,
"screen_name": "jackstarr1999",
"location": "Looking Ahead Maryland",
"description": "buzzing about all kinds of stuff do
say hello trying
to stay positive here",
"listed_count": 107,
"user_avatar":
"http://pbs.twimg.com/profile_images/3419216884/
5fb506f5bfea5ed0b99c2cfa24849c81_normal
.jpeg",
"followers_count": 13262,
"is_verified": false,
"favourites_count": 494,
"is_default_profile": false,
"has_profile_image": true,
"id": "268036007",
"language": "en",
"created_at": "20110318T01:
18:56.000Z",
"statuses_count": 94782,
"is_protected": false
}
},
"fields": {
"raw.user.created_at": [
1300411136000
],
"raw.timestamp_ms": [
1457115059662
],
"date": [
1457115059000
],
"user.created_at": [
1300411136000
],
"raw.created_at": [
1457115059000
]
},
"sort": [
1457115059000
]
}

FIG. 5k

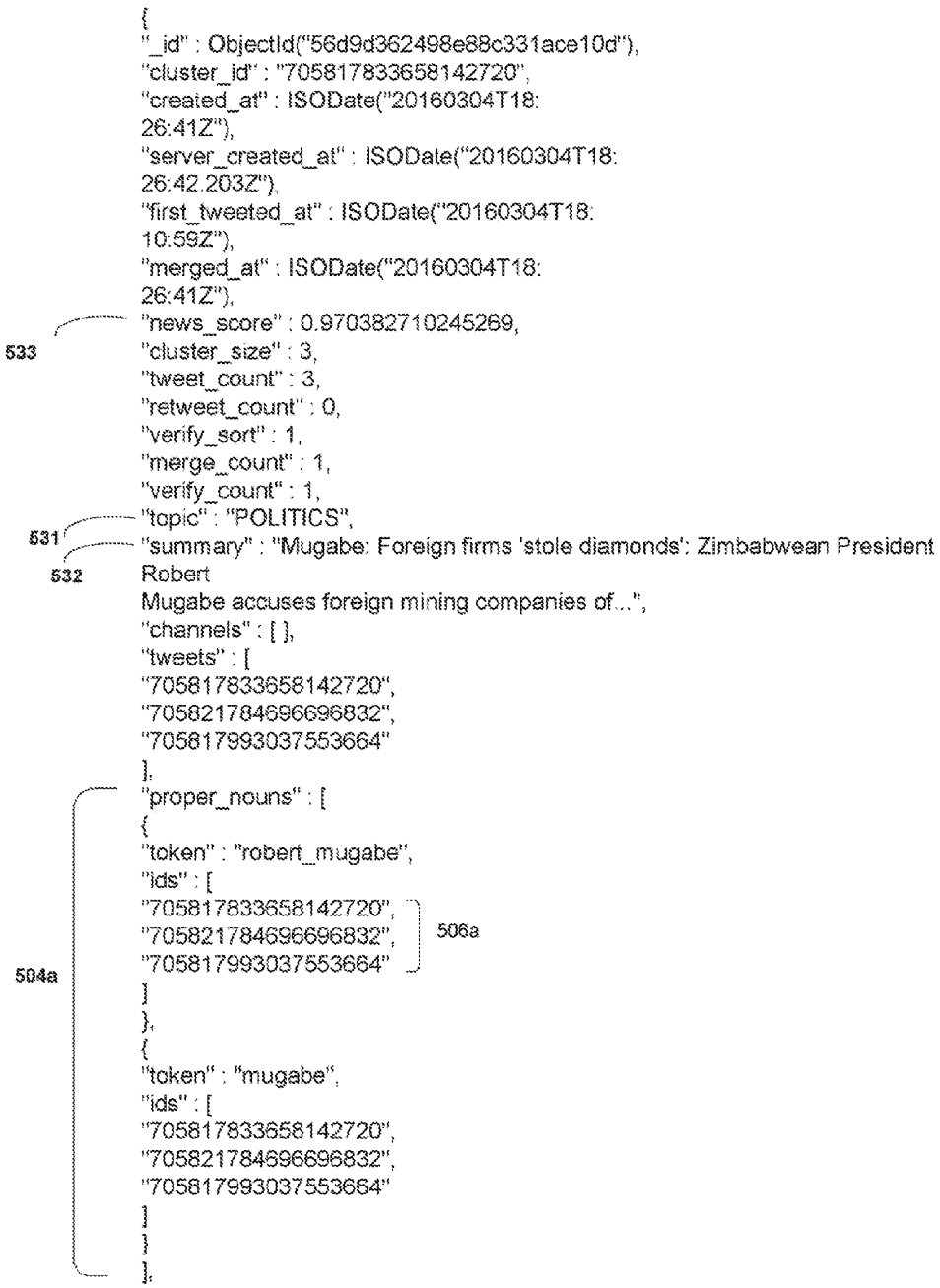

{
"_id" : ObjectId("56d9d362498e88c331ace10d"),
"cluster_id" : "705817833658142720",
"created_at" : ISODate("20160304T18:
26:41Z"),
"server_created_at" : ISODate("20160304T18:
26:42.203Z"),
"first_tweeted_at" : ISODate("20160304T18:
10:59Z"),
"merged_at" : ISODate("20160304T18:
26:41Z"),
"news_score" : 0.970382710245269,
533
"cluster_size" : 3,
"tweet_count" : 3,
"retweet_count" : 0,
"verify_sort" : 1,
"merge_count" : 1,
"verify_count" : 1,
"topic" : "POLITICS",
531
"summary" : "Mugabe: Foreign firms 'stole diamonds': Zimbabwean President
532
Robert
Mugabe accuses foreign mining companies of...",
"channels" : [ ],
"tweets" : [
"705817833658142720",
"705821784696696832",
"705817993037553664"
],
"proper_nouns" : [
{
"token" : "robert_mugabe",
"ids" : [
"705817833658142720",
"705821784696696832",
506a
504a
"705817993037553664"
]
},
{
"token" : "mugabe",
"ids" : [
"705817833658142720",
"705821784696696832",
"705817993037553664"
]
}
],

FIG. 5I

"hashtags" : [
{
"token" : "news",
"ids" : [
"705821784696696832"
]
}
],
"ticker_symbols" : [ ],
"additional_tokens" : [
{
"token" : "companies",
"tag_type" : "COMMON_NOUN",
"ids" : [
"705817833658142720",
"705817993037553664"
]
},
{
"token" : "mining",
"tag_type" : "COMMON_NOUN",
"ids" : [
"705817833658142720",
"705821784696696832",
"705817993037553664"
]
},
{
"token" : "president",
"tag_type" : "COMMON_NOUN",
"ids" : [
"705817833658142720",
"705821784696696832",
"705817993037553664"
]
},
{
"token" : "diamonds",
"tag_type" : "COMMON_NOUN",
"ids" : [
"705817833658142720",
"705821784696696832",
"705817993037553664"
]
},
{
"token" : "firms",
"tag_type" : "COMMON_NOUN",
"ids" : [
"705817833658142720",
"705821784696696832",
"705817993037553664"
]
}
],

FIG. 5m

```
"urls" : [
"http://bit.ly/bbcNews",
"http://bbc.in/1Yaj7V0"
],
"unit_clusters" : [
{
"tweets" : [
"705817833658142720",
"705817993037553664",
"705821784696696832"
],
"merged_at" :
ISODate("20160304T18:
26:41Z")
}
],
"locations" : [ ],
"merge_history" : [
{
"date" : ISODate("20160304T18:
26:41Z"),
"merge_id" : 1
}
],
"retweet_hierarchy" : [
{
"parent" : "705817833658142720",
"size" : 0,
"children" : [ ]
},
{
"parent" : "705821784696696832",
"size" : 0,
"children" : [ ]
},
{
"parent" : "705817993037553664",
"size" : 0,
"children" : [ ]
}
],
"verify_history" : [
{
"date" : ISODate("20160304T18:
26:41Z"),
"score" : 1
}
],
"verifiability" : true
}
```


506b

550

FIG. 5n

600

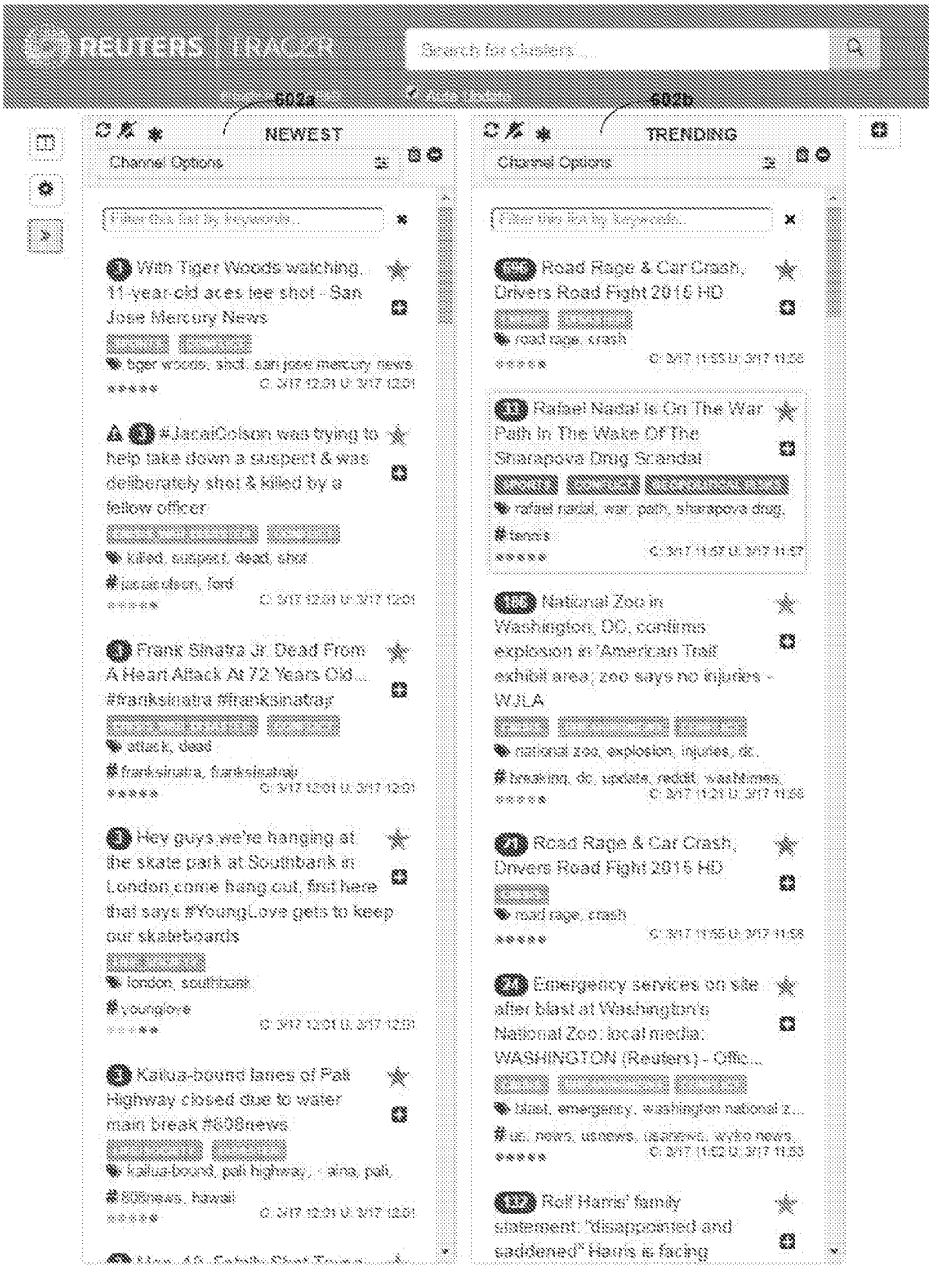

REUTERS
Search for clusters...
602a
NEWEST
Channel Options
With Tiger Woods watching, 11-year-old aces tee shot - San Jose Mercury News
tiger woods, shot, san jose mercury news
#JacaiColson was trying to help take down a suspect & was deliberately shot & killed by a fellow officer
killed, suspect, dead, shot
#jacaicolson, ford
Frank Sinatra Jr. Dead From A Heart Attack At 72 Years Old... #frankisinatra #frankisinatrajr
attack, dead
#franksinatra, frankisinatrajr
Hey guys,we're hanging at the skate park at Southbank in London,come hang out, first here that says #YoungLove gets to keep our skateboards
london, southbank
#younglove
Kailua-bound lanes of Pali Highway closed due to water main break #808news
kailua-bound, pali highway, - aina, pali,
#808news, hawaii
602b
TRENDING
Channel Options
Road Rage & Car Crash, Drivers Road Fight 2016 HD
road rage, crash
Rafael Nadal Is On The War Path In The Wake Of The Sharapova Drug Scandal
rafael nadal, war, path, sharapova drug,
#tennis
National Zoo in Washington, DC, confirms explosion in 'American Trail' exhibit area; zoo says no injuries - WJLA
national zoo, explosion, injuries, dc,
#breaking, dc, update, reddit, washtimes,
Road Rage & Car Crash, Drivers Road Fight 2016 HD
road rage, crash
Emergency services on site after blast at Washington's National Zoo: local media: WASHINGTON (Reuters) - Offic...
blast, emergency, washington national z...
#us, news, usnews, usanews, wyko news,
Rolf Harris' family statement: "disappointed and saddened" Harris is facing

FIG. 6a

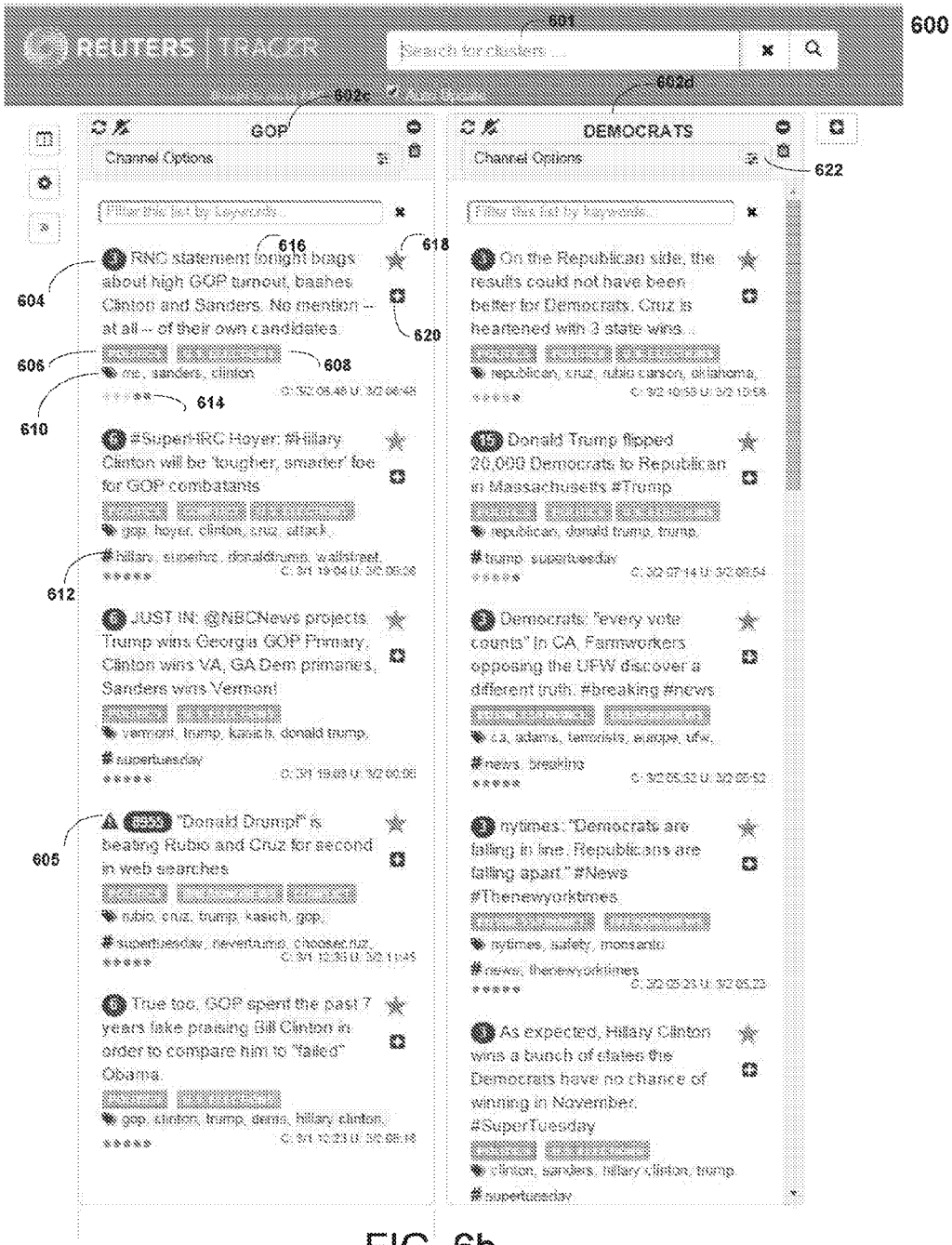

600
REUTERS
601
Search for clusters ...
602c
GOP
602d
DEMOCRATS
Channel Options
Channel Options
622
Filter this list by keywords...
Filter this list by keywords...
616
618
604
RNC statement tonight brags about high GOP turnout, bashes Clinton and Sanders. No mention -- at all -- of their own candidates.
620
606
608
610
614
rnc, sanders, clinton
On the Republican side, the results could not have been better for Democrats. Cruz is heartened with 3 state wins...
republican, cruz, rubio carson, oklahoma,
#SuperPAC Hoyer: #Hillary Clinton will be 'tougher, smarter' foe for GOP combatants
gop, hoyer, clinton, cruz, attack,
612
#hillary, superpac, donaldtrump, wallstreet,
Donald Trump flipped 20,000 Democrats to Republican in Massachusetts #Trump
republican, donald trump, trump,
#trump, supertuesday
JUST IN: @NBCNews projects Trump wins Georgia GOP Primary, Clinton wins VA, GA Dem primaries, Sanders wins Vermont
vermont, trump, kasich, donald trump,
#supertuesday
Democrats: "every vote counts" in CA, Farmworkers opposing the UFW discover a different truth. #breaking #news
c.a, adams, terrorists, europe, ufw,
#news, breaking
605
"Donald Drumpf" is beating Rubio and Cruz for second in web searches
rubio, cruz, trump, kasich, gop,
#supertuesday, nevertrump, choosecruz,
nytimes: "Democrats are falling in line. Republicans are falling apart." #News #Thenewyorktimes
nytimes, safety, monsanto
#news, thenewyorktimes
True too. GOP spent the past 7 years fake praising Bill Clinton in order to compare him to "failed" Obama.
gop, clinton, trump, dems, hillary clinton,
As expected, Hillary Clinton wins a bunch of states the Democrats have no chance of winning in November. #SuperTuesday
clinton, sanders, hillary clinton, trump
#supertuesday

FIG. 6b


REUTERS | TRACER
Search for stories ...
« BACK TO GOP
"Donald Drumpf" is beating Rubio and Cruz for second in web searches
631
rubio, cruz, trump, kasich, gop, donald drumpf, carson, clinton, sanders, super tuesday
#supertuesday, nevertrump, choosecruz, trump2016, alwaystrump, trump, makedonaldtrumpfagain, cruzcrew, gapol, makeamericagreatagain
632
Tweets
« Page 1 »
634
J Reckas @JReckas
@Rightwingpolok Then I ask,why can't Rubio or Cruz beat @realDonaldTrump Huh? Tired of seeing that ridiculous poll
3/2/16 8:11 AM
632a – 632n
Luis Rosas @Rosas77
And that's not even taking into account that the entire media seems to have a vendetta against Cruz and a love affair w Rubio @CruzGal2016
3/2/16 12:48 AM
Vincristine
@vincristine
RT @m_adam: John Oliver's movement has executed a more successful campaign than either Cruz or Rubio https://t.co/4f...
3/1/16 9:57 PM
Duncan Kenyon
@DuncanKenyon1
@politicalwire if Rubio does get 20%, he'll eat into

FIG. 6c

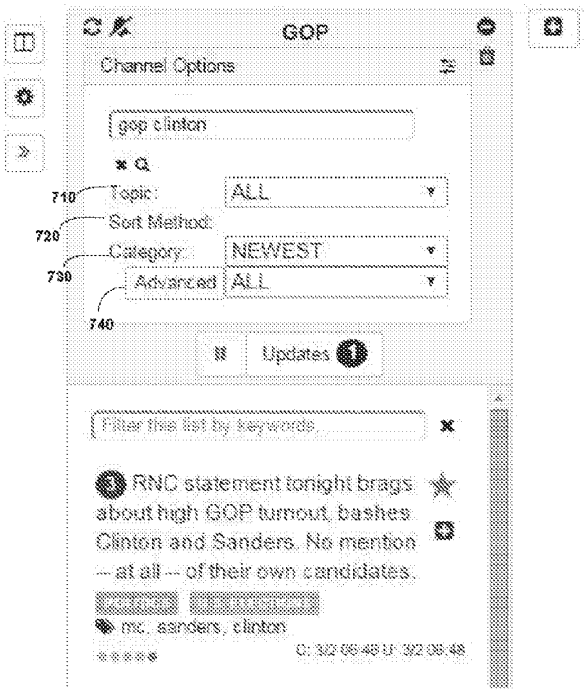

GOP
Channel Options
gop clinton
710
Topic:
ALL
720
Sort Method:
730
Category:
NEWEST
Advanced
ALL
740
Updates
Filter this list by keywords
RNC statement tonight brags about high GOP turnout, bashes Clinton and Sanders. No mention -- at all -- of their own candidates.
rnc, sanders, clinton

FIG. 7a

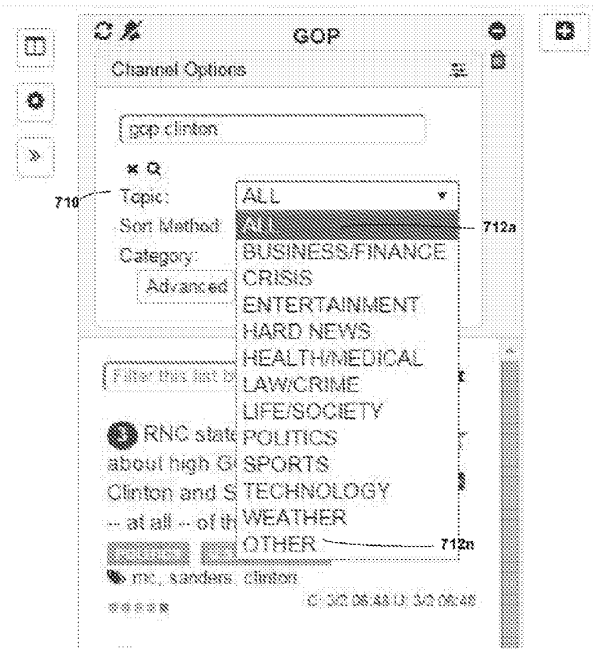

GOP
Channel Options
gop clinton
710
Topic:
ALL
712a
Sort Method
Category:
Advanced
BUSINESS/FINANCE
CRISIS
ENTERTAINMENT
HARD NEWS
HEALTH/MEDICAL
LAW/CRIME
LIFE/SOCIETY
POLITICS
SPORTS
TECHNOLOGY
WEATHER
OTHER
712n

FIG. 7b

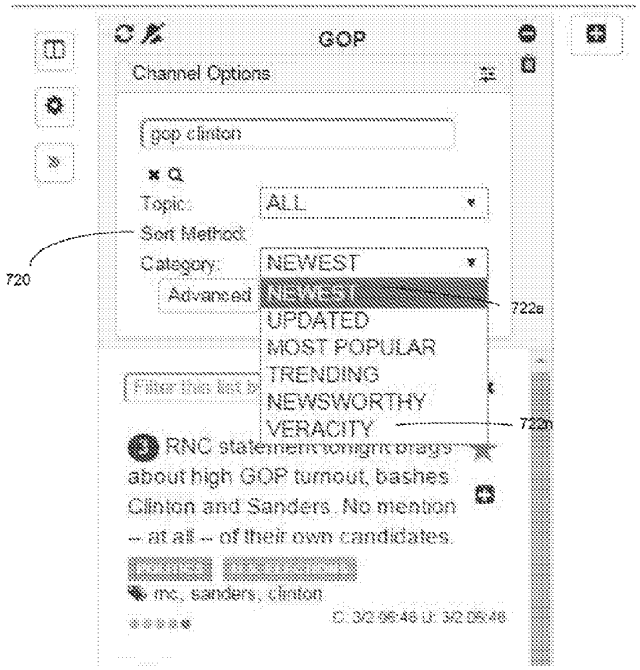

GOP
Channel Options
gop clinton
Topic:
ALL
Sort Method:
Category:
NEWEST
Advanced
720
722a
UPDATED
MOST POPULAR
TRENDING
NEWSWORTHY
VERACITY
722n
RNC statement tonight snags about high GOP turnout, bashes Clinton and Sanders. No mention -- at all -- of their own candidates.
mc, sanders, clinton

FIG. 7c

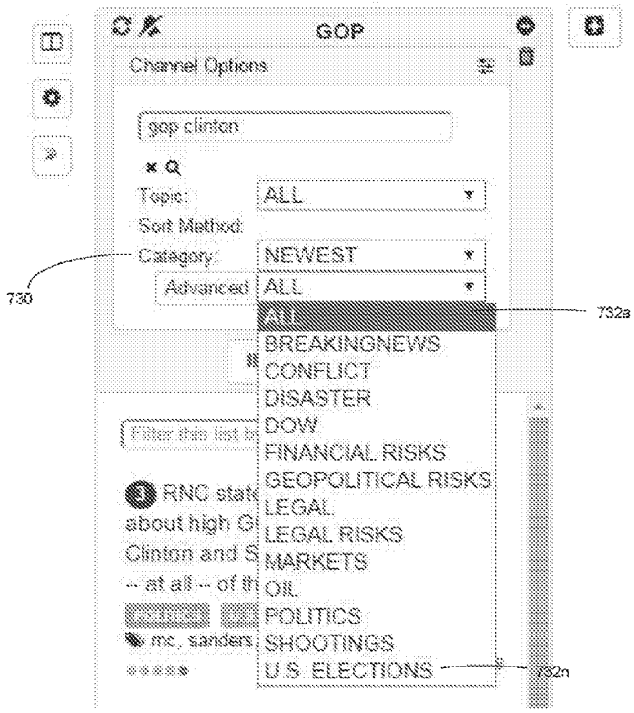

GOP
Channel Options
gop clinton
Topic:
ALL
Sort Method:
Category:
NEWEST
Advanced
ALL
730
732a
BREAKINGNEWS
CONFLICT
DISASTER
DOW
FINANCIAL RISKS
GEOPOLITICAL RISKS
LEGAL
LEGAL RISKS
MARKETS
OIL
POLITICS
SHOOTINGS
U.S. ELECTIONS
732n

FIG. 7d

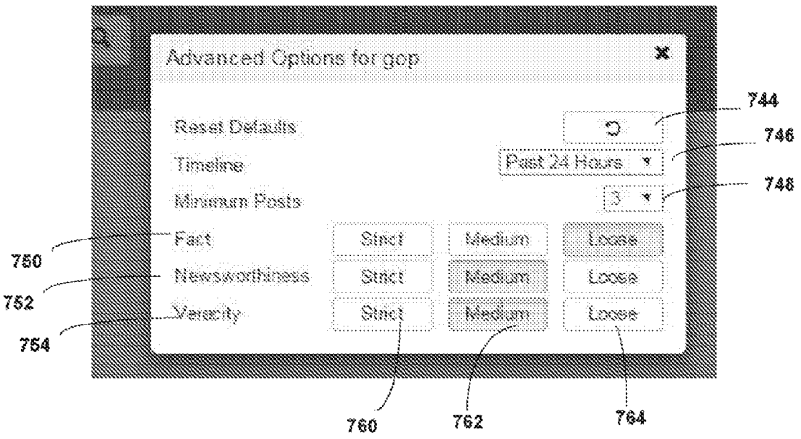

Advanced Options for gop
Reset Defaults
Timeline
Past 24 Hours
Minimum Posts
3
Fact
Newsworthiness
Veracity
Strict
Medium
Loose
744
746
748
750
752
754
760
762
764

FIG. 7e

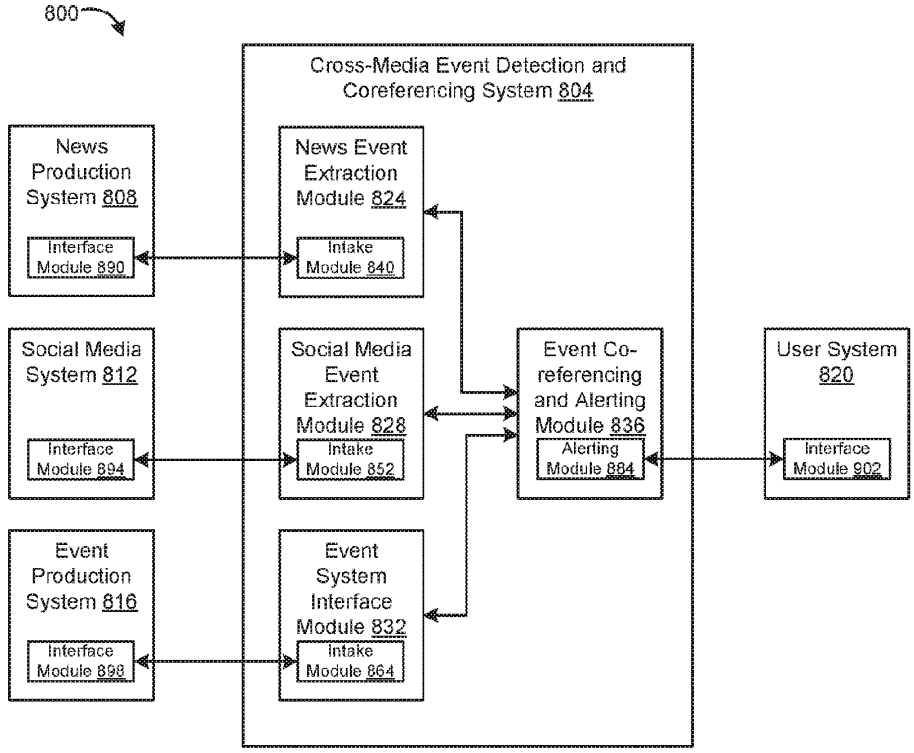

800
Cross-Media Event Detection and Coreferencing System 804
News Production System 808
Interface Module 890
News Event Extraction Module 824
Intake Module 840
Social Media System 812
Interface Module 894
Social Media Event Extraction Module 828
Intake Module 852
Event Co-referencing and Alerting Module 836
Alerting Module 884
User System 820
Interface Module 902
Event Production System 816
Interface Module 898
Event System Interface Module 832
Intake Module 864

FIG. 8

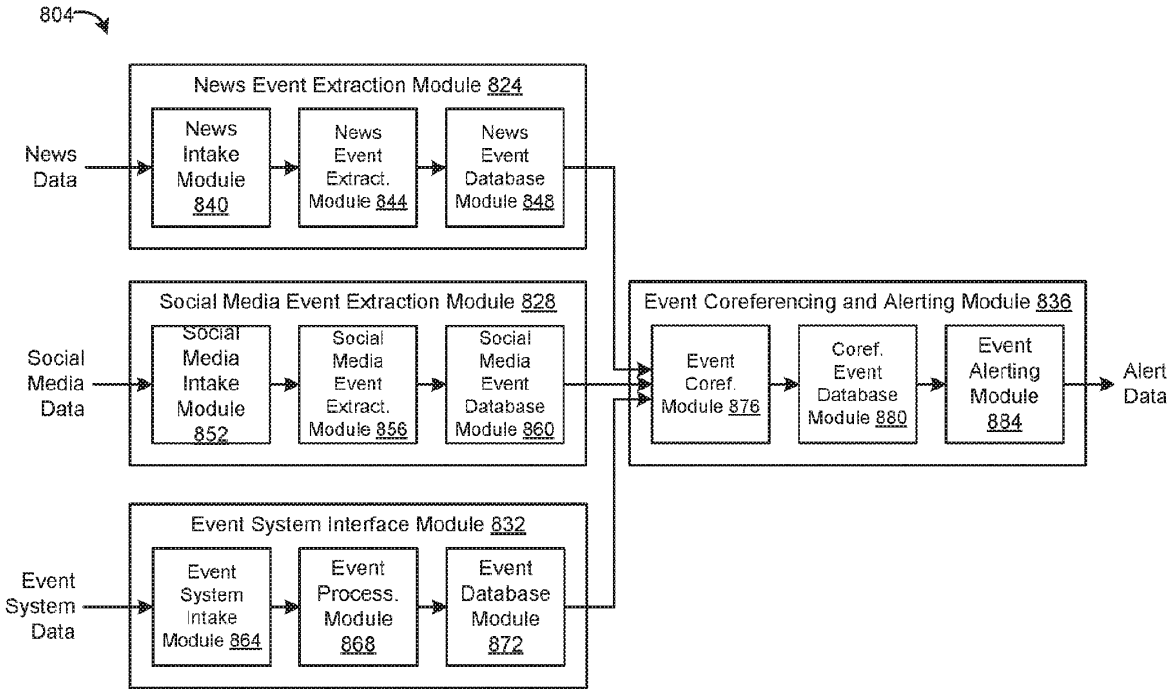

804
News Event Extraction Module 824
News Data
News Intake Module 840
News Event Extract. Module 844
News Event Database Module 848
Social Media Event Extraction Module 828
Social Media Data
Social Media Intake Module 852
Social Media Event Extract. Module 856
Social Media Event Database Module 860
Event Coreferencing and Alerting Module 836
Event Coref. Module 876
Coref. Event Database Module 880
Event Alerting Module 884
Alert Data
Event System Interface Module 832
Event System Data
Event System Intake Module 864
Event Process. Module 868
Event Database Module 872

FIG. 9

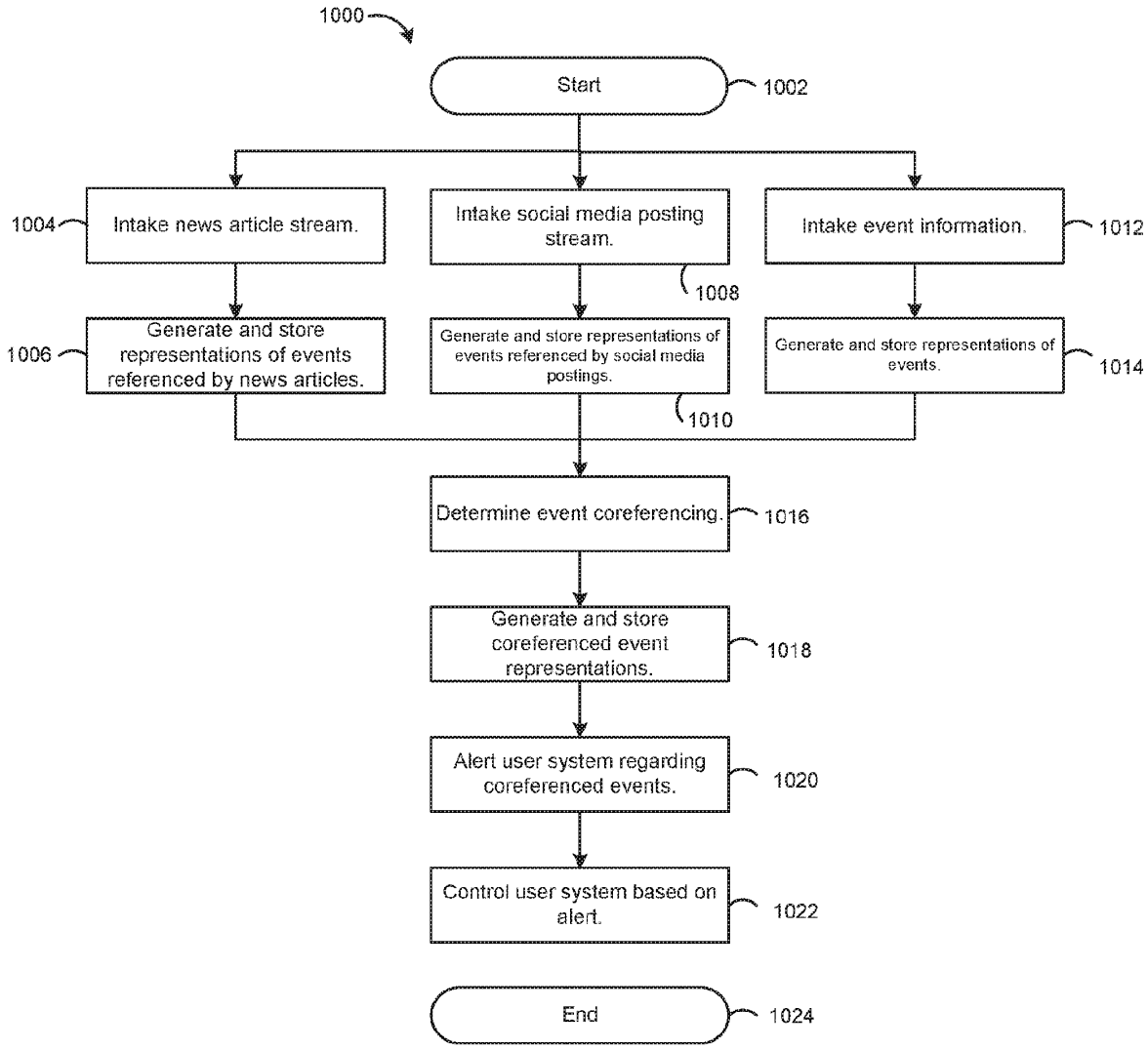

1000
Start
1002
Intake news article stream.
1004
Intake social media posting stream.
1008
Intake event information.
1012
Generate and store representations of events referenced by news articles.
1006
Generate and store representations of events referenced by social media postings.
1010
Generate and store representations of events.
1014
Determine event coreferencing.
1016
Generate and store coreferenced event representations.
1018
Alert user system regarding coreferenced events.
1020
Control user system based on alert.
1022
End
1024

FIG. 10

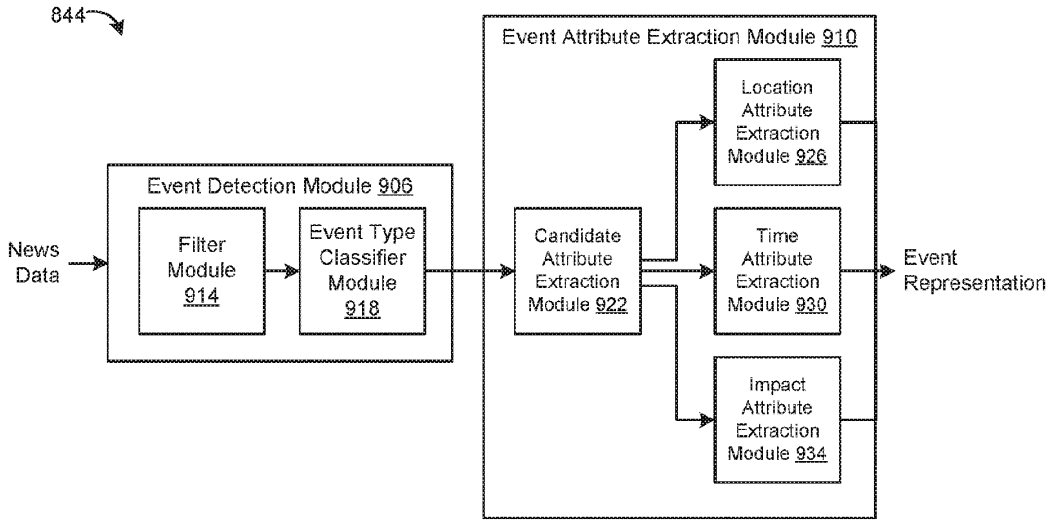

844
Event Attribute Extraction Module 910
Location Attribute Extraction Module 926
Event Detection Module 906
Filter Module 914
Event Type Classifier Module 918
News Data
Candidate Attribute Extraction Module 922
Time Attribute Extraction Module 930
Event Representation
Impact Attribute Extraction Module 934

FIG. 11

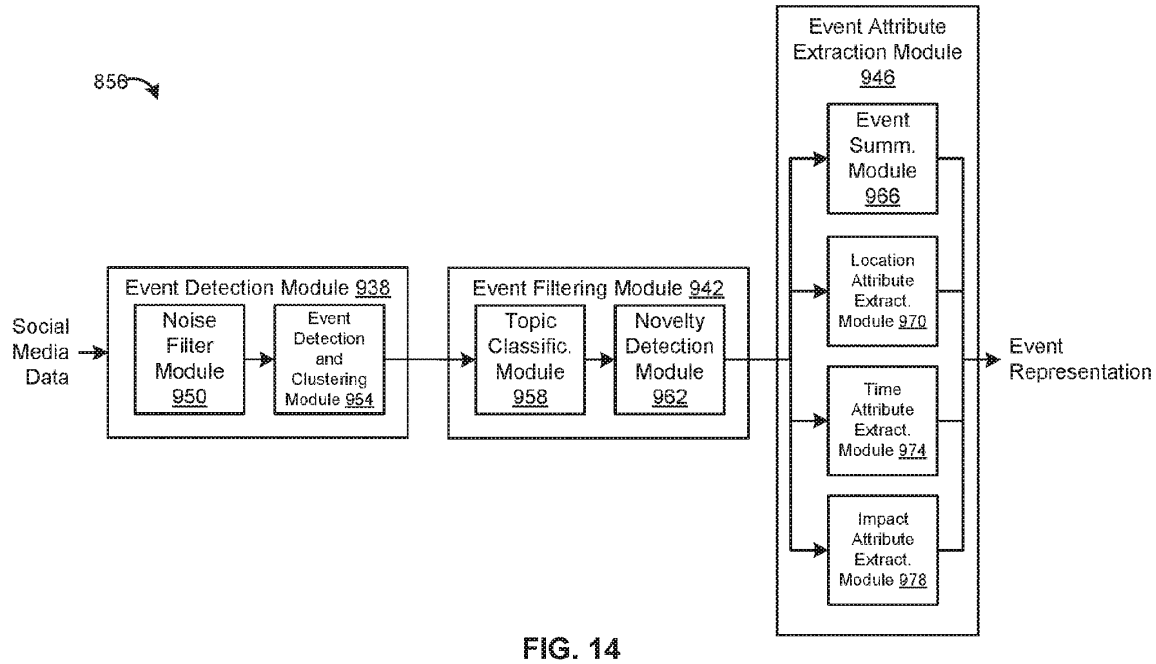

856
Event Attribute Extraction Module 946
Event Summ. Module 966
Event Detection Module 938
Noise Filter Module 950
Event Detection and Clustering Module 954
Event Filtering Module 942
Topic Classific. Module 958
Novelty Detection Module 962
Location Attribute Extract. Module 970
Social Media Data
Event Representation
Time Attribute Extract. Module 974
Impact Attribute Extract. Module 978

FIG. 14

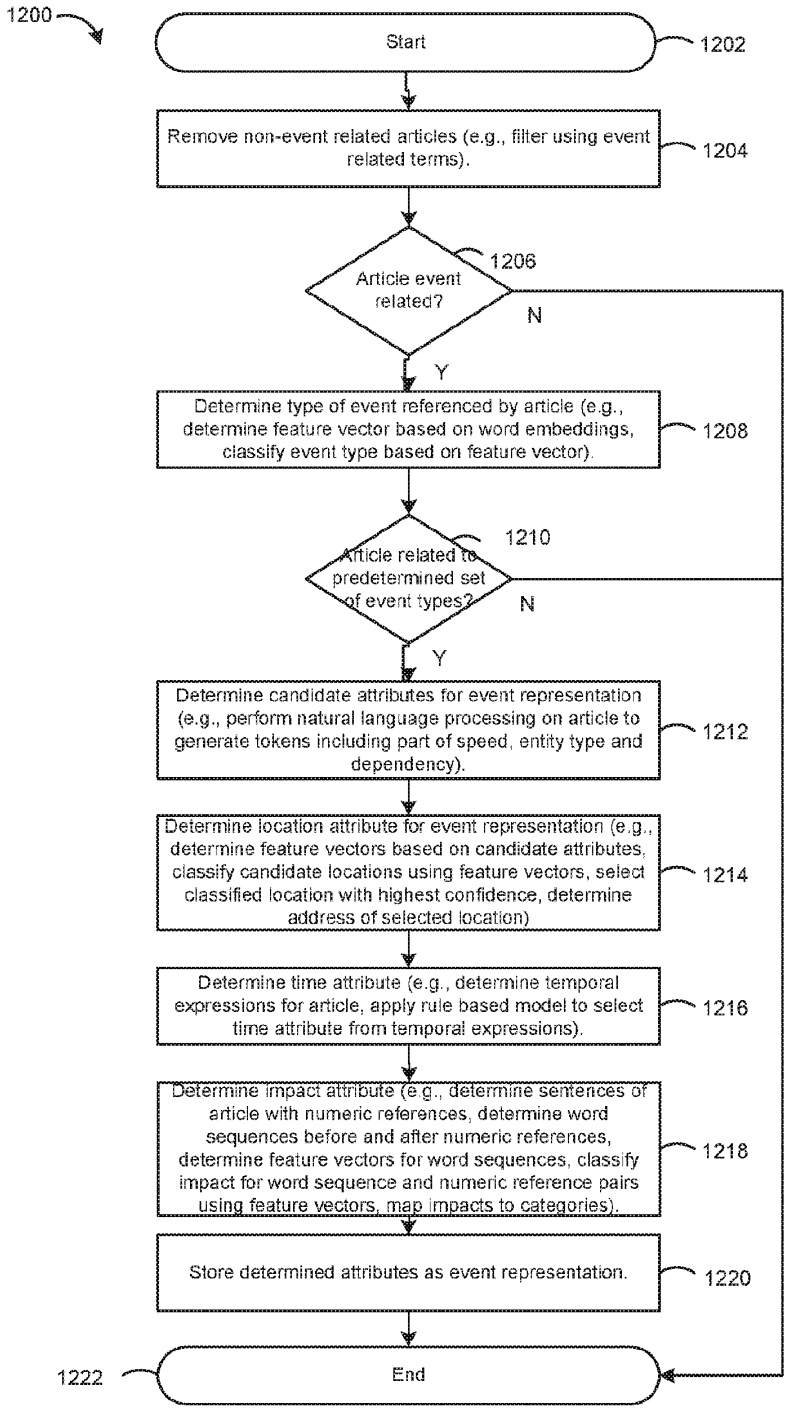

1200
Start
1202
Remove non-event related articles (e.g., filter using event related terms).
1204
Article event related?
1206
N
Y
Determine type of event referenced by article (e.g., determine feature vector based on word embeddings, classify event type based on feature vector).
1208
Article related to predetermined set of event types?
1210
N
Y
Determine candidate attributes for event representation (e.g., perform natural language processing on article to generate tokens including part of speed, entity type and dependency).
1212
Determine location attribute for event representation (e.g., determine feature vectors based on candidate attributes, classify candidate locations using feature vectors, select classified location with highest confidence, determine address of selected location)
1214
Determine time attribute (e.g., determine temporal expressions for article, apply rule based model to select time attribute from temporal expressions).
1216
Determine impact attribute (e.g., determine sentences of article with numeric references, determine word sequences before and after numeric references, determine feature vectors for word sequences, classify impact for word sequence and numeric reference pairs using feature vectors, map impacts to categories).
1218
Store determined attributes as event representation.
1220
End
1222

FIG. 12

event (news)

Event Type	fire
Location	northern California
Time	9 October 2017
Impact	..

Evacuations underway as fires rage through California's wine country.
October 09, 2017 - A hospital and homes had to be evacuated overnight in northern California after fast-moving wildfires...

event (twitter)

Event Type	fire
Location	Northern California
Time	9 October 2017, 10:07
Impact	..

@qatarairways: Wildfires force evacuations in Northern California #news
@WFSN12News: Wildfires force evacuations in Northern California

FIG. 13A

Event Type	storm
Location	Aglish
Time	16 October 2017
Impact	1 killed

Woman in her 20s killed in Hurricane Ophelia storms after tree falls onto her car in village.
A woman has been killed after a tree fell onto her car during fierce Hurricane Ophelia storms. The accident happened in the Irish village of Aglish...

Event Type	storm
Location	Waterford
Time	16 October 2017, 12:53
Impact	1 dead

@lapplainn: Ophelia: One dead after tree falls on car in Waterford via @RTENewsNow
@SkyNewsBreak: RTE reports one person has died in southeast Ireland as a direct of storm Ophelia

FIG. 13B

Event Type	conflict
Location	Baghlan
Time	07 October 2017, 15:59
Impact	9 killed, 1 injured

Militant attack kills 8 police officers in Afghanistan.
Unknown militants in Afghanistan have attacked a police checkpoint in the country's northern Baghlan Province, killing two officers and injuring another [...] seven Taliban militants had been killed...

Event Type	conflict
Location	Afghanistan
Time	08 October 2017 10:10
Impact	9 killed

@1stNewsReds: ABC News. Afghan officials: 2 police, 7 militants killed in attacks
@HighGroundVets: Afghan officials: 2 police, 7 militants killed in attacks - Nazarullah Jamshidi

FIG. 13C

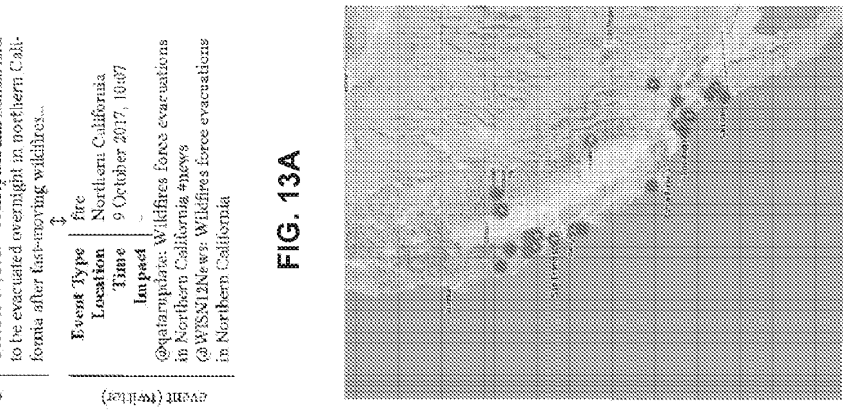


FIG. 13D

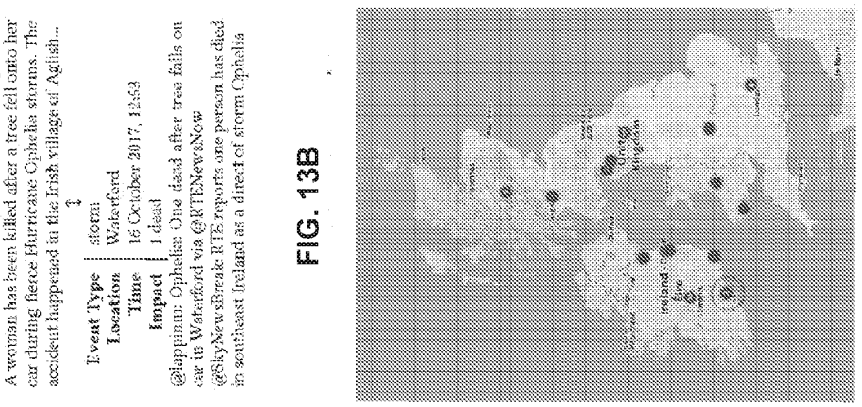


FIG. 13E

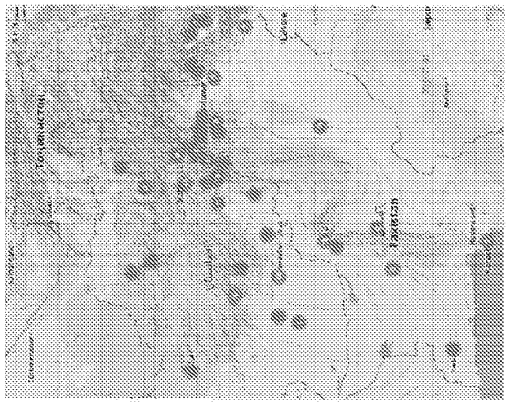


FIG. 13F

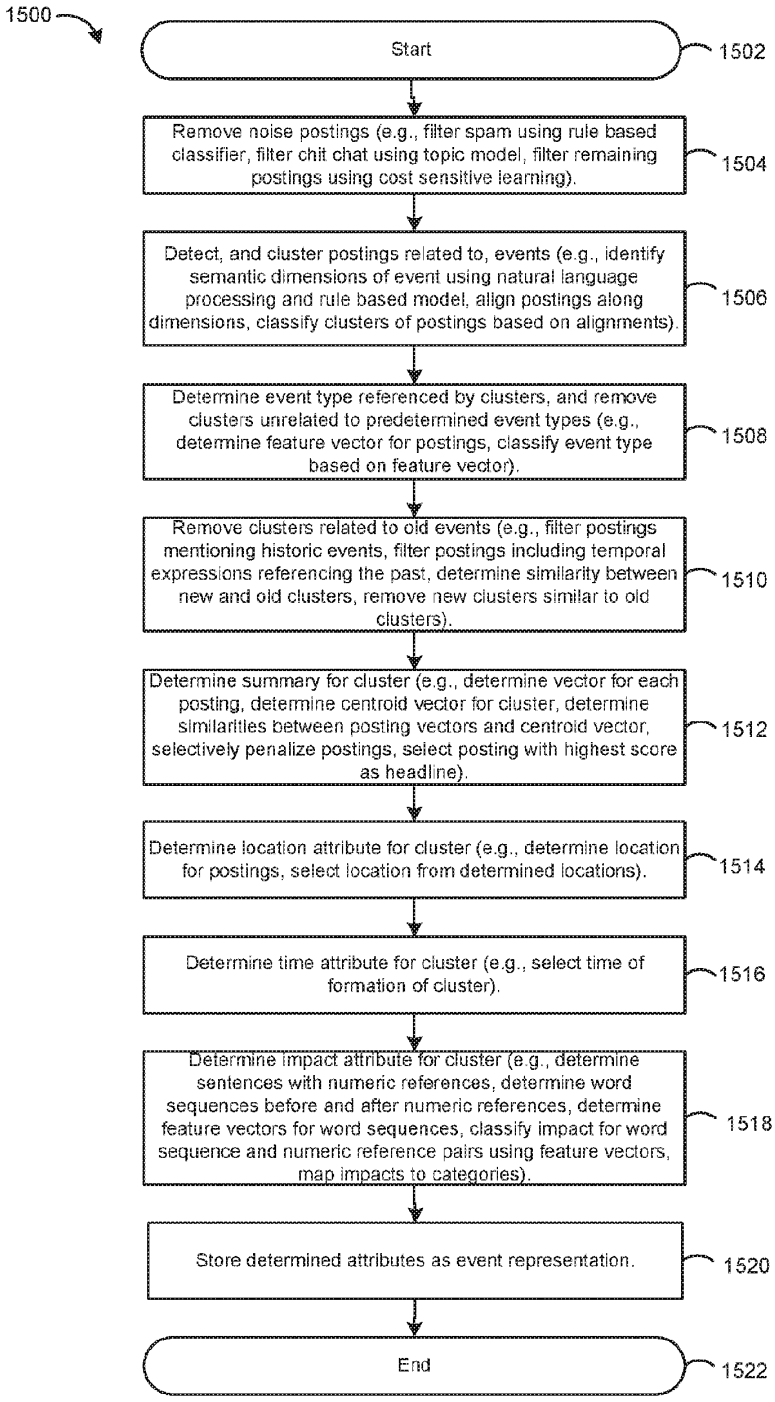

1500
Start
1502
Remove noise postings (e.g., filter spam using rule based classifier, filter chit chat using topic model, filter remaining postings using cost sensitive learning).
1504
Detect, and cluster postings related to, events (e.g., identify semantic dimensions of event using natural language processing and rule based model, align postings along dimensions, classify clusters of postings based on alignments).
1506
Determine event type referenced by clusters, and remove clusters unrelated to predetermined event types (e.g., determine feature vector for postings, classify event type based on feature vector).
1508
Remove clusters related to old events (e.g., filter postings mentioning historic events, filter postings including temporal expressions referencing the past, determine similarity between new and old clusters, remove new clusters similar to old clusters).
1510
Determine summary for cluster (e.g., determine vector for each posting, determine centroid vector for cluster, determine similarities between posting vectors and centroid vector, selectively penalize postings, select posting with highest score as headline).
1512
Determine location attribute for cluster (e.g., determine location for postings, select location from determined locations).
1514
Determine time attribute for cluster (e.g., select time of formation of cluster).
1516
Determine impact attribute for cluster (e.g., determine sentences with numeric references, determine word sequences before and after numeric references, determine feature vectors for word sequences, classify impact for word sequence and numeric reference pairs using feature vectors, map impacts to categories).
1518
Store determined attributes as event representation.
1520
End
1522

FIG. 15

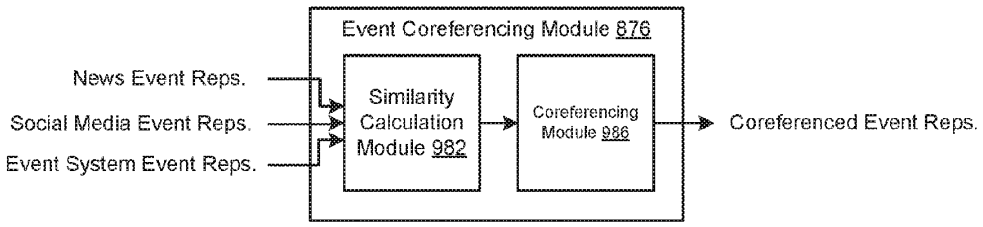

Event Coreferencing Module 876
News Event Reps.
Social Media Event Reps.
Event System Event Reps.
Similarity Calculation Module 982
Coreferencing Module 986
Coreferenced Event Reps.

FIG. 16

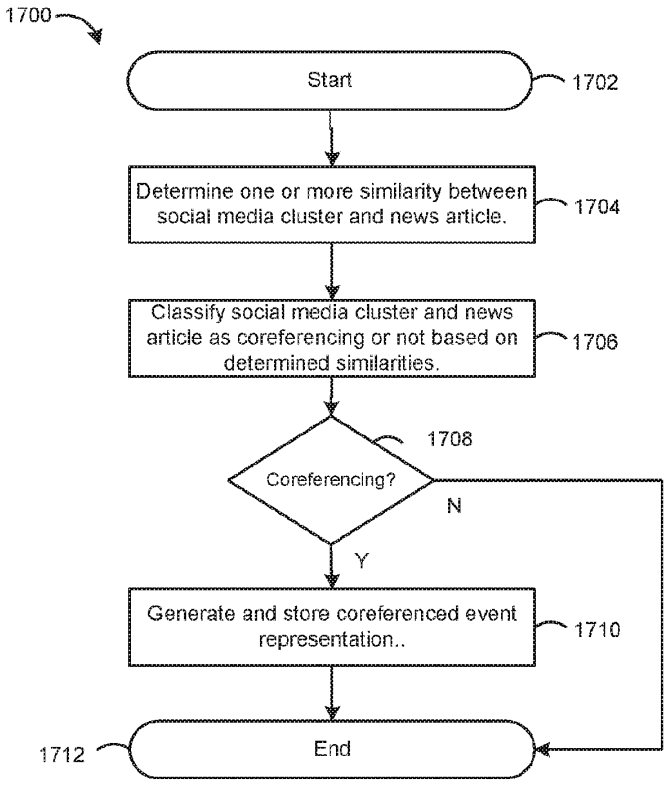

1700
Start
1702
Determine one or more similarity between social media cluster and news article.
1704
Classify social media cluster and news article as coreferencing or not based on determined similarities.
1706
1708
Coreferencing?
N
Y
Generate and store coreferenced event representation..
1710
End
1712

FIG. 17

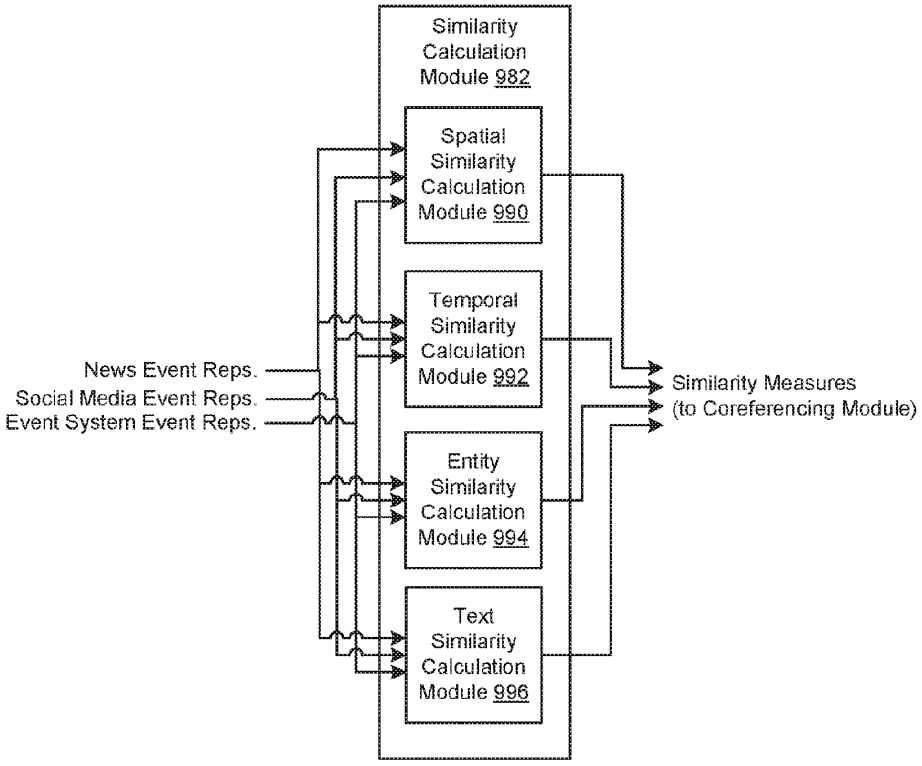


FIG. 18

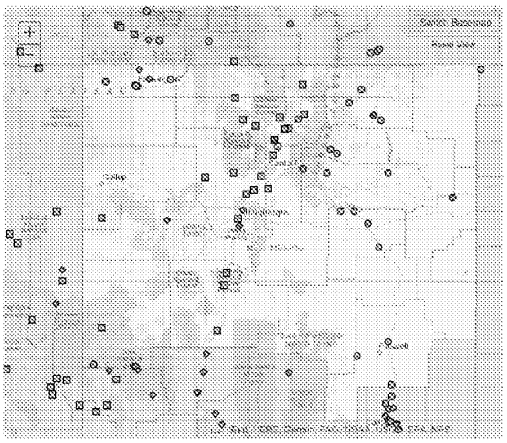


FIG. 25

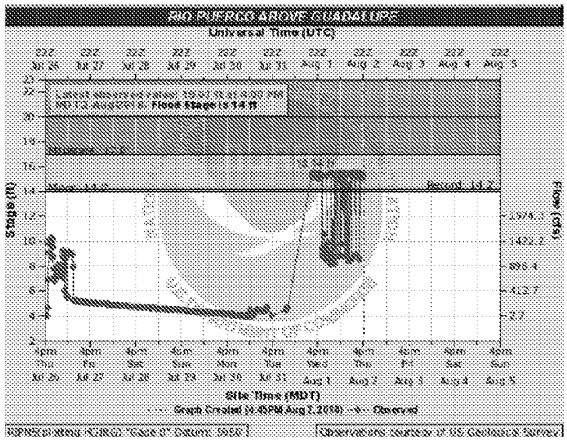


FIG. 26

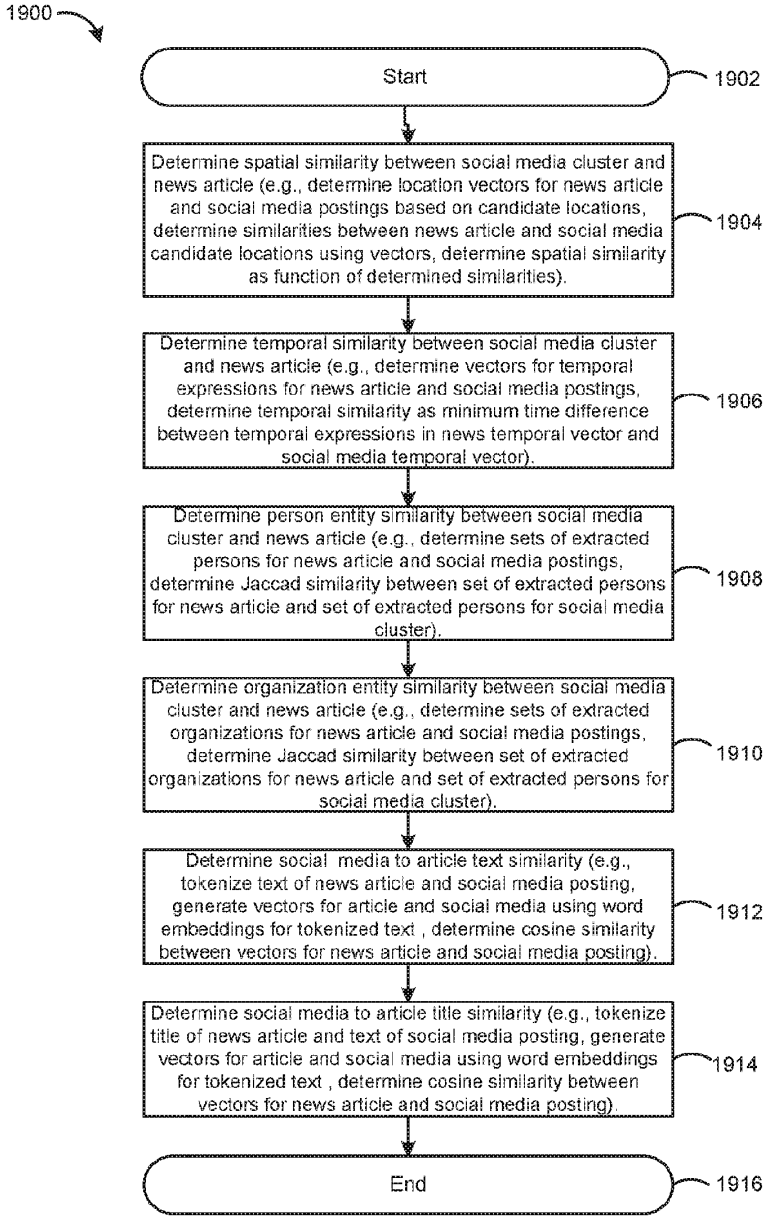

1900
Start
1902
Determine spatial similarity between social media cluster and news article (e.g., determine location vectors for news article and social media postings based on candidate locations, determine similarities between news article and social media candidate locations using vectors, determine spatial similarity as function of determined similarities).
1904
Determine temporal similarity between social media cluster and news article (e.g., determine vectors for temporal expressions for news article and social media postings, determine temporal similarity as minimum time difference between temporal expressions in news temporal vector and social media temporal vector).
1906
Determine person entity similarity between social media cluster and news article (e.g., determine sets of extracted persons for news article and social media postings, determine Jaccad similarity between set of extracted persons for news article and set of extracted persons for social media cluster).
1908
Determine organization entity similarity between social media cluster and news article (e.g., determine sets of extracted organizations for news article and social media postings, determine Jaccad similarity between set of extracted organizations for news article and set of extracted persons for social media cluster).
1910
Determine social media to article text similarity (e.g., tokenize text of news article and social media posting, generate vectors for article and social media using word embeddings for tokenized text , determine cosine similarity between vectors for news article and social media posting).
1912
Determine social media to article title similarity (e.g., tokenize title of news article and text of social media posting, generate vectors for article and social media using word embeddings for tokenized text , determine cosine similarity between vectors for news article and social media posting).
1914
End
1916

FIG. 19

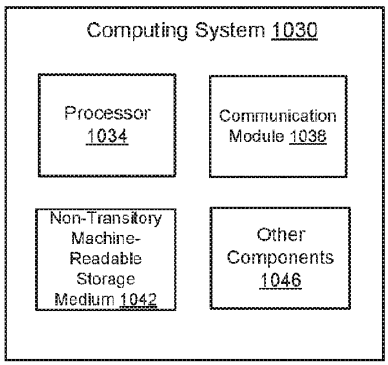


FIG. 20

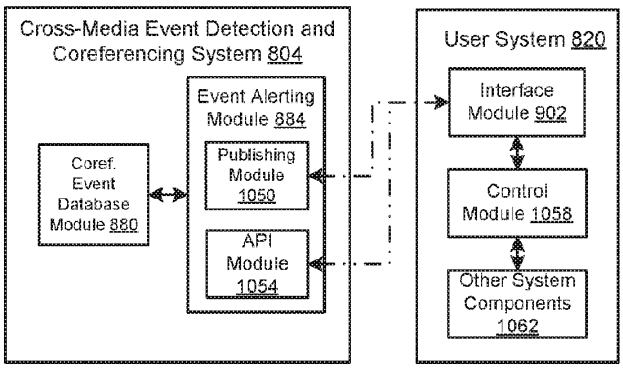


FIG. 21

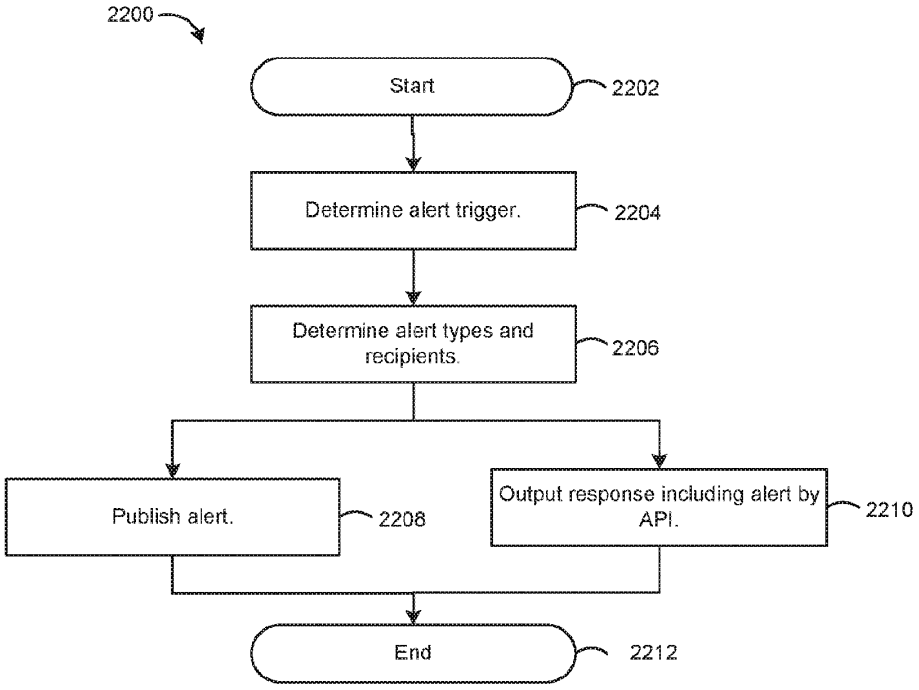


FIG. 22

To: marysmith@tradecorp.com
From: eventalert@thomsonreuters.com
Subject: 1 dead after Ophelia storm near Aglish
Date: 17 October 2017

Event Type	storm
Location	Aglish
Time	16 October 2017
Impact	1 killed

Woman in her 20s killed in Hurricane Ophelia storms after tree falls onto her car in village.
A woman has been killed after a tree fell onto her car during fierce Hurricane Ophelia storms. The accident happened in the Irish village of Aglish...

@lappinm: Ophelia: One dead after tree falls on car in Waterford via @RTENewsNow
@SkyNewsBreak: RTE reports one person has died in southeast Ireland as a direct of storm Ophelia

More on this event at https://event28767.thomsonreuters.com

FIG. 23A

To: 415-444-5555
From: 607-777-8888
1 dead after Ophelia storm near Aglish
More on this event at https://event28767.thomsonreuters.com

FIG. 23B

Event Type	storm
Location	Aglish
Time	16 October 2017
Impact	1 killed

Woman in her 20s killed in Hurricane Ophelia storms after tree falls onto her car in village.
A woman has been killed after a tree fell onto her car during fierce Hurricane Ophelia storms. The accident happened in the Irish village of Aglish...

@lappinm: Ophelia: One dead after tree falls on car in Waterford via @RTENewsNow
@SkyNewsBreak: RTE reports one person has died in southeast Ireland as a direct of storm Ophelia

More on this event at https://event28767.thomsonreuters.com

FIG. 23C

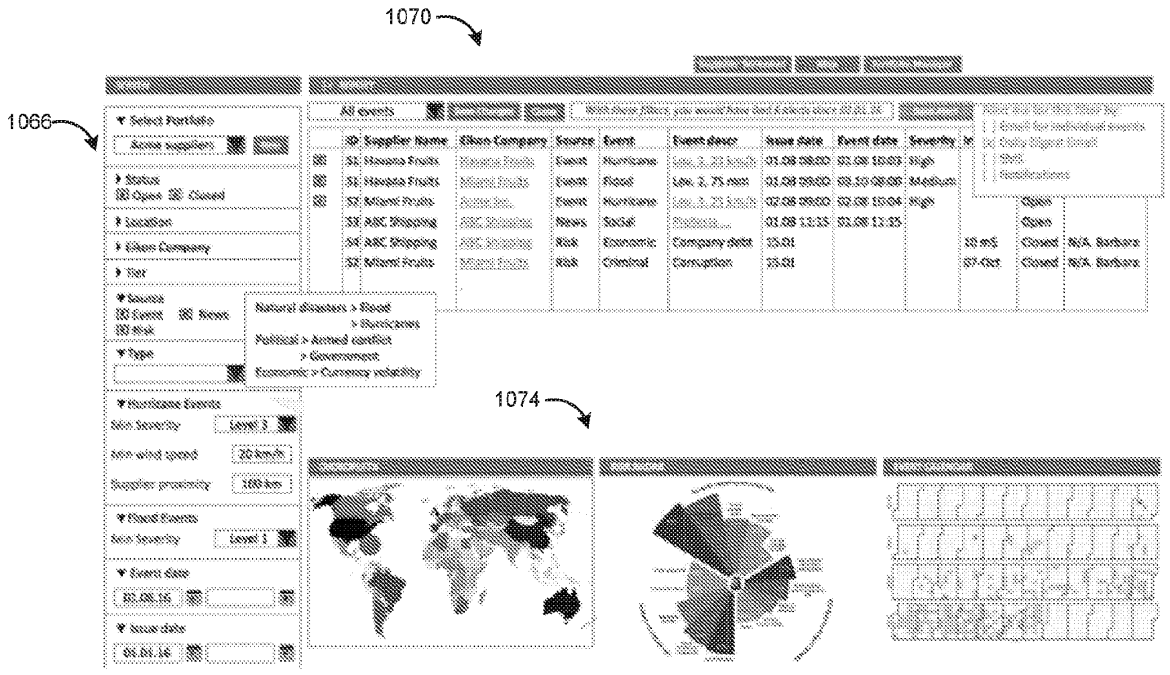


FIG. 24