Towards realtime Twitter analysis

ISCRAM 2012

Arnout de Vries (TNO), Teun Terpstra (HKV), Geerte Paradies (TNO), Richard Stronkman (Twitcident)
Discussion and future work

Results: early warning, facts and feelings, resilience

Analysis (Pukkelpop) and research method (Twitcident)

Goal: “Monitor and analyze Twitter during incidents in real-time to improve crisis management”

Social sensors and citizen journalism
13,000+ New Posts on Tumblr

NEW PANDORA

25,000+ New Videos

600+ New Wall Posts

168 Million Emails Are Sent

695,000+ New Comments

60,000+ New Articles Downloaded

7,100+ Firefox Downloads

695,000+ New YouTube Videos

25+ Hours Total Duration

60,000+ New Firefox Updates

1,700+ New Status Updates

30,000+ New Wall Posts

125+ New Firefox Updates

320+ New Firefox Add-ons

601+ New Wall Posts

2,350 New Wall Posts

320+ New Firefox Add-ons

601+ New Wall Posts

6,600+ New Firefox Add-ons

50+ New WordPress Add-ons

60,000+ New WordPress Add-ons

50+ New WordPress Add-ons

60,000+ New WordPress Add-ons

Google

NEW钢管

60,000+ New Articles Downloaded

7,100+ Firefox Downloads

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25+ Hours Total Duration

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601+ New Wall Posts

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125+ New Firefox Updates

320+ New Firefox Add-ons

601+ New Wall Posts

6,600+ New Firefox Add-ons

50+ New WordPress Add-ons

60,000+ New WordPress Add-ons

50+ New WordPress Add-ons

60,000+ New WordPress Add-ons

Google
Twitter first to publish dramatic crash pictures

February 25 2005

The social networking site Twitter again stole a march on traditional media when it was the first outlet to publish dramatic pictures of the Turkish Airlines crash.

Moments after the plane crashed at Amsterdam's Schipol airport on Wednesday morning the news was appearing on Twitter. CNN's lead correspondent Errol Barnett said:

"There is a show that trends on Twitter in Amsterdam."

Send reports via:
- mobile phone
- email
- web
Pukkelpop storm

About the Pukkelpop storm
69k 39k 20k 14k
tweets users re-tweets replies

Finding and filtering: keywords, syntactical, context and semantic features. More info:

WORLD WIDE WEB
2012
LYON - FRANCE
Pukkelpop Twitter visual analysis

156,157 tweets total in 2 days

576 tweets/min
Selection of 96,957 tweets between noon and midnight

Tweets /min

Thu Aug 18 8 am 12 pm 4 pm 8 pm Fri Aug 19 8 am 12 pm 4 pm 8 pm Sat Aug 20

0 200 400 600
Geographical spread of Tweets

(A) 4:15 - 6:15 PM  
(B) 6:15 - 6:30 PM  
(C) 6:30 - 7:15 PM  
(D) 7:15 - 8:15 PM

Total spread afterwards:
1. Early warning

'Dangerous weather' messages as early indicators

2. Damage and casualties

Messages about (rumours on) casualties and deaths

3. 'Community resilience'

People offering help in various ways (e.g. twitterlists)
Early warnings?

Words used 25 minutes before impact

1. Weather: storm, thunder, cloud bursts, hail, ....
2. Locations: Brussel, Gent, Hasselt, ...
3. Severity: intense, enormous, drama, 'hell', !...
1. Early warning

I pity those on #pukkelpop! It was pitch dark here for over 15 minutes! And hail storm, lightning, thunder, ...OMG!
Damage: photo's from eye witnesses
2. Damage and casualties

- Retweets expressing doubts
- Some messages reach 10k users in 3 seconds
- Hyperlinks (news or photo websites) high propagation

SMS from the Standard: according to fireman of Sint-Truiden 6 deaths on #ppl1 because of storm #shitman
Pukkelpop Twitter: community resilience

- #Hasselhelpt, #Genthelpt, #Brusselhelpt, ...
- Creation of Twitterlists (e.g. PatriceF)
- Sharing of phone numbers
- Creation of Twitter accounts

3. ‘Community resilience’

#Hasselhelpt 2 beds, shower and breakfast, ask @Daffybal - pick up at church possible, we live behind the festival grounds
Flood Control 2015

Discussion

> Festival goers were taken by surprise, so it seems. But (weak) signals were there.

> Retweets accounted for large amounts of tweets on damage and casualties and only occurred when pictures (in case of damage) or links to official news sites (in case of casualties) were available. This suggests social norms on twitter prevent propagation of unverified information about delicate topics.

> Solidarity is important in coping with disasters (Starbird et al). Within 2 hours the #hasselthelpt initiative was followed massively. This suggests social media can facilitate community resilience that originate from nearby people.

> Twitter monitoring could enable crisis managers to confirm or refute rumors and take emotional responses into account in crisis communications.
Future research

- **Early detection and early warning:**
  - Examples: Queensday, (death) threats and weather conditions

- **Filters** for **damage** and **casualties** need to be verified for other incidents. **New topic filters** such as **resilience** need more research.

- **Retweets** and **source credibility** are indeed related. Images and links, besides the author, play an important role in assessing credibility.
  - Indicators for **assessing real-time credibility** seem possible and are valuable for crisis response teams.
Implications for crisis management

> **Visual analysis** provide a good start to identify abnormalities

> **Filtering** on damage could have provided pictorial 'evidence'

> **# of retweets** attract attention and point toward a hot topic from a 'trusted' source, and news about damage or casualties mostly have high propagation

> **Not just about technology**: organizational solutions needed for embedding social media usage in crisis communications, such as more experience, knowledge and policies.
challenging

Questions? #daretoask

engaging
Flood Control

Thank you!

Demonstration:
TUESDAY afternoon
4:00 PM – 5:00 PM
at Concourse level

Arnout de Vries
Senior scientist
Innovation Management

Arnout.de.vries@tng.nl
http://www.tng.nl

@MrFreeze23
Flood Control 2015

First incident: heavy rainfall from citizens

0.52

18:15

18:20

18:25

18:30

18:35

18:40

18:45

19:00

Indications of measures of storm heading to Pukkelpop from citizens

Reports about damage and casualties

First relevant pictures showing damage (collapse of tent)

Large amounts of rumour spread about #deaths

Deaths semi-confirmed by individual journalist

Initiation of #FloodControl

Reports about deaths

Fire depts Sint Truiden say 6 deaths and Hasselt says 1 death, 7 injured

First message since incident

Belgian press started reporting (individual accounts)

Dutch press starts reporting

Announcement that festival is cancelled for the night

GSM network in fixed "SMS use only" is asked for

Press conference (TV): 2 deaths and 40 injured

Belgian press started reporting (individual accounts)

Official news: 5 deaths, tens injured, festival cancelled

WWW.FLOODCONTROL2015.COM
Pukkelpop Twitter: damage & casualties

**Tweets/min on 'Damage' topic**

- 7 pm
- 8 pm

**Tweets/min on 'Casualty' topic**

- 7 pm
- 8 pm

Flood Control 2015
Of which 94,109 were created from the start of the disaster (6:15 PM)
Flood control 2015

> Flood control 2015 programme:
Stimulates the development of (IT) innovations in order to promote smarter protection against floods and other water related hazards.

> Social media and crisis management project
Gathering information from technical sensors
  e.g. weather, dikes, waterlevels

-> But also from the HUMAN sensor
  which information could humans provide?
Twitcident
Real-time Twitter monitoren tijdens incidenten
1. Early warning

Matthias Vanhamme

I pity those on #pukkelpop! It was pitch dark here for over 15 minutes! And hail storm, lightning, thunder, ...OMG!

2. Damage and casualties

Kim Wouters

SMS from the Standard: according to fireman of Sint-Truiden 6 deaths on #pp11 because of storm #shitman

3. 'Community resilience'

Davy Stiers

#Hasselthehelp 2 beds, shower and breakfast, ask @Daffybal - pick up at church possible, we live behind the festival grounds
GSM network is fixed, "SMS use only" is asked for.

Fire depts Sint Truiden say 60 deaths and 7 injured.
Hasselt says 1 death, 7 injured.

Flood Control 2015

Start incident heavy rainfall
Reports about damage and casualties
Indications of heaviness of storm heading to Pukkelpop from citizens

First relevant pictures showing damage (collapse of tent)

Reports about deaths

Large amounts of rumour spread about deaths
Deaths semi confirmed by individual journalist

20:19

Initiation of #HasseltHelp

GSM network is fixed, "SMS use only" is asked for.

21:16

Official news: 6 deaths, tens injured, festival cancelled.
Kiewit Storm
Occurred Aug 18, 2014 4:00 PM

Current selection:
1,093 1,000 tweets
Current users

Filter tweets
Tweet property
Author
Topics of interest
Title

Sort tweets on
Sort options

Berichten vanaf het festivalterrein

svenvanbrabant
Saw the damage and many people in panic at #pukkelpop #pp11
Ooggetuigen maken direct foto's
Hoe werkt Twitcident?

Emergency Services & General Public

Faceted Search & Realtime Analytics

Filtering

Information need

Semantic Enrichment

Social Media Aggregation

Incident Profiling

Incident Detection

http://wis.ewi.tudelft.nl/twitcident
helping emergency services

Detects, filters and analyses tweets to help emergency services during incidents

Provides real-time situational awareness:

Before incident

'Early warnings'

I pity those on #pukkelpop! It was pitch dark here for over 15 minutes! And hail storm, lightning, thunder...OMG!

During incident

'Damage, casualties, and rumours'

SMS from the Standard: according to fireman of Sint-Truiden 6 deaths on #pp1 because of storm. #shitman

After incident

'Community resilience'

#Hasselthelphl 2 beds, shower and breakfast, ask @Daffybal - pick up at church possible, we live behind the festival grounds

Want to know more?

Visit the website or contact
Amout de Vries
31 (0)88 866 77 78
amout.devries@tno.nl

SOLUTIONS FOR SMART FLOOD CONTROL

Flood Control 2015 is an initiative of:

ARCADIS
Deltares
TNO
TUGBOAT
HKU
Royal Netherlands Institute for Sea Research
Curaçao Research & Development Foundation (CUR)
As soon as something happens around them, people start to twitter. This rapid messaging with text and often images presents a huge mountain of unstructured data. Some tweets about an impending incident or disaster contain information that is useful to the emergency services such as the police and fire departments. They can analyse the messages to assess the gravity of the situation and how best to deploy the emergency operations. Even, in some situations, it will help emergency services to foresee potential risks and help them to act accurate. Twitcident enables these twitter data to be filtered intelligently.
TWITCIDENT DETECTS, FILTERS AND ANALYSES

Pukkelpop storm
Started on August 15, 2011 at 6:33 PM

Flood Control 2015

TWITCIDENT
TU-Delft, TNO and entrepreneur Richard Stronkman developed Twitcident, a tool that finds twitter messages and then intelligently filters and displays the most reliable and relevant messages. Quick, relevant information: that’s what everyone and emergency services most of all is best served by when an incident or disaster occurs. This also quickly provides an operational picture of the surroundings of the incident.

PUKKELPOP FESTIVAL
The storm that hit the Pukkelpop festival in the summer of 2011 in Belgium was signalled early through Twitter. A case study carried out by TNO (with HKV lijn in water) revealed an explosion of an enormous stream of tweets with questions, rumours, facts, photos and videos. It appears that during calamities all parties want facts to be separated from rumour.

If the authorities can be prepared for this, then they can immediately respond to these rumours and incorporate the facts in their decision-making. In the event of large-scale rioting, terrorist attacks, earthquakes or floods, the emergency services can gain valuable information in this way about locations, victims, blocked roads or fleeing crowds of people. Maps, photos and visualized statistics give the police and fire services an even better situational awareness. Several police corps in the Netherlands have already trialled Twitcident. During the New Year festivities the police used Twitcident for information about illegal fireworks being let off and arson.

Want to know more? Contact
Arnout de Vries
31 (0)88 866 77 78
arnout.devries@tno.nl
TWITCIDENT DETECTEERT, FILTERT EN ANALYSEERT

"Poeh he. Ga ik in bad niets aan de hand kom ik eruit is er allemal alleen op pukkelpop" #bizar #pp11

"Noodweer Pukkelpop eist 2 doden - NRC Handelsblad: Eindhovens Dagblad Noodweer Pukkelpop eist 2 doden"

"Hartverwarmend alle hulp die aangeboden wordt in Hasselt en omstreken. Sterkte aan iedereen daar." #Pukkelpop

Bron: Flickr, by miss.libertine

Twitcident zoekt naar tweets die hulpdiensten bij crisis kunnen helpen

Mensen beginnen meteen te twitteren als er iets in hun omgeving gebeurt. Een deel van de tweets over een (dreigende) ramp of een incident bevat nuttige informatie voor bijvoorbeeld politie en brandweer. Een analyse van de berichtgeving kan door hen worden gebruikt om de ernst van de situatie in te schatten en wat de inzet van hulpdiensten zou moeten zijn. Deze snelle berichtgeving met tekst en vaak ook beeld vormt samen een grote berg aan actuele maar ongestructureerde data. Met Twitcident kan deze twitterdata slim worden gefilterd, ter ondersteuning van hulpdiensten tijdens een crisis.
TWITCIDENT DETECTEERT, FILTERT EN ANALYSEERT

Pukkelpop storm

Started on August 18, 2011 at 6:15PM

About the Pukkelpop storm

66k 39k 20k 14k

tweets users rt-tweets replies

Search in Pukkelpop tweets

Filter tweets

Pubisher

Flood Control 2015


PUKKELPOP

De storm die Pukkelpop in de zomer van 2011 in België trof werd vroeg gesignaleerd via middel van Twitter. Een analyse die TNO (samen met HKV lijn in water) achteraf losliet op het Twitterverkeer tijdens die ramp, laat zien dat er een enorme stroom van tweets met vragen, geruchten, feiten, foto's en video's losbarstte. Er blijkt tijdens calamiteiten vooral behoefte te zijn aan betrouwbare informatie en het scheiden van geruchten en feiten.

TWITCIDENT


SOLUTIONS FOR SMART FLOOD CONTROL
Towards realtime Twitter analysis

ISCRA M 2012

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Social sensors and citizen journalism
Twitter first to publish dramatic crash pictures

February 27 2015

The social networking site Twitter again stole a march on traditional media when it was the first outlet to publish dramatic pictures of the Turkish Airlines crash. Moments after the plane crashed at Amsterdam's Schiphol airport on Wednesday morning, photos were appearing on Twitter. CNN's correspondent Errol Barnett said, "They are down there, Twitter is up there."

Network Effects: Social Media's Role in the London Riots

Facebook and Twitter can fuel uprisings by allowing participants to coordinate action and to see themselves as part of a larger movement.

Send reports via:

mobile phone :: email :: web
Finding and filtering: keywords, syntactical, context and semantic features. More info:

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LYON - FRANCE
Pukkelpop Twitter visual analysis

156,157 tweets total in 2 days

576 tweets/min

Tweets /min

600

400

200
Selection of 96,957 tweets between noon and midnight

Tweets /min
600
400
200

Thu Aug 18  8 am  12 pm  4 pm  8 pm  Fri Aug 19  8 am  12 pm  4 pm  8 pm  Sat Aug 20
12 AM
12 PM
Geographical spread of Tweets

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Messages about (rumours on) casualties and deaths

2. Damage and casualties

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'Dangerous weather' messages as early indicators

3. 'Community resilience'

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Damage: photo's from eye witnesses
Pukkelpop Twitter: damage & casualties

2. Damage and casualties

- Retweets expressing doubts
- Some messages reach 10k users in 3 seconds
- Hyperlinks (news or photo websites) high propagation

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• #Hasselhelpt, #Genthelpt, #Brusselhelpt, ...
• Creation of Twitterlists (e.g. PatriceF)
• Sharing of phone numbers
• Creation of Twitter accounts

3. 'Community resilience'

#Hasselhelpt 2 beds, shower and breakfast, ask @Dafybel - pick up at church possible, we live behind the festival grounds
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> Festival goers were taken by surprise, so it seems. But (weak) signals were there.

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Future research

> **Early detection and early warning:**
  > Examples: Queensday, (death) threats and weather conditions

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Implications for crisis management

- Visual analysis provide a good start to identify abnormalities.

- Filtering on damage could have provided pictorial 'evidence'.

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- Not just about technology: organizational solutions needed for embedding social media usage in crisis communications, such as more experience, knowledge and policies.
challenging

Questions? #daretoask

engaging
Demonstration:
TUESDAY afternoon
4:00 PM — 5:00 PM
at Concourse level

Arnout de Vries
Senior scientist
Innovation Management

@MrFreeze23
Timelines

8h:32

Reports about damage and casualties

19h:11

First relevant pictures showing damage (collapse of tent)

19h:15

Large amounts of rumour spread about deaths

20h:15

Deaths semi-confirmed by public relations of Hasselt

21h:15

OSM network is fixed. "SMS use only" is asked for.

8h:24

First pictures showing panic

19h:11

Reports about death and injuries

20h:12

Press conference (TV): 2 deaths and 40 injured

WWW.FLOODCONTROL2015.COM
Flood Control 2015

Pukkelpop Twitter: damage & casualties

Tweets/min on 'Damage' topic

Tweets/min on 'Casualty' topic

News media

rumors

SLIDE 23
Pukkelpop Twitter visual analysis

Of which 94,109 were created from the start of the disaster (6:15 PM)

Tweets /min

600

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Twitcident
Real-time Twitter monitoren tijdens incidenten
Richard Stronkman, Hans Burghard, Arnout de Vries

April 2012
1. Early warning

Matthias Vanhamme

I pity those on #pukkelpop! It was pitch dark here for over 15 minutes! And hail storm, lightning, thunder, ...OMG!

2. Damage and casualties

Kim Wouters

SMS from the Standard: according to fireman of Sint-Truiden 6 deaths on #pp11 because of storm #shitman

3. ‘Community resilience’

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#Hasselhelpt 2 beds, shower and breakfast, ask @Daffybal - pick up at church possible, we live behind the festival grounds
Indications of heaviness of storm heading to Pukkelpop from citizens. Reports about damage and casualties. Reports about deaths. Start incident.

First message since incident. WNW FL0D CONTROL 2015. Conference (TV): 2 deaths and 40 injured. First pictures showing panic. Dutch press starts reporting (individual accounts).

Official news: 5 deaths. Tens injured. Festival cancelled. First relevant pictures showing damage (collapse of tent). Large amounts of rumour spread about deaths. Fire depts Sint Truiden say 66 deaths and e. Hasselt says 1 death 7 injured. Press URL and phone number and contact information.

Flood Control Initiation of SHasselthelpt. Deaths semi-confirmed by individual journalist @Pukkelpop.

First messages asking for SMS use only. GSM network is fixed.

Reports about damage and casualties. Dutch press starts reporting (individual accounts).
Saw the damage and many people in panic at Kwikkelpop. #gpop
Ooggetuigen maken direct foto's
Hoe werkt Twitcident?

http://wis.ewi.tudelft.nl/twitcident
Flood Control 2015

Provides real-time situational awareness:

Before incident

‘Early warnings’

I pity those on #pukkelpop! It was pitch dark here for over 15 minutes! And hail storm, lightning, thunder... OMG!

During incident

‘Damage, casualties, and rumours’

SMS from the Standard: according to fireman of Sint-Truiden 6 deaths on #pp1 because of storm.

#shitman

After incident

‘Community resilience’

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Solutions for smart flood control

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TU-Delft, TNO and entrepreneur Richard Stronkman developed Twitcident, a tool that finds twitter messages and then intelligently filters and displays the most reliable and relevant messages. Quick, relevant information: that’s what everyone and emergency services most of all is best served by when an incident or disaster occurs. This also quickly provides an operational picture of the surroundings of the incident.

PUKKELPOP FESTIVAL
The storm that hit the Pukkelpop festival in the summer of 2011 in Belgium was signalled early through Twitter. A case study carried out by TNO (with HKV lijn in water) revealed an explosion of an enormous stream of tweets with questions, rumours, facts, photos and videos. It appears that during calamities all parties want facts to be separated from rumour.
If the authorities can be prepared for this, then they can immediately respond to these rumours and incorporate

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Mensen beginnen meteen te twitteren als er iets in hun omgeving gebeurt. Een deel van de tweets over een (dreigende) ramp of een incident bevat nuttige informatie voor bijvoorbeeld politie en brandweer. Een analyse van de berichtgeving kan door hen worden gebruikt om de ernst van de situatie in te schatten en wat de inzet van hulpdiensten zou moeten zijn. Deze snelle berichtgeving met tekst en vaak ook beeld vormt samen een grote berg aan actuele maar ongestructureerde data. Met Twitcident kan deze twitterdata slim worden gefilterd, ter ondersteuning van hulpdiensten tijdens een crisis.
TWITCIDENT DETECTEERT, FILTERT EN ANALYSEERT

TWITCIDENT

PUKKELPOP
De storm die Pukkelpop in de zomer van 2011 in België trof werd vroeg gesignaleerd door middel van Twitter. Een analyse die TNO (samen met HKV lijn in water) achteraf losliet op het Twitterverkeer tijdens die ramp, laat zien dat er een enorme stroom van tweets met vragen, geruchten, feiten, foto’s en video’s losbarstte. Er blijkt tijdens calamiteiten vooral behoefte te zijn aan betrouwbare informatie en het scheiden van geruchten en feiten. Als autoriteiten hierop voorbereid zijn, dan kunnen zij direct inspringen op deze geruchten en de feiten bij hun besluitvorming betrekken. Bij grote relaties, terroristische aanslagen, aardbevingen of overstromingen kunnen hulpdiensten op die manier waardevolle informatie krijgen over locaties, slachtoffers, geblokkeerde wegen of menigtes die op de vlucht zijn. Door middel van kaarten, foto’s en statistieken krijgen politie en brandweer een nog beter beeld van de situatie.

IN DE PRAKTIJK
Een aantal politiekorpsen in Nederland heeft al proefgedraaid met Twitcident. Tijdens de jaarwisseling gebruikte de politie Twitcident voor informatie over het afsteken van illegaal vuurwerk en brandstichting.

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