Visual Analytics for Decision Making

VACCINE (CVADA)
Kaethe Beck

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Team Profile

- Who We Are: Team of International Experts
  - 25 Institutions, 75+ Faculty
- What We Do: Help individuals find relevant, useful information from big data to aid in rapid, accurate decision making
VACCINE Projects

• VASA
• Sensor Forensics
• Corporate Insider Threat Detection
• SemanticPrism
• Scatterblogs
• Jigsaw
• Spring Rain*
VASA Decision-Making Tool (Purdue)

Food Distribution Model (Minn)
Critical Infrastructure Model (UNCC)
Weather Model and Data (UT Austin)
Routing (Purdue)

Component API

Common Model State
Common Time
Visual Representations
Interaction
Sensor Forensics

• Forensic characterization
  – Observe device output ➔ which device produced it?
  – Exploit how the device “makes” its output

• Device authentication
  – Performed using forensic characterization
  – Identify device type, make, model, configuration
  – Can the sensor be trusted?

• Detection of data forgery or alteration
• Fingerprint and trace
Corporate Insider Threat Detection

- **Sponsor:** Centre for the Protection of National Infrastructure
- **Academics:** Sadie Creese (PI), Min Chen, Michael Goldsmith, Michael Levi, David Upton and Monica Whitty
- **Combined Expertise** in cyber security, psychology, criminology, visual analytics, enterprise operations management and executive education
- **Objectives:**
  - Develop a model,
  - Understand psychological indicators
  - Identify the most effective algorithms
  - Understand enterprise culture and common practices
  - Provide a **visual analytical** interface
  - Develop an understanding of both the various organisational roles and awareness raising and educational methods
- **URL:** http://www.cs.ox.ac.uk/projects/CITD/index.html
- **Oxford Cybersecurity Centre:** http://www.cybersecurity.ox.ac.uk/index.html
SemanticPrism: A Multi-aspect View of Large High-dimensional Data

- VAST 2012 Mini Challenge 1 Award: Outstanding Integrated Analysis and Visualization
- Geo-Temporal
- Time-serial
- Pixel-based
- Semantic Zoom
SemanticPrism

Time Serial Curves

Pixel-based IP space

Geo-Temporal Zoom-in

IP space Zoom-in
Topic Analysis

was     just
large    running
you    happen

explosion
line    the
two bostonmarathon

what report    and they
everywhere okay

awful miss boston
now     ma

went bomb off

Text
Oh my god what just happened
Something happened at the end of the Boston Marathon. Something bad and there is a lot of chatter on Twitter. What's going on?
Multiple people are injured near the Boston Marathon finish line after two explosions. The #BostonMarathon has been stopped.
two bombs just went off on boylston

BREAKING NEWS: Two powerful explosions detonated in quick succession right next to the Boston Marathon finish line this afternoon.

What the FUCK was that
Back in Sept, @croon1 solicited me for $2000. He now has a music video with William Shatner. If you watch it (god forbid) keep that on mind.

Literally what the fuck get me out of here

@DTenenbaum my office right next to it

@FRANCESCAlco I figured 3 people would get the joke

This is crazy I seen that blow up #bostonmarathon

can someone tell me what that explosion was? #boston #bostomarathon
• Location-based Social Network data has substantial potential to increase situational awareness.

Spatial user-based Tweet distribution during four hours right after evacuation order for Hurricane Sandy on October 28th, 2013 (Left). A relatively large number of people immediately went to super markets nearby the evacuation area, instead of the emergency shelter. Spatial pattern of Twitter users during 24 hours in the city of Moore after damages from a strong tornado (Right). Relatively many people moved to severely damaged areas after the disaster. Topic cloud (Right-Bottom): Topics from Tweets within the selected area with a box. The topics are ordered by their abnormality scores.
Jigsaw: Visual Analytics for Investigative Analysis
2013 VAST Challenge MC2 Award
Outstanding Creative Design

Spring Rain

A Visual Analytics System with an Ambient Information Display
1. Non-routine and crisis security issues

2. Network health issues

3. March 2013 Undersea Cable Cut incident to demonstrate performance issues

4. Some networks are out of reach. Possibly due to power outage caused by a hurricane
Contact Information

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www.VisualAnalytics-CCI.org
Financial Risk

Rule 1: Bank A & Market C & Credit Score > 740
Rule 2: Bank A & Market C & Credit Score 680-739
Rule 3: Bank A & Market C & Credit Score 620-679
Rule 4: Bank A & Market C & Credit Score < 620

Indicators for market stability

Investments in dollar amount

[Graph showing data analysis and indicators]