Visual Analytics for Regional Needs: Applications in Command & Control, Emergency Response, and Public Health Surveillance

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Research and Projects

Visual analytics areas:
• Infield, mobile visual analytics
• Command and control visual analytics
• Syndromic surveillance visual analytics

Projects
• Emergency Response Technology and testbeds
• Public and animal health surveillance
• Port Authority of New York and New Jersey (PANYNJ)
• Automated Regional Justice Information System (ARJIS)

Partners: NVAC, NeVAC, Army CERDEC, Lafayette Police, Purdue EMS, Indiana DHS, Indiana BOAH, Indiana SDH, Georgia Dept. of Health
Emergency Response Visual Analytics

Increase situational awareness (SA Level 1 & 2)

Improve scenario training

Simple representation

In-field personnel

• Limited device capabilities
Command and Control Visual Analytics

Goal: Provide relevant, actionable, understandable information for rapid decision making

Keys to success

- Usability, reliability and dependability
- Appropriateness/effectiveness
- Aggregation/abstraction
- Signature/feature extraction
- Correlative analysis

Unique requirements for techniques

- Display/device/user/location/task adaptation of techniques
- Seamless scaling across devices
Sensor and Video Visual Analytics

**Partners:** Army CERDEC, Indiana DHS, PANYNJ

**Goals:** Track objects in real-time in video sequences for CCI, surveillance, and emergency response

**Impact:**
- Video tracking of unstructured video tested and deployed
- Extending to real-time mobile on-device tracking for infield unit commanders
EMMS Visual Analytics Testbed: Muscatatuck Urban Training Center

Goal

Demonstrate a mobile, low-cost exercise monitoring and training system

Solution approach

• Provide increased EOC and in-field situational awareness through integrated visual analytics

• Track, display, and interact with actions and events during and after training exercises

• Track up to 25 exercise participants responding to and within a scenario building

• Provide a national capability to train, test & experiment with joint, interagency, inter-government, multi-national teams

• Provide training for school incidents
Emergency Response Training Components

**Personnel/asset tracking**
- Interior and exterior tracking, sensors

**Video/audio recording & monitoring**
- Streaming and recorded

**COP and AAR displays**
- Integrated tracking and video display for situational awareness and review

**Real-time data, video, sensor, communications, and network integration**
Impact

Developed emergency response and urban training technology test-bed at Burtsfield middle school and will deploy at the Muscatatuck Urban Training Center.
Initial Results

Video

Equipping agents

- Tracking Tag
- Camera
- Sensor Board
- GPS
- Video Pack

Purdue University Regional Visual Analytics Center
Purdue University Homeland Security Institute
Health Monitoring and Management
Visual Analytics

**Partners:** ISDH, IDHS, IBOAH, PUSH, GaDH, LLNL, CERATOPS, Banfield, VIN, FAZD

**Goal:** Improve public health, animal health, food safety through visual analytic environments for planning, monitoring, detection, response, and management

- Chemical/biological/nuclear event detection
- Syndromic surveillance
- Natural disease/pandemic detection
- Syndromic factor analysis, disease spread analysis
- Interdiction modeling and analysis

**Relevance:** Natural and manmade event detection and response
Health Monitoring and Management
Visual Analytics: Impact and Relevance

• Analyzed public health effects from chemical spill in Fairburn, Georgia.
• Analyzed syndromic spread factors for national veterinary association to reduce production losses and disease spread.
• Evaluated effectiveness of and proposed improvements to Indiana pandemic influenza monitoring and management.
• Developing linked animal-human health surveillance system for more timely and accurate health monitoring and response.
• Investigated correlation of influenza system in pets and humans for improved influenza planning and response.
• Evaluating use of ProMed and VIN data sources for outbreak/event detection and monitoring.
Health Monitoring and Management
Visual Analytics: Impact and Relevance

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LAHVA Example Displays
Law Enforcement and Counter-Terrorism

AIM

Develop a thin-client platform for integrating diverse visual analytic applications in an approachable interface for knowledge discovery.

IMPACTS

- Users can easily discover topical, temporal, and geographic patterns in their structured and unstructured data.
- Customers can easily integrate visualization into their existing web portals.
- Real-time information sharing builds situation awareness.

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Law Enforcement and Counter-Terrorism

Desktop to Handheld: Enabling cross-jurisdictional situational awareness for rapid decision making and resource deployment

Intuidex

SRS/DCAF

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PANYNJ: Phase 1 - The Assessment Wall

Developed an interactive information visualization system that provides an up-to-date overview and helps users intuitively find documents of interest on a large touch display.

- A walk-up usable interface that provide anyone instant analytical capability.
- Designed for team collaboration and discussion of analytical tasks.
- Simple interface design to provide rapid analytical results is ideal for command room style utility.
PANYNJ: Phase 2 – Law Enforcement Visual Analytics

- Integrate INSPIRE technology for incident reports
- Integrate advanced geospatial temporal analytic techniques
- Adapt and integrate syndromic surveillance to incident and crime reports for improved surveillance