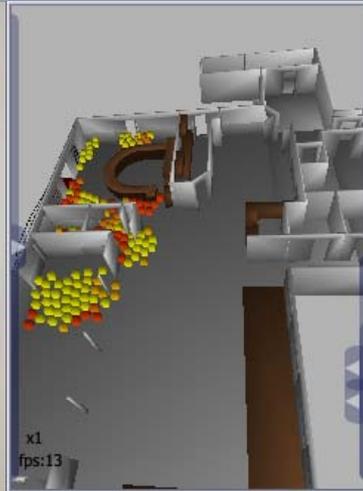


Visual Analytics for Regional Needs: Applications in Command & Control, Emergency Response, and Public Health Surveillance



David S. Ebert

www.purvac.org

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PURVAC
Purdue University Regional
Visualization and Analytics Center



RVAC
Regional Visualization
and Analytics Centers

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 realtime mobile on-device tracking for infield unit commanders



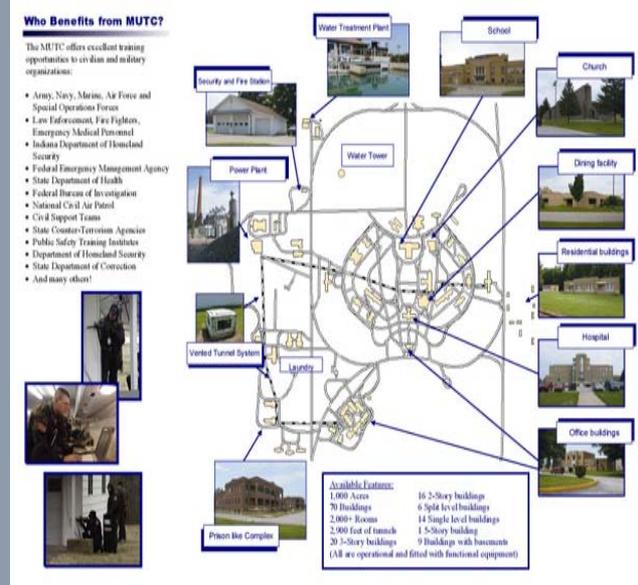
EMS Visual Analytics Testbed: Muscatatuck Urban Training Center

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

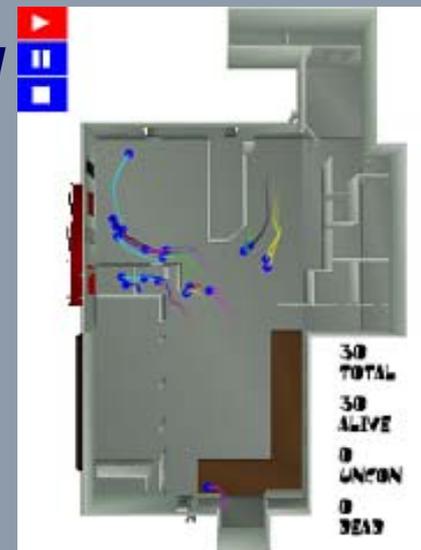
Video/audio recording & monitoring

- Streaming and recorded

COP and AAR displays

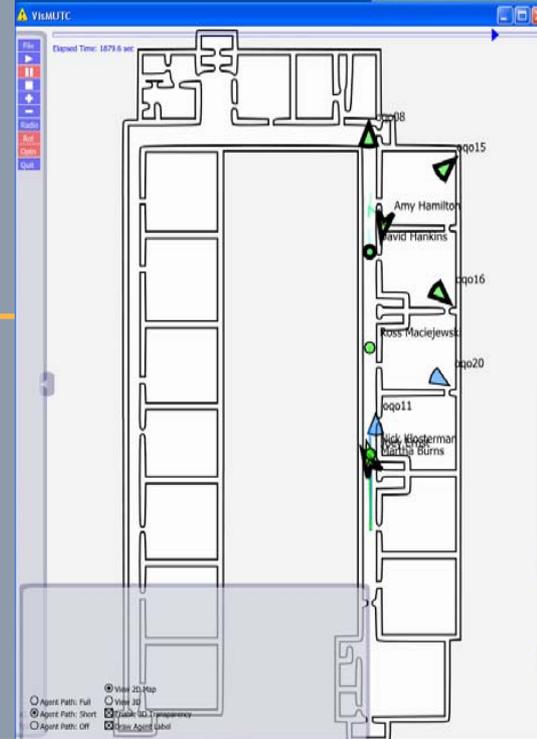
- Integrated tracking and video display for situational awareness and review

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



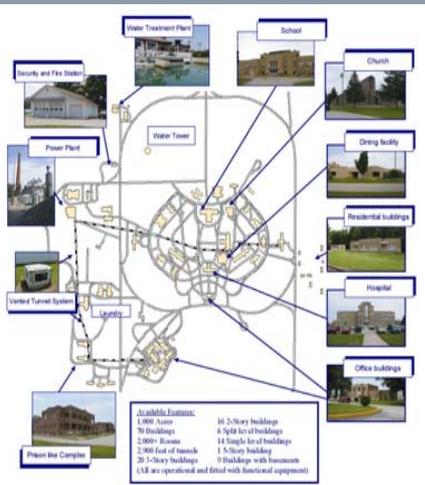
Impact

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



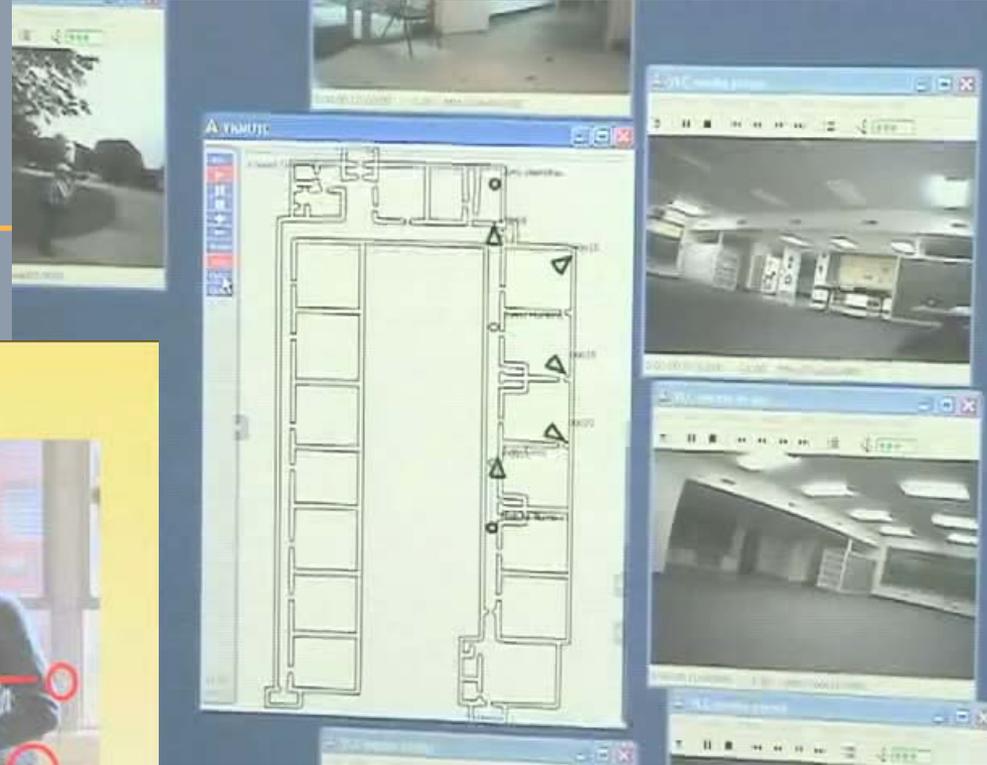
Who Benefits from MUTC?

- The MUTC offers excellent training opportunities to all state and military organizations:
- Army, Navy, Marine, Air Force and Special Operations Forces
 - Law Enforcement, Fire Fighters, Emergency Medical Personnel
 - Indiana Department of Homeland Security
 - Federal Emergency Management Agency
 - State Department of Health
 - Federal Bureau of Investigation
 - National Civil Air Patrol
 - Civil Support Teams
 - State Counter-Terrorism Agency
 - Public Safety Training Institute
 - Department of Homeland Security
 - State Department of Correction
 - And many others!

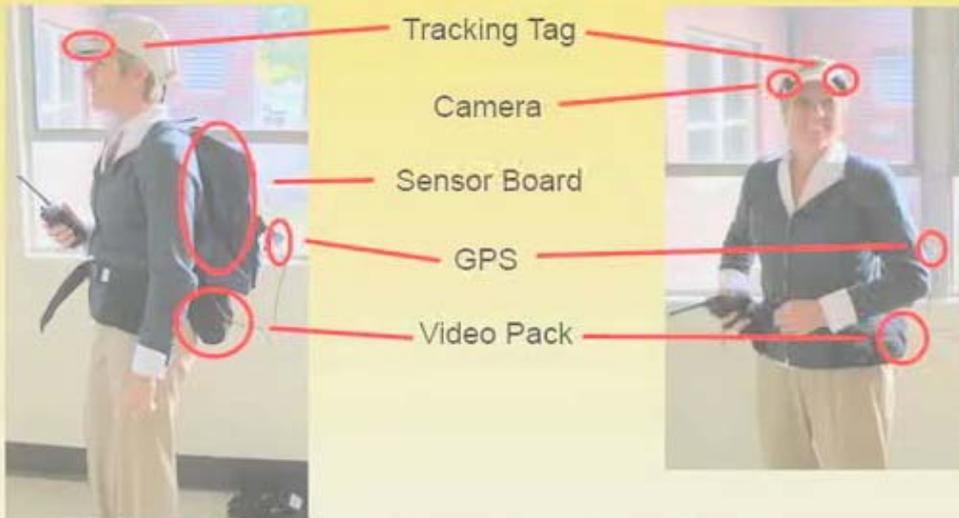


Initial Results

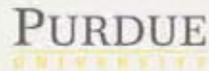
Video



Equipping agents



Purdue University Regional Visual Analytics Center
Purdue University Homeland Security Institute



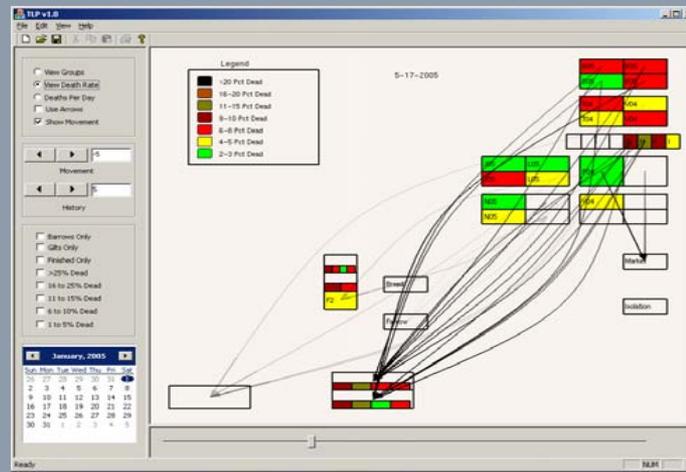
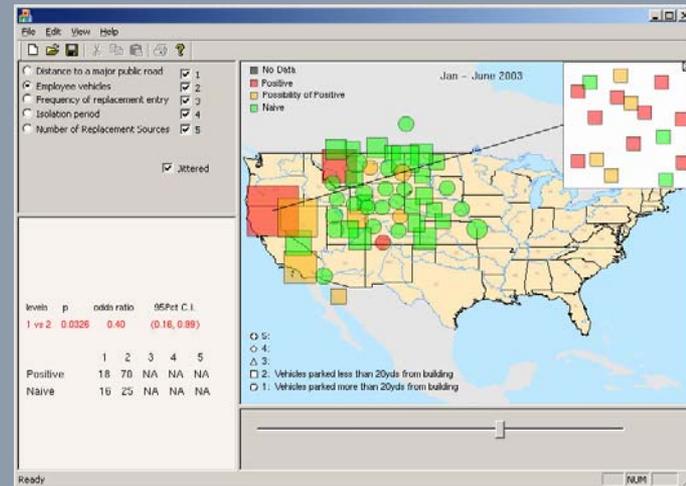
Health Monitoring and Management Visual Analytics

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



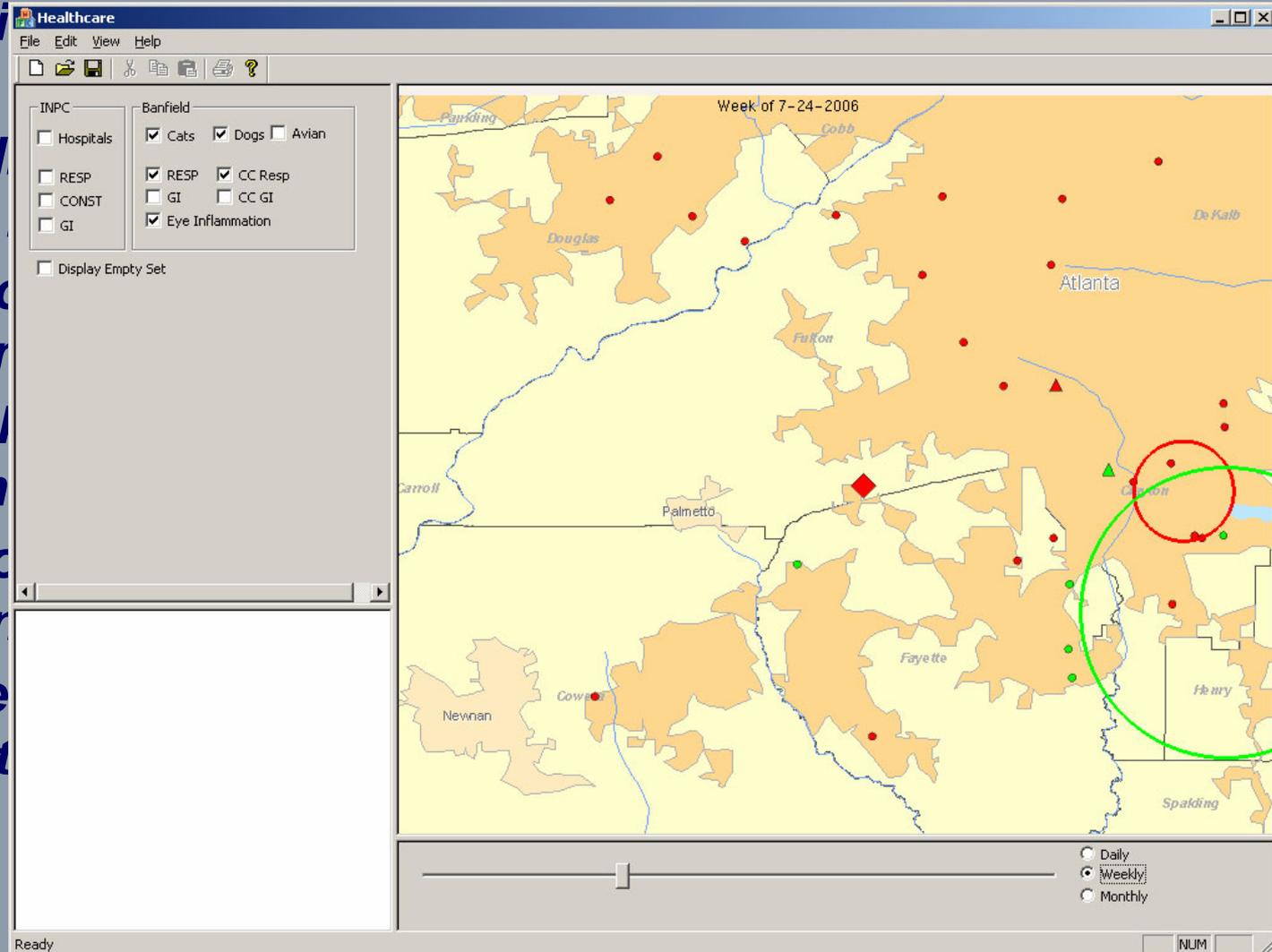
Health Monitoring and Management Visual Analytics: Impact and Relevance

- *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

- Analyzed public health data in Georgia.
- Analyzed syndromic data association to influenza.
- Evaluated effectiveness of Indiana pandemic preparedness.
- Developing links for more timely and accurate data.
- Investigated correlations for improved influenza management.
- Evaluating use of outbreak/event data.



LAHVA Example Displays

Healthcare
2006-06-13 to 2006-06-19

File Edit View Help

CoCo Classifiers

RESP HEMM
 GI BOTU
 CONST NEURO
 RASH OTHER

ILI

Keyword Classifiers

AND OR

AND OR

Demographics

All Male Female

Age

0 To 0
 0 To 0
 0 To 0

All patients
 Affected patients
 Density by county
 Show Hospitals
 Show KDE
 Show Data Aggregation

5 19
H-II NN-II
50 186
H-All NN-All

4 1
Agg Dist Area Factor

>30%
20-30%
15-20%
10-15%
8-10%
6-8%
4-6%
3-4%
2-3%
1-2%
<1%

Increment

Aggregate

ISDH vs. PUSH

Hospital Counts

Selected Region Data

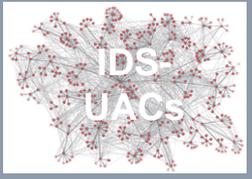
NUM



Law Enforcement and Counter-Terrorism

AIM

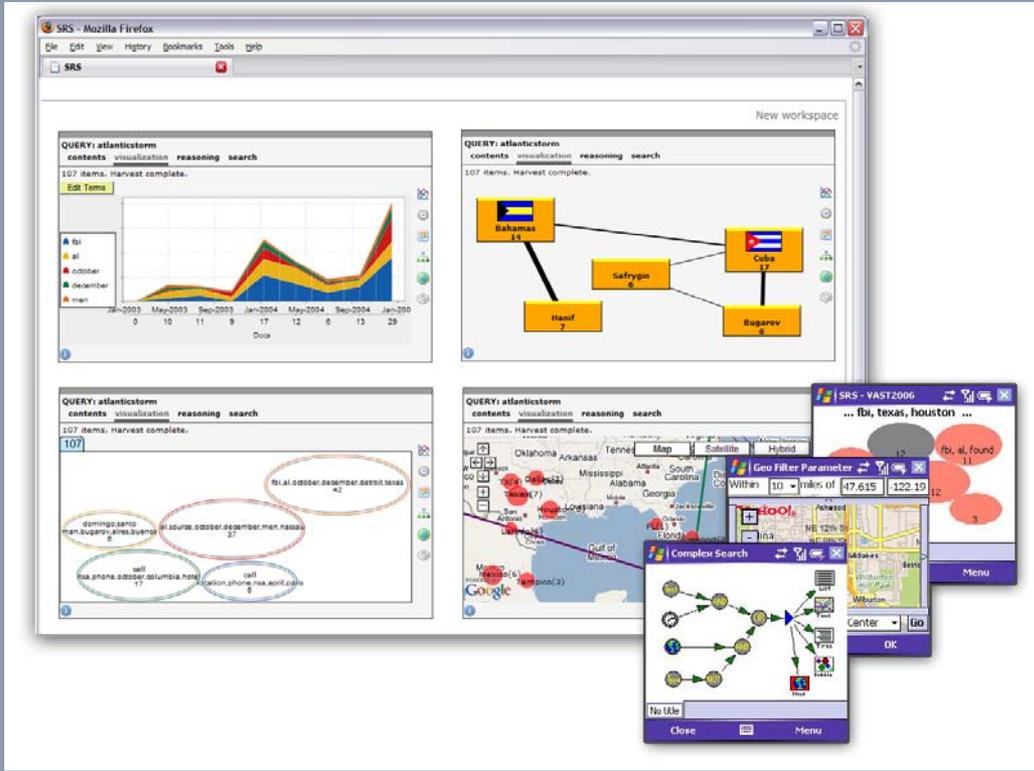
Develop a thin-client platform for integrating diverse visual analytic applications in an approachable interface for knowledge discovery.



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.*

Law Enforcement and Counter-Terrorism



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

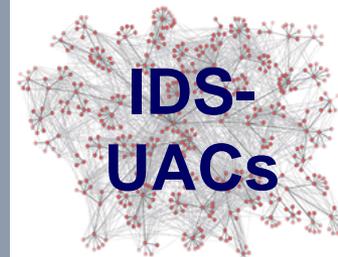


START ►►



SRS/DCAF

Intuidex





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.



