Center for Computational Homeland Security

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Joint Funding

New Science
- New knowledge in real world context
- Processes, procedures, and methodologies
- Computational Experimentation tools and techniques
- Epidemiological & Intervention modeling
- Fail safe grid computing

Real World Application
- Early Access to new knowledge
- Tactics, techniques, & procedures
- Validation & Verification of science
- Reality check
- Concept testing

Commercialization and Mass Dissemination

21st Century Fund:
- Homeland Security Technology Commercialization
  - Training real policy makers and responders
  - Build community/DoD relationship

Purdue/IU/IU School of Medicine
Post Harvest Food Supply-Chain Security Simulation
The Simulation

• Supply Chain Security Simulation
  – Multi-Layered
  – Multi-Tiered
  – Network Model

• Modeling
  – Inventory Control
  – Perishable v/s Non-Perishable Goods
  – Propagation of Inventory
  – Consumer and Supplier Supply and Demand
The Synthetic Environment

Food Flow Systems Model - Computational Decision Making

Source (Pre-harvest)  Transport (Post-harvest)  Storage  Processing  Retail & Consumption

Detection:  Response:  Recovery:  Prevention:
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Real World

National Surveillance (i.e. Food Net)
Traceback and Tracking Identification
Communication Network (database, wireless)

Economic Impacts?
Public Health Impacts?

Farm
• Grains
• Animals
• Plants

Detection:  Response:  Recovery:  Prevention:
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The Inputs

- **Products**
  - Dairy, Meat, Grains, Fruits

- **Infrastructure**
  - Bulk, Processing, Distribution, Retail, Consumers

- **Inventory Control Protocols**
  - Shelf Life, Inventory Size, JIT Inventory

- **Supply and Demand of Consumers**
  - Fluctuations in consumption, Influence of media

- **Supply and Demand of Suppliers**
  - Consumer Demand, Cost of Warehousing

- **Economic Aspects of Supply Chain**
  - Production, Transportation, Warehousing, Quality Maintenance
The Process

- SEAS Propagation Model
  - Agent-based, scalable

- Model
  - Supply-Chain
  - Supply and Demand
  - Product Life

- Track
  - Lots and packages
  - Inventory transfer
  - Cost
The Real-Time Visualization

Visualize
- Supply-Chain
- Flow paths
- Flow rates
- Cost
- Critical Infrastructures

Control
- Inventory
- Production
- Emergency Responses
The Scenario

- Chemical and Biological Terrorist Attacks
- Terror attacks can be caused by
  - Bombs, Sabotages, Contaminations
- Preventive Actions
  - Quality control, Inventory management
- Response Actions
  - Test, recall, de-contaminate, control
The Result

- We get out of the simulation…
  - Emergency Preparedness
  - Emergency Response
  - Analysis of options and actions
  - Effective communication procedures
  - Identify weak spots in the infrastructure

- Questions like…
  - Authority to make decisions?
  - Responsibility to prevent, respond?
Thank You

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