

Potential Enhancements to the Human Interface

Arthur Desrosiers CHP

radcorder@verizon.net

Safety and Ecology Corporation

What is the Human Interface

- The method by which radiation measurements, operational status and analysis is conveyed to users
- Adding a microprocessor package and software between the detection system and the user can provide new methods for operations, analysis and communications
- Think in terms of a feature that guides users and adds more measurement capability

Hardware Implementation

- This capability could be mounted in a traditional CAM cabinet with A/C power, networked unit, or it could be a battery powered “blind” unit that attached to an air sampler and operated through a remote computer.



Simple Operational Controls

- Select from a library of efficiencies
 - Different buildings in a lab, areas within a building
- Preselected list of alarm levels
 - Environmental, RCA, respiratory protection
- Adjust count periods
 - Adjust count time according to background rate
- Calculate time to alarm (airborne stay time)
- Automatic verification of alerts or alarms

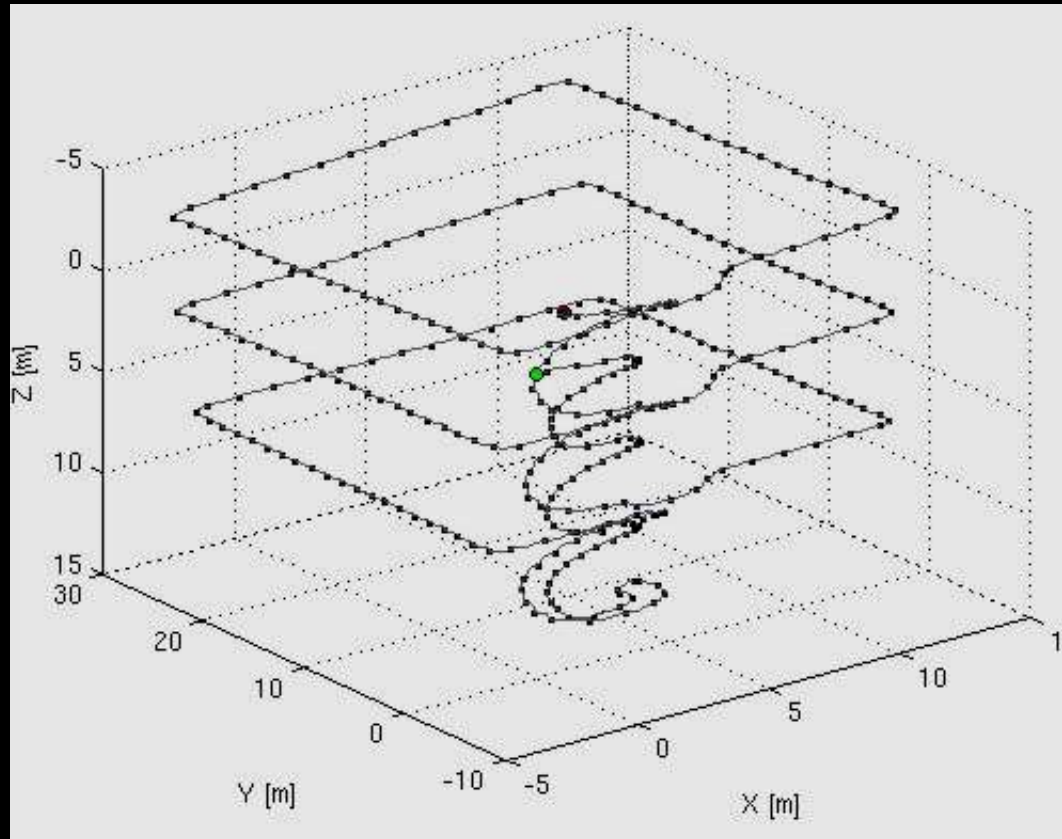
Automatic Location Measurement

- Location measurement could be built in
 - GPS is nearly universal in outdoor applications
 - WiFi nodes can also be used for location
 - Cell phone nodes can be triangulated
 - Custom laser/RF beacons
 - Inertial Guidance
- Location movement alarm
 - LoJack for CAMs

Inertial Location Example



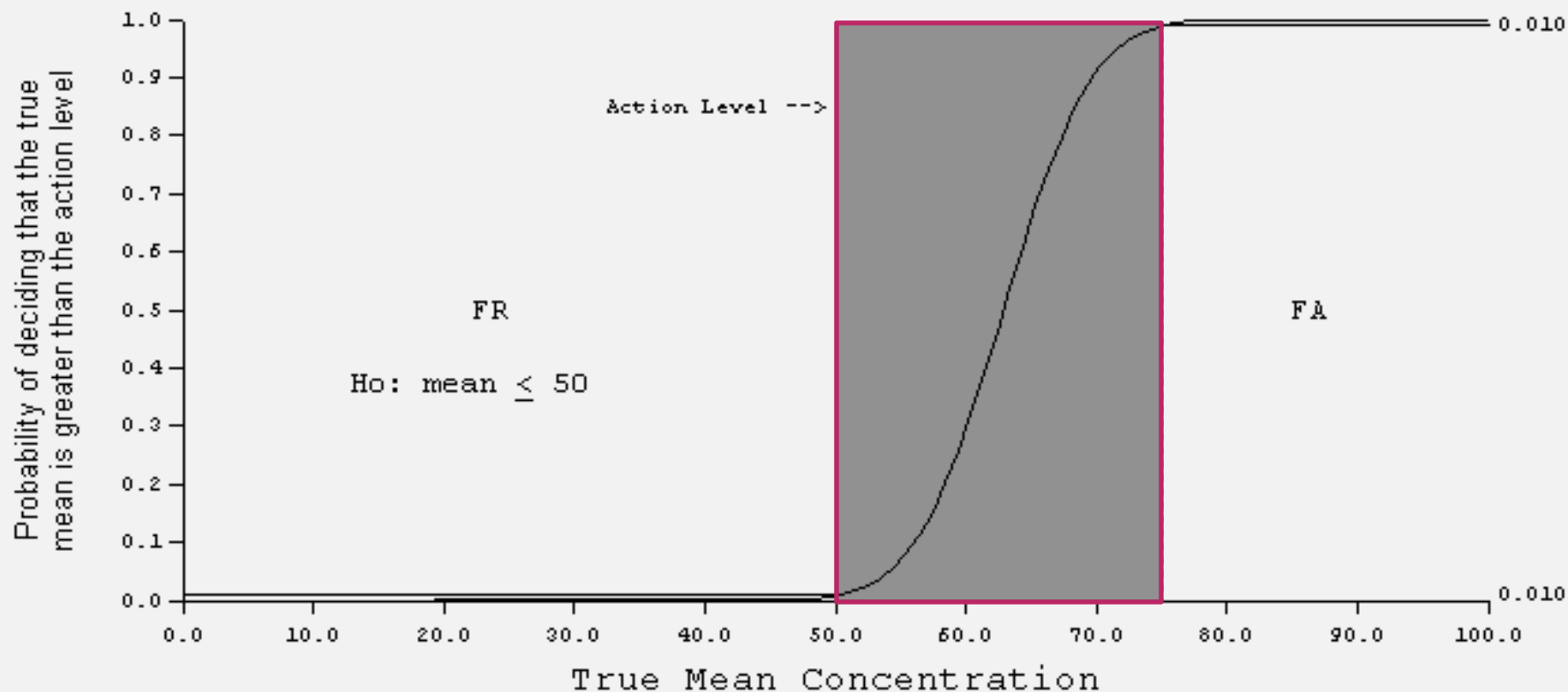
Automatic 3D R-T-L Chart



Complex Operational Controls

- Detect bimodal distributions
 - Counting statistics assume single Gaussian or Poisson distributions
 - Divergence due to actual airborne radioactivity can/will increase the actual standard deviation
 - Small intermittent puffs (too small to see as step changes) might show up as increases in the sigma
 - Radon activity may/is time dependent
 - Real time measurement of standard deviation allows adjustments to set points and may avoid false alarms or lack of true measurement sensitivity
 - Initial application would be to adjust alarm set points
 - Too complex for humans, but simple for processors

Estimated Performance Curve



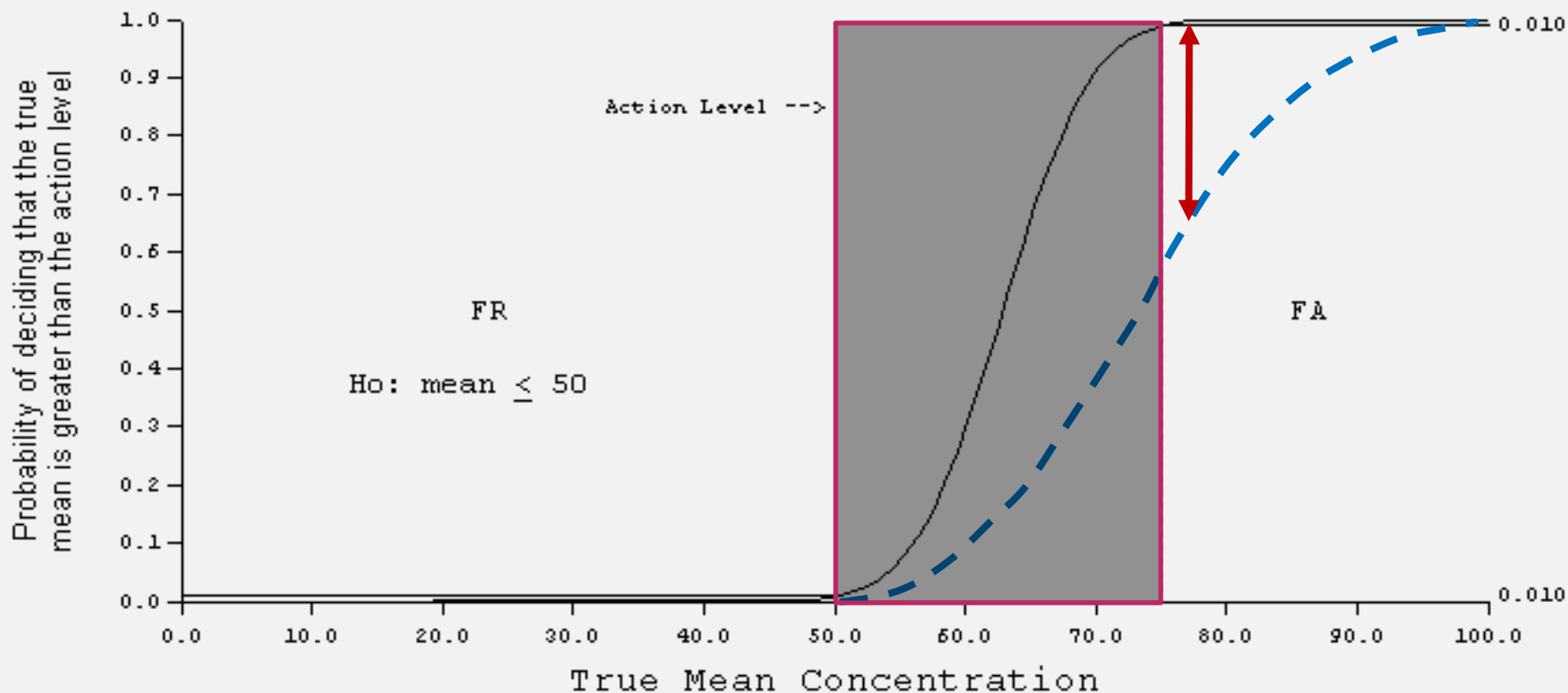
Simple Random Sampling
 Action Level = 50.000
 Cost = \$13650.00
 Sample Size = 13

| Decision Error Limits | | |
|-----------------------|---------|------|
| concentration | prob(E) | type |
| 50.000 | 0.010 | FR |
| 75.000 | 0.010 | FA |

Why Measure Sigma?

- Standard sensitivity calculations assume:
 - $MDC \sim \text{SQRT}(N_B^2 + N_S^2)$ where $N_S \Rightarrow N_B$
 - $MDC \sim \text{SQRT}(2 * N_B^2)$
- However any situation that might produce chronic or intermittent airborne:
 - $N_S > N_B$
 - Then $MDC \sim \text{SQRT}(2 * N_B^2)$ underestimates
- Similar to LLD versus MDC analysis for labs
- Microprocessor power allows real time adjustment for air monitoring applications

Estimated Performance Curve



Simple Random Sampling
 Action Level = 50.000
 Cost = \$13650.00
 Sample Size = 13

| Decision Error Limits | | |
|-----------------------|---------|------|
| concentration | prob(E) | type |
| 50.000 | 0.010 | FR |
| 75.000 | 0.010 | FA |

Adaptive Response

- Collect spectroscopy data
- Radio to remote computer for analysis
- Notify HP, supervisor or SME of unexpected results
- HP or SME review and concur
- Adjust efficiencies and set points in real time
- Detect fission products (e.g. Ce-144) where activation products were expected, for example

Enhanced Communications

- Alarms, equipment status, concentration measurements could be communicated by:
 - WiFi, cell phone text, Bluetooth
 - CAMs could text specific phones with status
 - HPT w/PDA could walk by monitors, get status
 - Use of generic data displays lowers costs
- Unattended monitoring – e.g. flow rate decline or delta P (loading)