LOCALIZING CHEMICAL AND BIOLOGICAL THREAT DETECTION

Improving CBRNE Situational Awareness Using Wearable Kennel Threat Detection Boxes

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CBRNE sensors have historically been focused on stationary applications such as Critical Infrastructure protection resulting in large, complex, and cost-prohibitive systems that require extensive training, elevated maintenance costs, and do not scale or transition appropriately towards low-cost wearable equivalents for the combatants of the different service branches. Numerous notable efforts have aimed to bring CBRNE sensing technologies to the wearable domain by significantly reducing weight, size, and power, but wearable systems continue to remain cost-prohibitive, bulky, and energy inefficient. Furthermore, most wearable technologies implement limited fixed sensing modalities requiring many different systems to be worn during mission execution while adding a burden on the warfighter. Additionally, many systems cannot interface with other sensor systems or integrate into existing tactical networks to achieve multi-layered full spectrum CBRNE monitoring capabilities within a layered defense paradigm. This paper introduces a disposable type of interconnected IP66-68 unattended wearable sensors for the CBRNE domain, called KENNEL Threat Detection Boxes (KTDBs)[NS1] . KTDBs are extremely low cost (disposable), energy efficient, implement a modular multi-modal sensing architecture, remain small and low weight (low SWaP), while providing secure long-range wireless communications and compatibility with existing tactical Common Operating Picture (COP) software.

KTDBs implement a smart modular sensor architecture enabling the warfighter to configure sensing modalities on the field to meet dynamic mission requirements while reducing training and burden of traditional systems. KTDBs automatically detect and identify connected sensors and re-configure the onboard and monitoring software accordingly. Multiple sensors can be attached to a single KTDB to achieve full spectrum CBRNE monitoring, and hundreds of KTDBs can be used at any given time to achieve in-depth combatant monitoring while contributing to a multi-layered defense paradigm. Sensing capabilities include detecting Volatile Organic Compounds (VOCs), Chemical Warfare Agents (CWA), ionizing radiation, temperature, humidity, ambient pressure, AI-enabled visual target detection, and blue-force position monitoring among many others.

We demonstrate how KTDBs can be statically mounted, concealed, worn by combatants (including K9 units), and even mounted onto manned and unmanned vehicles. In past exercises, we integrated with networked sensors and systems to automate CBRNE monitoring (with robotic assets), increase Situational Awareness (SA), and improve the commander’s decision-making process. While KTDBs use long-range encrypted communications, we also show that they can leverage existing communications systems such as tactical MANET radios enabling a faster integration into a multi-layered defense. Threat alerts and monitoring information are automatically relayed to Android Team Awareness Kit (ATAK) devices and other common COP systems via Cursor on Target (CoT). ATAK devices can be stationed at the TOC, JOC, C2 element, or worn by warfighters. The ATAK plug-in enables bi-directional communications with the KTDBs, real-time sensor monitoring, management, historical information access (and playback), as well as automatic CBRNE threat alerts. KTDBs can improve SA of operators and TOC personnel enabling a quick change in force protection posture based on threat indicators. Commanders may use the integrated information to speed decision making for follow-on actions, additional recon, or inform decontamination efforts.

[NS1]TDB is sort of generic. Should we say KENNEL TDB (KTDB)?

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