Contamination Mapping the Agentase Disclosure Spray Using Simultaneous Localization and Mapping and Augmented Reality

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Agentase Disclosure Spray (ADS)

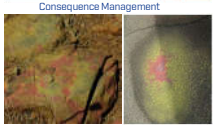
- Sprayable enzyme-based indicator that can be used for detection and mapping CWA contamination over large surfaces
- Available at handheld and wide area scales for different missions / applications

Decontamination

SSA/SSE Missions

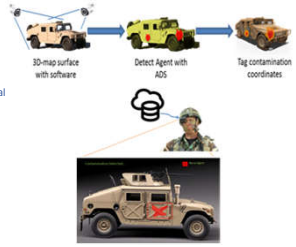
Protective Equipment Doffing

Consequence Management

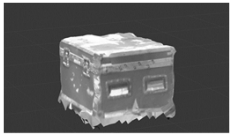


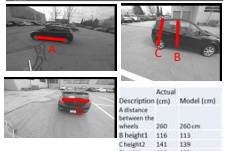
Vehicle Contamination Mapping

- Develop a system for high-resolution 3D digital contamination mapping in order to locate, tag, store, and recall ADS contamination information
- Enable real-time detection signal augmentation
- Facilitate focused decon and decon assurance operations
- Interface with future autonomous/robotic decontamination capabilities



Using Stereo Cameras to generate 3D Models

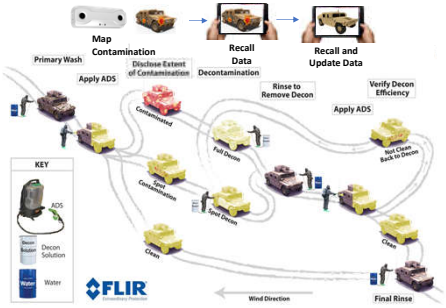




Description	Actual (cm)	Model measurement (cm)
A depth (inner margins)	44	44, 42, 45
B height	33	33, 31, 34
C width	51	51, 52, 50

Description	Actual (cm)	Model (cm)
A distance between the wheels	260	260 cm
B height1	116	113
C height2	141	139
D width	119	105

Decon Triage with ADS



Wide-Area Chemical Release Mapping

Russian spy and his daughter were poisoned by nerve agent

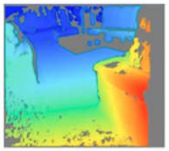
Tokyo subway sarin attack
地下鉄サリン事件

- ADS can be used to map contamination on terrain to minimize the spread of contamination and assist with remediation.

SLAM using Stereo Cameras

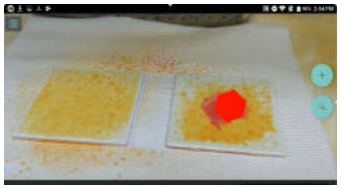
- SLAM: Simultaneous Localization and Mapping
  - Construction of a map of an unknown environment while keeping track of the camera location within it
- Stereo cameras use triangulation for 3D sensing
  - Similar to human vision
  - Correspondence attempted between cameras for every stereo image pixel results in tens of thousands of 3D values
  - Visual odometry for positional tracking

FLIR BPC 2500 camera



Area Mapping and Signal Detection

- Demo app on Google Tango area learning platform
- Red color detected and augmented on live video
- Location of threat is tagged
- Augmentation stays in place after signal is gone
- Ideal for Mapping and Tagging Chemical Threats over large areas



Sensitive Site Assessment & Exploitation

1. Sample the ADS positive test result
2. Extract the sampler
3. Inject it on the Griffin 510 GCMS to identify the chemical species

- Tagged ADS location can be sampled for downrange confirmatory GC/MS analysis in the hot-zone to identify the chemical threat.

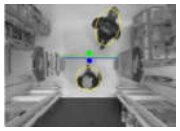
Contamination Indicator / Decon Assurance System (CIDAS)

- Mission: Field Agent Disclosure Spray (Nerve & Training) to Joint Services for Contamination Disclosure and Decon Assurance / Validation
- Customer: JPEO CBRND – JPM Protection
- Users: Army, Air Force, Marines, USSOCOM
- FLIR is the sole prime contractor
  - EMD 2015 – 2017
  - LRIP 2017 – 2019
  - FRP 2019 – 2025
- Blister Agent formulation to transition in 2019

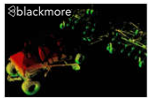
FLIR IIS Stereo Camera

Current use of the FLIR IIS stereo camera (BPC 2500)
- Mostly used as a closed product for people tracking in retail stores
- Also used for assisted boat docking by Raymarine

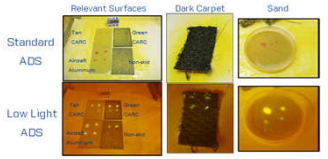
Merits of the BPC camera over other stereo cameras
- Ethernet interface, on-board stereo processing, high calibration accuracy
- Onboard System on a Chip (SoC) makes the product flexible to adjust for particular application



ADS Signal Detection



- Red detection challenges
  - Dark surfaces
  - Porous surfaces
  - Shaded areas
  - Low light conditions
- Risk management
  - ADS fluorescent additive
    - Excited with blue light, observed with orange filter
  - LIDAR-higher resolution 3D modeling
  - Machine learning – train camera and algorithm to identify threats



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