PEO IEW&S Industry Engagement Capability Statement

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Leadership

Basil Boluk, CEO & CTO
MechEng, EEE / Embedded,
Optics, Physics, R&D,
Management, Strategy, Marketing

Tess Volkova, VP SW Dev
Software / Embedded Eng, AI/ML,
Computer Vision, Sensors, Signal
Processing

Executive Summary

AI-powered Tactical Situational Awareness
[Mobility Platform: Hardware, SaaS, User's Protection]

Mission Statement

Our mission is to empower U.S. DoD, IC, and NATO agencies with the knowledge and tools needed to help stay ahead of evolving threats in defense and national security areas. Our goal is to foster a safer digital environment through education, innovation, and collaboration.

Vision

Military and security agents have super vision, super hearing, super respiratory and facial protection, a built-in drinking system, an omnichannel communication system, firing assistance, SIGINT and navigation tools, remote control for drones and robots, various digital assistants using Augmented Reality, Artificial Intelligence, Computer Vision, Computer Audition, voice control, hand tracking, and vitals body sensors.

Core Competencies

Integration
- Battlefield Management System (BMS)
- Joint All-Domain Command and Control (JADC2)
- Multi-Domain Battle Management Team (MBMT) Mobility Platform
- C4ISR / C5ISR
- Casualty Tracking and Monitoring System (CTMS)
- Human Performance, Training and Education
- Cognitive Science for Human Machine Teaming
- Life-Synthetic Training Environment (L-STE)

Innovation
- Tactical Augmented Reality (TAR)
- Tactical AI
- Synthetic Day/Night Vision
- Next Generation Identification Awareness
- Artificial Intelligence/Machine Learning (AI/ML) Image Intelligence (IMINT)
- Highly-directional Antenna Options
- RF Surveillance
- Multiple Object Tracker or Multiple Target Tracking (MOT/MTT)
- Local Device AI/ML and CV/CA Processing

Areas of interest

Data collection and processing

 # Night Vision
 # Day Vision
 # Twilight Vision
 # Synthetic Vision
 # Smart Audition
 # RF Space ISR
 # Passive Radar ISR
 # Vitals Body Sensors
 # Highly-directional Antenna
 # Digital Beamforming

Soldier-as-Sensor Concept

Expanding the data collection and verification network, increasing the density of observation points per quadrant, diversifying observations from multiple locations simultaneously, improving data accuracy, reducing data processing time.

Multimodal data

HD / HDR / SWIR / LWIR images and videos (no IR illumination), stereo cam rangefinder (no laser), azimuth, elevation angle, speed and direction measurements, 20 ballistic parameters, sound wave characteristics (19-microphone dome array), RF spectrum characteristics (2 MHz - 8 GHz) and localization (RDF) of signal sources, RF reflected signal characteristics in multistatic passive radar mode, per-shot and ammunition stockpile data, 8 groups of user health data, task and auto-task performance data for mission, training, or skill exercise.

Data collection with and without the user's action

AI triggered recording, control via voice assistant and quick button shortcuts, short and long timelines, preference modes for real-time filtering and searching of audiovisual information, auto frequency scanning, auto selection of passive radar RF probe signal.

Data processing

Frequency decomposition, channel gain, filters (noise, brightness, power, etc.), Histogram of Oriented Gradients (HOG), Support Vector Machine (SVM), Rectified Linear Unit (ReLU), Local Response Normalization (LRN), Very Deep Convolutional Neural Networks (CNN) for Large-Scale Image Recognition by the Visual Geometry Group (VGG-16), Track-Before-Detection (TBD), intra- and inter-frame detection, range-velocity ambiguity separation, Cumulative Value Function (CVF) based estimation criteria, false alarm exclusion based on polynomial coefficient variance statistics, edge refinement, other neural network algorithms and convolutional deep learning and self-learning networks Computer Vision and Computer Audition **on local device**, generation of Synthetic Vision and Audition (exclusion of solid boundaries and surfaces that create noise and hinder perception), detection and identification of RF sources, 3D RF carrier decomposition in multiplexing, identification of passive radar signatures, transcribing user voice into text, text voicing with user avatar voices, data encryption and decryption.

Data transmission and BLOS / LOS-communications

Raw and processed data transmission modes (important for reducing traffic, number and duration of communication sessions), connection via Highly-directional Antenna using hopping frequencies and dynamic power control Digital Beamforming.

Safe navigation

 # Identification Friend-or-Foe
 # Navigation Grid
 # Situational Awareness Grid
 # Gunfire Locator
 # Drone Detection
 # Radar Warning
 # Passive Radar
 # Ground-Based NavSys
 # Law Altitude NavSys
 # Map & Navigation
 # Route Tracking

Identification Friend-or-Foe (IFF), Situational Awareness Grid

The solution against friendly and crossfire, improved coordination and cross-domain interaction (CDI), multi-domain operations (MDO), and intelligent stealth modes (Force Recon, Scout Snipers, etc.).

Gunfire Locator (GFL)

Detection and recognition of counter-directional ballistic trajectories including the use of a silencer, identification and localization of the source of the shot.

Radio Frequency Drone Detection (RFDD)

RF carrier detection and recognition for drone and robot control and data transmission. It is used in addition to the visual and auditory modes of drone and robot detection by Computer Vision and Computer Audition methods (the main method that enables detection of fully autonomous flight missions).

Radar Warning Receiver Control (RWRC)

Detection and recognition of RF carrier reference beams of hostile and unidentified radars. Localization of all types of friendly and hostile radars when using illumination for passive radar.

Passive Covert Surveillance Radar (PCSR)

Passive multistatic radar using reference emissions from active friendly and hostile radars, as well as AM, FM, TV, HDTV bands. A pre-trained and self-learning model. Use of convolutional neural networks for processing signatures with low Signal-to-Noise Ratio.

Ground-Based Navigation System (GBNS) and Law Altitude Navigation System (LANS)

Integration with ground-based, aerostat, and drone-based navigation solutions in challenging GNSS satellite signal suppression and distortion environments.

Navigation and Route Tracking (NAV & PATH)

Navigational mapping (similar to ATAK-MIL) to dynamically alter routes and section speeds in response to changes in the environment, including enemy movements, threat evasion maneuvers, weather conditions, experience of other units in given sections, synchronization with the movement of other friendly units within the mission, and to avoid congestion in narrow sections of the route.

Collaboration

R&D
o Joining efforts to exchange expertise and hypotheses
o Dataset exchange for training ML, LM, CV, and CA models
o Training pipeline engineering

Integration
o Integration of different products with common goals
o Creation of joint projects

Distribution
o Joining efforts for promotion and contracts

Fundraising
o Venture Investing
o Grants
o Warm intro to In-Q-Tel (IQT) and others IC / DoD Venture Capital

We are interested in collaborating with defense agencies and military-technical companies in the areas of Battlefield Management Systems, Tactical AI, Battlefield Awareness, Multiple Object Tracker or Multiple Target Tracking Systems, Warfighter Health Protection, Casualty Tracking and Monitoring Systems, Live-Synthetic Training Environment, Military Drones and Robots, Surveillance and Reconnaissance (ISR) Platforms, Multi-Domain Battle Management Team (MBMT) Mobility Platform, Tactical Map and Navigation Systems, Highly-directional Antenna, Digital Beamforming, Automated Imagery Analysis, Neuromorphic Computing and in related fields where we could join forces, share our hypotheses and experiences.

We are ready to offer to participate in a private Community (https://community.furtherium.com/**), where it is convenient to hold time-distributed intellectual discussions.**

Project References

YouTube Demo
https://www.youtube.com/watch?v=kIUt2jbYHMs

Pitch Deck
https://www.furtherium.com/docs/ARHUD_mask_7-min_pitch.pdf

Traction & Roadmap (Wiki)
https://wiki.furtherium.com/wiki/Public:ARHUDFM_Traction

Product Details (Wiki)
https://wiki.furtherium.com/wiki/Public:ARHUDFM_Features_Summary

Apps Details (Wiki)
https://wiki.furtherium.com/wiki/Public:Applications

HackerNoon Article
https://hackernoon.com/ais-influence-is-going-to-go-deeper-than-just-the-corporate-sector