

Parallax Advanced Research
Capabilities Statement Regarding IARPA SINTRA
August 3, 2022

1 Bottom Line Up Front

Parallax Advanced Research, formerly known as the Wright State Applied Research Corporation, has multiple capabilities to offer an IARPA SINTRA prime contractor. We are specifically looking for a prime with experience in physical sensing domains as our expertise fits best in the processing of data with low Signal to Noise Ratios (SNRs).

2 Company Overview

Parallax is a nonprofit 501c3, with headquarters in Dayton Ohio and employees throughout 11 states. With our ten year history and greater than 100 employees, we are small enough to be agile and yet large and mature enough to have appropriate cost and accounting systems to support various contract types. As of this writing, Parallax employees and its sponsored 1099 workforce hold 64 TOP SECRET clearances and an additional 21 SECRET clearances. Parallax operates ~90,000 square feet of TS/SCI and Special Access Program (SAP) spaces with multiple computer networks and classification levels.

3 Capabilities

Parallax has a long history of supporting space-based missions with noteworthy customers and stakeholders at the National Air and Space Intelligence Center (NASIC), the National Geospatial Intelligence Agency (NGA), Space Delta 18 (DEL 18) at the National Space Intelligence Center (NSIC), and the 566th Intelligence Squadron (566 IS). This includes space situation awareness (SSA) focusing on threat characterization and traditional terrestrial based threat awareness. We support processing at nearly any scale, from thousands to millions of targets simultaneously. Our deep experience in Human-Machine Teaming (HMT) enables the integration of human factors and AI to seamlessly present that data to operators in an actionable context and reduce cognitive load. Details at higher classification levels are available if need-to-know is validated by our customer(s).

Parallax excels in application focused design and implementation of Artificial Intelligence/Machine Learning (AI/ML) models with successful development for DARPA, IARPA, the services, and three letter agencies. Parallax's research focuses on explainable AI (XAI), cognitive architectures for AI, trust in AI, and spiking neural networks. Our AI portfolio ranges through automated document processing, exploitation in Electro-Optical (EO) sources, predictive maintenance, robotic system control, safe reinforcement learning for satellite docking, autonomous air combat and flight, and counter-AI research.

Our research has not traditionally focused on sensing hardware systems, but rather the software that analyzes their output to draw conclusions. Parallax has a mature software development process following DevSecOps, cloud-based deployments using Docker/Kubernetes container software, and Singularity for high-performance computing (HPC) systems. Our agile approach is derived from the Scaled Agile Framework (SAFe 5.1) and we offer end-to-end services in software development from full-stack design and implementation to long term support (LTS). While we do have preferred methods, our researchers are versed in nearly all software development environments, software languages, and models for software process.

Parallax furthermore has expertise in sensor fusion techniques between sensors and data with heterogenous properties. Specifically we have proven cross-cue capabilities between sensing systems enabling operational hand-off of targets through the (Find, Fix, Target, Track, Engage and Assess) F2T2EA process, enabling analysts and warfighters to remain confident in data and models we provide.

Regardless of the type of sensing system used in SINTRA, simultaneous processing of the estimated 330 million Low Earth Orbit (LEO) targets in order to gain certainty of orbital trajectories requires significant low SNR processing. We use multiple State of the Art (SOTA) techniques to handle both the spatial and temporal nature of the problem given various sensor errors in range and cross direction as well as in frequency. We often also develop and validate custom approaches when SOTA algorithms are insufficient.

Lastly, Parallax also enjoys success in large scale modeling and simulation showcased by the following three examples. 1: In prediction of COVID outbreaks across the state of Ohio, we model every one of the 11.8 million Ohio residents, their interactions, and tracked baseline transmission against the model. 2: We model computational fluid dynamics (CFD) models for air-breathing hypersonic bodies in order to study plasma phase changes and aerodynamic issues. 3: We work in collaboration with partners to model multi-domain warfighting, including the impact of space assets on the courses of action available to joint commanders.

4 Other Elements

- Parallax has a strong academic outreach component with access to nearly any university in the nation and active programs engaging with the vast majority of R1 and R2 universities.
- Parallax can work with traditional and non-traditional hardware such as CPUs, FPGAs, GPUs, and neuromorphic chipsets.
- Parallax will only propose US persons as a part of the SINTRA program.
- An overview of the research parallax performs, at a high level, can be found at: [Parallax Advanced Research - Research Development Testing and Evaluation](#)

5 Conclusion

We look forward to further discussions if you require a processing partner. Our business model is collaborative and we are flexible with several contract types and working arrangements. Please feel free to reach out by phone or email to Darrell Lochtefeld, PhD. 937-307-9691, darrell.lochtefeld@parallaxresearch.org.