GPS-Denied Autonomy Solution Can be Adapted for Next-Gen Use Cases

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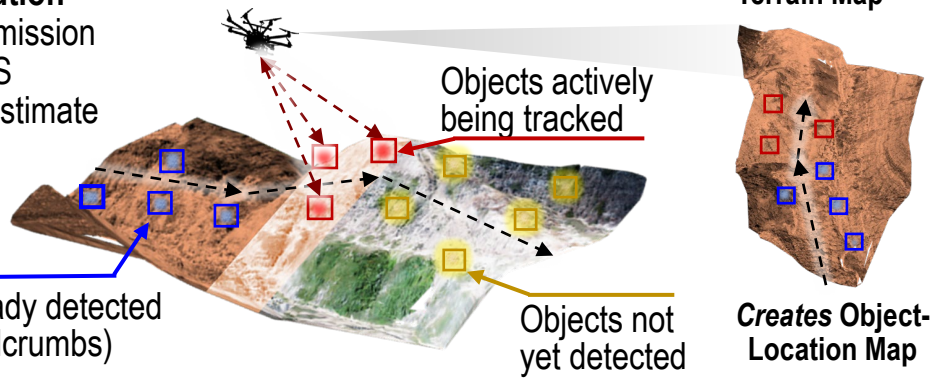
Rhoman GPS-Denied Autonomy

Rhoman Aerospace is delivering GPS-Denied navigation, autonomy, and Alt-PNT solutions to Air Force, Space Force, and Navy customers

Navigation with Rhoman Solution

- ✓ Performs mission w/Out GPS
- ✓ Location estimate
- ✓ Detects spoofing



No Pre-Loaded Terrain Map

***Creates* Object-Location Map**

Detects & tracks objects, corrects drift, saves object locations into a map, follows map home

Key Benefits: Autonomy w/Out GPS, Portable & Scalable

Autonomous UAV won't work on a GPS-Denied battlefield…
…the solution lets them work *as if there was GPS*

- ✓ Allows ISR and target localization in GPS-Denied areas
- ✓ Work anywhere: no pre-existing terrain maps
- ✓ Electronically silent: no-emit, uses cameras, no comms needed
- ✓ Supports Group 1-4 UAV, flight vehicles, munitions
- ✓ Long range: Navigation methodology scales to long distances with minimal degradation

Easily deployable: deploys by software mod payload to current UAV

Software download to existing UAV

Modular add-on with software/cameras

Software add to ISR Payload

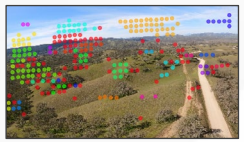
Works with ATAK

How the Technology Works

The solution combines Visual Inertial Odometry with a drift-error-corrector that uses machine-learning & object-detection to detect objects/features in the environment and track UAV movement relative to these objects/features

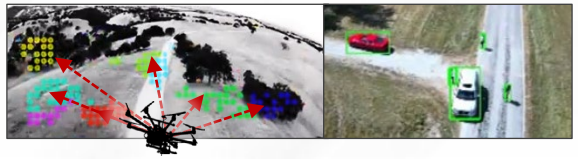
The solution stores the tracked objects/features in an object-location map during flight, and uses these 'visual-breadcrumbs' to always make it back to launch

VIO



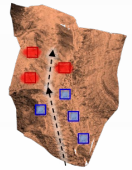
VIO guides flight

Object/Feature Detect & Track



Tracking UAV movement relative to multiple objects and pixel-clusters at once corrects drift error, object detection enables targeting

Object-Map



Follow visual-breadcrumbs to get home

Active USAF, USSF, and Navy SBIR/STTR Efforts

- **USAF SBIR Phase II:** Long-Range No-Emit GPS-Denied UAV Navigation & Alt-PNT
- **USSF SBIR Phase II:** World-Wide, No-Drift, No-Emit GPS-Denied Alt-PNT for Supersonic UAV, Celestial & Ambient RF Position & Navigation
- **USAF STTR Phase II:** Maritime GPS-Denied Autonomy, Alt-PNT, and Target Relative Maneuver, Naval Postgraduate School Partner, InSitu, Firestorm Labs
- **NAVY SBIR Phase I:** GPS-Denied Autonomous Aerial Logistics, Sense & Avoid, and Auto-Air Traffic Management [Phase II proposal in contracting]
- ***USAF SBIR Phase I:*** *Give Any UAV GPS-Denied Autonomy: Software-Upload or ATAK App, Tomahawk Robotics/AeroVironment [Follow-on P2 in the works!]*

Great partners and potential AFWERX funded effort collaborators

U.S. AIR FORCE · NPS · LOCKHEED MARTIN · L3HARRIS · TELEDYNE FLIR · FIRESTORM · AeroVironment · TEAL · NVIDIA