The Invisible Revolution: How Physics-Based Positioning Will Power Our Next Digital Leap

By Gregory Steinberg, Founder, iDvera

The future of navigation isn't about building more satellites or towers - it's about reading the physics of the world around us. While the tech industry fixates on AI and quantum computing, a quieter revolution is unfolding in how we understand position and time. This revolution doesn't require billion-dollar infrastructure or exotic hardware. It runs on the smartphones in our pockets and the sensors already embedded in our supply chains.

The Fourth Dimension of Authentication

Every location on Earth has a unique physical signature written in magnetic fields, pressure gradients, and motion patterns. When we learn to read these signatures with the precision of a fingerprint scanner, we unlock possibilities that seemed like science fiction just years ago.

Imagine smart contracts that execute based on verified physical delivery, triggered not by spoofable GPS coordinates but by the actual physics of a cargo's journey through space. Picture financial transactions authenticated by algorithms that read the Earth's magnetic field itself - creating a fourth factor of authentication that proves not just who you are, but precisely where you are when it matters most.

This is the promise of physics-based positioning through systems like ALIS (Advanced Location Intelligence System): supply chains that maintain perfect visibility from factory floor through warehouse black zones to final delivery, emergency responders who can navigate through smoke and darkness guided by the Earth's magnetic signature rather than blocked satellite signals, and autonomous systems that operate reliably whether they're on a sunny street or deep in an underground parking garage.

Beyond the Satellite Horizon

The vulnerability of GPS has become impossible to ignore. Jamming incidents have increased tenfold since 2022, with over 10,000 vessels affected in just the second quarter of 2025 alone. A single incident in the Baltic Sea disrupted navigation for 1,600 aircraft. You can buy a GPS jammer online for $150 and bring logistics operations to a standstill.

But focusing solely on security misses the larger opportunity. The real revolution isn't about defending against bad actors - it's about enabling capabilities in the vast portions of our world

where satellite signals simply don't exist. Every underground mine, every steel-framed warehouse, every urban canyon between skyscrapers represents an opportunity to extend the digital revolution into previously dark zones.

When ALIS achieves continuous positioning using physics-based algorithms, it's not replacing GPS - it's completing it. Think of it as creating a seamless fabric of location awareness that doesn't tear when you walk indoors or drive through a tunnel. The system reads the magnetic and motion signatures unique to every location, maintaining position awareness whether you're navigating downtown Manhattan or coordinating operations 500 feet underground.

The Trust Infrastructure We Didn't Know We Needed

As our economy becomes increasingly automated and distributed, the question "where did this really happen?" becomes as crucial as "when did this happen?" or "who authorized this?" Physics-based positioning creates what GPS alone cannot: unforgeable proof of physical presence.

For financial institutions grappling with sophisticated fraud, this means transactions can be bound not just to identities and timestamps but to verified physical locations that can't be spoofed. Smart contracts could verify that a delivery actually reached a specific warehouse bay, not just that someone claimed it did. Supply chain integrity could be maintained through zones where GPS fails, ensuring complete chain-of-custody from manufacture to delivery.

The implications extend far beyond security. Cities could maintain awareness of first responders even when buildings collapse around them. Ports could operate immune to the GPS spoofing that's already disrupting global shipping lanes. Power grids could maintain synchronization even during solar storms that knock out satellite signals. Every one of these applications represents not just risk mitigation but entirely new operational capabilities.

From Laboratory to Reality

ALIS represents a different approach to the positioning challenge - one that doesn't require launching satellites or building terrestrial beacon networks. Currently in beta testing with early customers across defense, logistics, and industrial automation sectors, the technology demonstrates that physics-based positioning isn't just theoretically possible but practically achievable using existing hardware.

The elegance lies in the approach: instead of fighting the physics that blocks satellite signals indoors and underground, ALIS reads the physics of those very environments. Every building, every mine shaft, every urban street has its own magnetic and motion signature. The algorithms learn to read these signatures like a navigator reading terrain, maintaining position awareness regardless of whether satellites are visible, jammed, or simply absent.

This isn't about replacing the GPS constellation that has served us well for decades. It's about acknowledging that as our digital and physical worlds merge - through autonomous vehicles, smart cities, and distributed manufacturing - we need positioning capabilities that work everywhere, all the time, without exception. The physics-based approach offers that continuity, creating a positioning substrate that's as reliable as gravity itself.

The Path Forward

The transition to physics-based positioning won't happen overnight. Like any infrastructure evolution, it will roll out first where the need is most acute: defense applications where GPS denial is a tactical reality, warehouses where million-dollar inventory vanishes into positioning dead zones, and financial systems where location verification could prevent billion-dollar frauds.

But as these early deployments prove the technology, as costs decrease and capabilities expand, physics-based positioning will become as ubiquitous and invisible as the sensors that already surround us. The smartphones that already carry magnetometers and accelerometers will gain new capabilities. The autonomous systems being deployed across industries will navigate reliably in any environment. The smart cities being planned today will maintain awareness of every asset and responder, regardless of whether they're above ground or below.

We stand at the edge of a positioning revolution that doesn't require us to build anything new in space or on Earth - just to see what's already around us with new eyes. The magnetic fields, pressure gradients, and motion signatures that surround us contain all the information we need for precise positioning. We just needed to learn how to read them.

As ALIS moves from successful beta trials toward commercial deployment, it offers a glimpse of this future: one where position and time are as trustworthy underground as they are under open sky, where autonomous systems operate as reliably indoors as out, and where the verification of physical presence becomes as fundamental to our digital infrastructure as encryption is today.

The invisible revolution isn't coming. It's here, running on the devices in our pockets and the sensors in our buildings, waiting to unlock the vast potential of truly continuous, truly trustworthy positioning. The only question is how quickly we'll adapt our thinking to embrace it.

About the Author

Gregory Steinberg is the Founder and CTO of iDvera Software Inc., developing GPS independent positioning technology. He serves as a Department of Defense Subject Matter Expert for Position, Navigation, and Timing systems and holds a patent portfolio covering geophysical positioning methods. iDvera Software is an Austin Technology Incubator portfolio company.