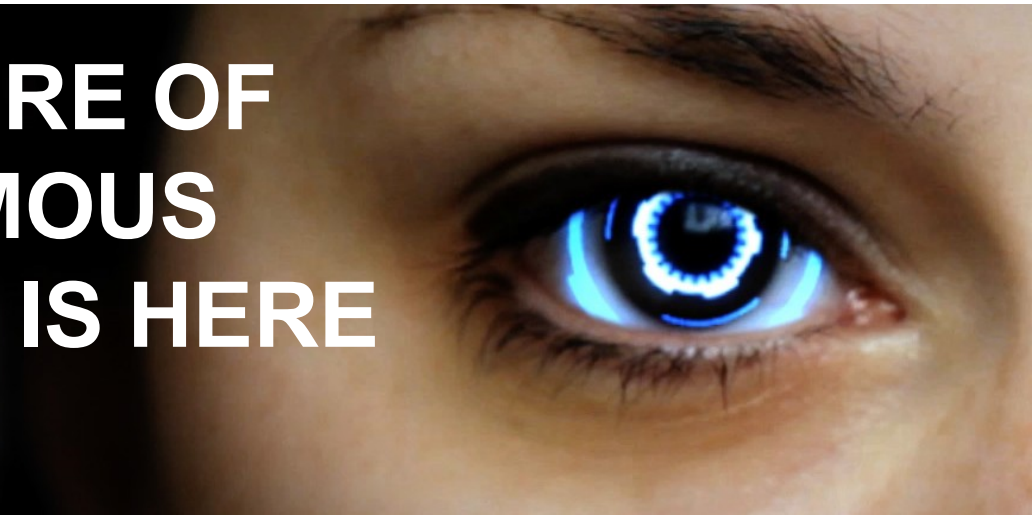
THE FUTURE OF AUTONOMOUS TRAINING IS HERE



Human Type Targets (HTTs)

(Mobile, four wheeled, robotic trackless targets for the military marksmanship training markets and beyond)

Challenges

- ✓ Current solutions for mobile targets are limited
- ✓ Little on-board intelligence capable of supporting a realistic training experience
- ✓ Lack of sensor support
- ✓ Limited user controls
- ✓ Target data limited to observational skills and tactical abilities of the control crew

SimIS Provides Scalable HTT Platforms and Control Systems

Benefits

- ✓ Stability on all types of terrains (indoor and outdoor, wet and dry, paved and unpaved)
- ✓ Easily interchangeable mount
- ✓ Provides Smart Targets
- ✓ Dynamic interactive scenarios involving both groups of targets and civilian robots
- ✓ Modular Design and Development
- ✓ Exhibits human like behaviors and reactions
- ✓ Reacts to various levels of engagement
- ✓ Differentiates between lethal hits, non-lethal hits, and near misses

Features

- ✓ 3D torso uses self-healing ballistic polymer and covered with training specific clothing
- ✓ Preprogram scenarios supports data capture such as Location of Miss and Hit (LOMAH)
- ✓ Torso resets to the raised position remotely requiring no human intervention
- ✓ Behavioral Logic and Control Module (LCM)
- ✓ Manually operated or fully autonomous or operate within scenario defined geospatial boundaries
- ✓ On Demand Remote Control Module
- ✓ Supports Geospatial Infrastructure and Standards for Autonomous Vehicles levels I through 4
- ✓ Complies with IEEE 1872 standard for robotic and automation ontologies and NIST robot message language guidelines

Overview

The HTT system is a mobile, trackless smart target that provides more realistic moving training targets. HTT isn't constrained to certain parts of the range and is deployable in a wide range of operating environments and terrain. The system is autonomous, featuring the ability to preprogram scenarios with technology to capture data such LOMAH for both instant feedback to the trainee as well as AAR built in.

Scalable Platform:

- Modular design Platform –Interchangeable top for a variety of situational applications based on customer affordability and sensor function
- Realistic moving human form with thermal signature
- Features sound, replicating voice, gunshots and other scenario based simulation
- Rugged, modular armor plates for easy on-site replacement protects against direct hits by rounds, with design for enhanced range safety
- Lighter armor (non-direct fire/ricochet proof) option for behind berm usage also available
- Data captured for AAR (After Action Review)
- Operates within existing ranges, yet can also be utilized off range for non-live fire training (e.g. role player)
- Variable Environments/Terrains – Usable on paved or unpaved terrain, in wet environments with run flat wheels with extended range
- AI that creates human like behaviors and responses, and speeds that approximate running

Command and Control:

- Fully or partially autonomous
- Trainer Control Station (TCS)
- Control Interfaces (teleoperated via terminal, joy stick, radio, smart phone, virtual control station, or tactical controller)
- Sensor control and Collision Avoidance
- Easily integrates with Laser/MILES devices and Digital Range Training Systems (DRTS)

Outdoor Use Case

HTT IS designed in a modular fashion to allow the most cost-effective design for a given application. For outdoor use there are three main modules generally employed for this use case. These are *Mobility, Target* and *Logic and Control.*

The *Mobility module* is the 4-wheel drive, all- terrain propulsion system (base unit) that can traverse gravel, concrete, small curbs, mud and other common surfaces found at range locations.

It is powered by 24V battery system providing over 3 hours of endurance (depending on desired movement). The system is specifically designed to emulate human movement dynamics, speed acceleration, forward reverse motion, and pivoting. It is tolerant to wet conditions such as mud or small puddles.

This all-terrain system is also shielded to prevent damage to propulsion systems and from inadvertently fired rounds.

The *Target module* consists of a 3D torso that may be outfitted using self-healing ballistic polymer and covered with training specific clothing and optimally equipped with various props i.e., weapons, equipment etc.

The target can be reset to the raised position remotely, requiring no human intervention. The target module is easily replaceable when the polymer is worn out.

The *Logic and Control module (LCM)* is responsible for managing the behavior of the target and is fully integrated with the propulsion and target modules. It is comprised of three modes:

Remote control mode: the trainer can control direction and speed of the target, as well as drop the target on demand, while receiving instantaneous feedback on detected shots and hits.

Pre-programmed route mode: targets move along pre-defined waypoints. It includes an intelligence/safety feature where targets bypass obstacles blocking the route, however will continue along the original when the obstacle is by-passed or moves away.

Intelligent mode: the trainer can define scenarios involving a series of behaviors such as loiter, route follow; follow leader, scatter, drop, and others. Behaviors can be invoked based on external events such as the leader was hit, rounds are fired, time sequences for scenario start, and interactive signal by the trainer. It is fully integrated with target portion and hit detector and allows arbitrary complex scenarios to be developed. The behavior of the targets is configurable and can be tested via the exercise planning capability.

All targets are wirelessly networked with each other and with the main control station.

Optional video feeds from the targets can also be routed to the main monitoring station where they can be displayed and/or recorded for after- action review. To increase the range and minimize wireless range-related issues of frequency congestion and competition with other equipment, the system consists of a local dispatch station which defines the primary connection point for the mobile targets.

The connection between the dispatch station and the main control station can be wired or use dedicated high-gain antennas to achieve a range of 5 miles or more. This design provides the most flexibility and interoperability with other equipment that may utilize competing radio frequencies.

Indoor Use Case

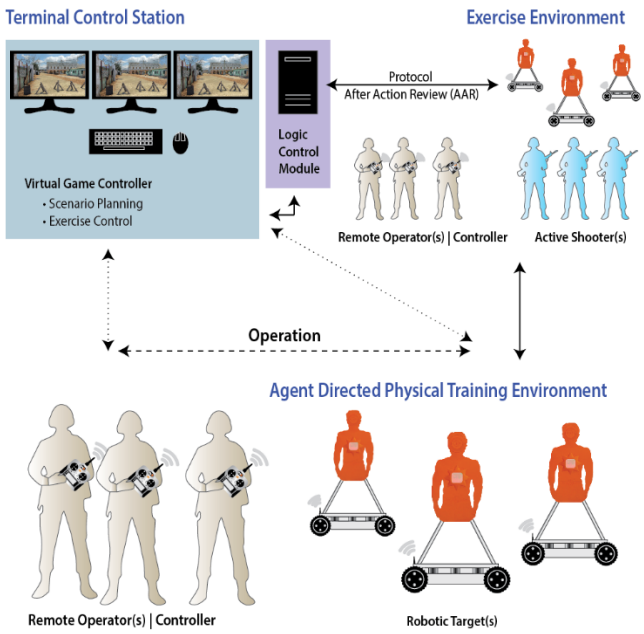
Given its modular design platform, HTT is easily configured for indoor environments. This environment would require more agility due to space restrictions and constraints. For autonomous operation, HTT may require building mapping navigation or color coding to sense its environment. This includes task algorithms to assist with piloting in tight situations using the appropriate sensors. An alternative would be to include video capture and image recognition navigation packages on the platform. This opens both target navigation interoperability and AI capabilities.

In any case, HTT may be used as the platform, as the Mobility, Target and LCM Modules perform the base function. However, depending on the scenario, a scaled down version and footprint of HTT may be better suited for this environment.

For both outdoor and indoor applications, the TCS allows the user to author scenarios, as well as control the targets. It is fully integrated with target portion and hit detector and levels of intelligence can be controlled interactively consists of a PC/table and a target interface module.

The target interface module includes all wireless communication to the mobile targets through the dispatch station. Before the scenario, it is used to verify operational health of all targets, define safety protocols (all-stop conditions) and pre-position targets. Scenario design provides the ability to use the simulator for testing scenarios without occupying the physical targets.

During a scenario the Terminal Control System (TCS) is used to monitor the status of targets. It can calculate pre-defined training metrics and provide scenario override controls. Following a scenario, it allows for full after-action review playback, maps based target position movement, hits, and scores. If equipped with video, it provides first person video from the targets.



The TCS Provides Shared Virtual Environment for Operator and Scenario Control

The TCS scenario provides an easy-to use virtual environment for defining training scenarios to include Initial target positions, behaviors, triggers and alternative behaviors. This includes defining performance metrics and automatic calculation of performance scores. It also serves as a real-time

monitoring device for an on-going scenario.

The provided technology allows capturing position and status of each autonomous target when hits occur. These data will be collected and allows a detailed after-action review (AAR) using the exercise planning capability. As autonomous targets expose quasi-intelligent and social

behavior – they communicate with each other, support their tasks, and react on events like one of the targets being under fire (a smart exercise planning capability is needed to define scenarios and expected behavior of the targets). This capability provides an easy-to use environment within which to define training scenarios for the initial target positions, the behaviors of individual targets, triggers and alternative behaviors based on events or communications, and the definition of performance metrics and automatic calculation of performance scores.

Customers will benefit from a comprehensive, well designed, responsive, mobile target(s) that can realistically demonstrate human characteristics.