



PIECES OF EIGHT ISOLATED AUTONOMY CONCEPT

The Noblis Pieces of Eight (Po8) concept orchestrates the motions and actions of unfamiliar, connected, and autonomous machines. With this concept, systems of autonomous machines are safer, more productive, and more equitable.

The Noblis Pieces of Eight (Po8) system enables nearby connected machines to share situational awareness of obstacles and threats projected over time. It allows them to collectively plan motion paths and other actions that avoid collisions or conflicts. This interoperability permits high-speed motion and coordinated actions which are impossible without advance knowledge of all the localized actions.

Further, the Po8 system supports a collective post-hoc accountability process to assess the reliability of each individual machine to act faithfully in accordance with collectively optimized motion paths and actions. An individual machine establishes a track record within the Po8 system (secured using a blockchain) so that the reliability of the machine to faithfully follow collectively assigned motion/action paths in the past may be factored into the representation of the collective uncertainty map and the current set of optimized motion/action paths.



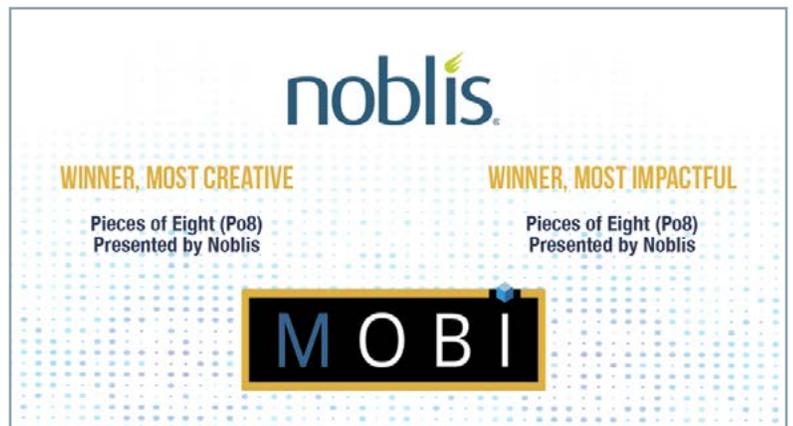
THE PO8 SYSTEM HAS FIVE FUNDAMENTAL ELEMENTS:

1. Collective situational awareness realized in a normalized local obstacle and threat map with uncertain contours. This element normalizes diverse sensor technologies into a single shared local dynamic map that explicitly considers the past reliability (earned trust) of individual machines.
2. Optimization of collective motion/action traversing uncertain contours reconciling potential conflicting motion paths or actions among all machines and cognizant of the reliability (earned trust) of individual machines.
3. A value distribution by contribution method for equitable remuneration from machines with advantageous path/action allocations to local machines. This element helps reduce uncertainty in for contributing to uncertainty reduction and local/non-local machines contributing to the administration of Po8 system functions.
4. Post hoc individual accountability assessment where all machines assess the ability of nearby machines to act and move in accordance with collectively determined motion/action paths.
5. Earned trust accounting and reporting for each individual machine in an open consortium blockchain distributed ledger to ensure transparency, accuracy, and security of the Po8 system.

DEMONSTRATING PO8: THE ROBOT DERBY

The Robot Derby demonstration is an early physical realization of the Po8 concept and prototype system. In this demonstration, multiple autonomous robots are given repeating (and naturally conflicting) paths to navigate simultaneously in a constrained physical environment. Myopic motion path planning (no orchestration) results in slow collective progress as the individual robots attempt to avoid each other using passive detection. Connecting the autonomous robots to the Po8 system allows collective obstacle detection and motion path planning, so faster movement is possible. As the machines interact and learn, earned trust in the system rises, allowing progressively faster speeds. A monitor to the side of the demonstration shows how the blockchain builds earned trust scores for each machine and measures the speed of robot circuit completion.

The goal of this prototype is to expand Noblis' capabilities in vehicle/robot/device autonomy, sensor integration, LIDAR (laser pulse-based radar), obstacle mapping, and edge device development.



In February of 2019, Noblis' Autonomy Research team presented their "Pieces of Eight (Po8) Orchestrated Autonomy Concept: Robot Derby Demonstration" in Munich, Germany as part of the MOBI Grand Challenge, sponsored by the MOBI (Mobility Open Blockchain Initiative) and TloTA (Trusted IoT Alliance).

To learn more, scan the code
and watch our video:



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The NSR program is a vital and essential part of corporate life at Noblis. Our yearly investment in this program, along with our ethical practices and code of conduct, is part of what makes us the unique nonprofit organization that we are. Noblis research is the forward-thinking seed that generates not only larger corporate work programs and roles, but also sound, sustainable solutions with enduring impacts.

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