

Autonomous Vehicle Interoperability Concept

The Noblis autonomy 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 orchestrated autonomy 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 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 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.

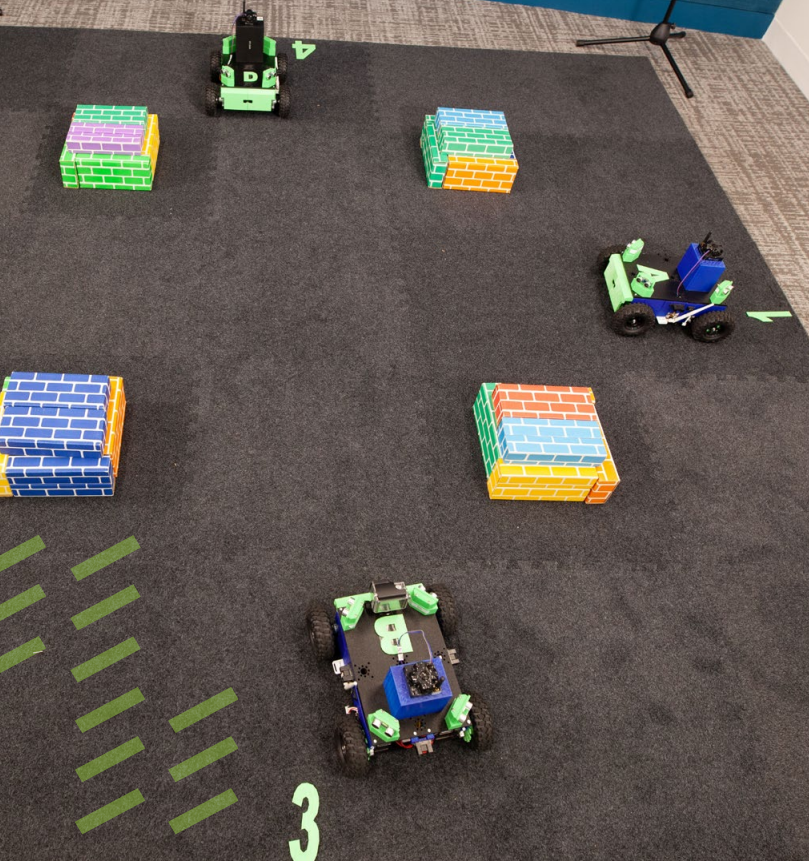
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For the best of reasons

The 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. **Optimized 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** ensures equitable remuneration to/from machines receiving/granting priority and to machines that assist in identifying dynamic obstacles. This element specifically incentivizes machines to contribute to key system ecosystem 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 system.

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The Robot Derby Demonstration

The robot derby demonstration is an early physical realization of the 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 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.

Award-Winning Concept

Noblis' Orchestrated Autonomy Concept won the Highest Potential Impact Award and the Most Creative Award at the MOBI Grand Challenge Phase I in Munich, Germany (February 2019).

Noblis' Orchestrated Autonomy Concept ranked first for "Most Creative" and "Highest Potential Impact" - and second in the "Overall Category" at the MOBI Grand Challenge Phase II in Los Angeles, California. (November 2019).

Noblis' orchestrated autonomy concept was chosen as an Industry Innovation Winner by Washington Technology / 1105 Media as part of the Government Innovation Awards showcase which recognizes the best examples of discovery and innovation in government IT (September 2019).



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Orchestrated
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