U.S. Army Research Laboratory

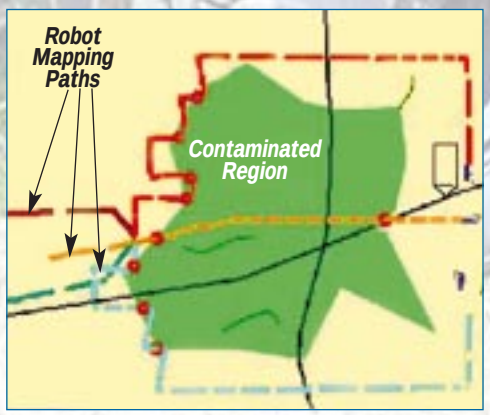
Robotic Behavior Development

Successful application of robotic vehicles to military missions will require the insertion of mobility, perception, real-time control software, and intelligent architecture technologies. The integration of all these technologies to develop functional robotic vehicles capable of carrying out multiple missions requires an intensive effort in modeling and simulation. The U.S. Army Research Laboratory (ARL) is actively engaged in developing and implementing high-fidelity models and conducting simulations of robotic behavior.

One of the goals of the U.S. Army Ground Robotics Research Program is to develop individual and group behaviors that allow robotic vehicles to contribute to battlefield missions. This is especially important for notional Army concepts, such as the Future Combat System. Autonomous, tactically realistic behaviors allow a soldier to place multiple robotic assets in harm's way without exposing the human operators to the same level of risk, extending the soldier's presence on the battlefield.

The next step in this program is to transition the behavior algorithms from the simulations to experimental unmanned vehicles (XUV's). Information gained from implementing the behavior algorithms on the actual platforms will enable the improvement of both the behaviors and the simulation environment. Improvements made in the simulation tools will enable the development of additional behaviors.

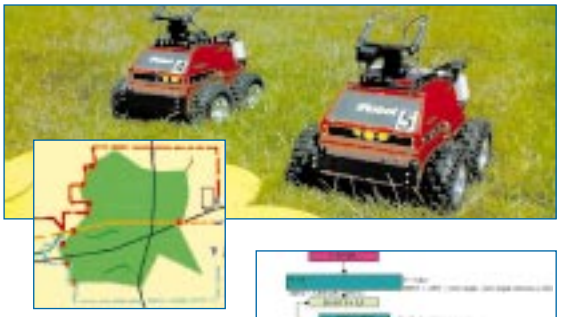
Modeling and Simulation Research Contributes Throughout the Development Process for Robotic Platforms



TACTICAL BEHAVIOR DEVELOPMENT

The use of modeling and simulation to develop tactical behavior algorithms destined for robotic platforms greatly enhances the process of creating these tactical behaviors required by unmanned platforms on the battlefield of the future. This facet of the ARL research effort is focused on early user involvement, developing robust behavior algorithms using robotic simulations, and transitioning these behaviors to unmanned platforms.

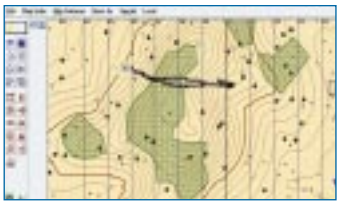
Integration of Military Expertise



Simulation of Cooperative Tactical Behavior of Robots Mapping Ground Contamination

Design of Behavior Algorithms

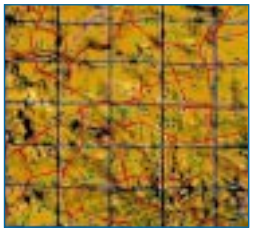
ANALYSIS



The analysis effort is providing insight into the operational effectiveness of robotic systems using battlefield simulations and parametric studies of mobility, subsystem reliability, and other parameters. Primary emphasis is placed on improving the tools to support the evaluation of small robotic systems. The ultimate goal is to provide a set of tools and techniques that can be used to help assess robotics concepts for the battlefield. Some ARL improvements include enhancing digital terrain databases to accurately simulate the mobility of small robotic platforms, stimulating perception algorithms, and integrating robotic path planning with the One Semi-Autonomous Forces (OneSAF) battlefield simulation tool to accurately represent robotic movement on the battlefield.

TRAINING

ARL's supporting role in training is well integrated with its analysis effort. The soldier's introduction to the robotic vehicle occurs through virtual simulations used for analysis and training. Emphasis is placed on improving the models of the "robotic entity" and its environment so that the soldier has a more realistic view of its capabilities and limitations.



FOR FURTHER INFORMATION

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