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Rudimentary Force Feedback for Safe Guarded Teleoperation of Unmanned Vehicles: A Simulations and Training Approach

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SUPERIOR TECHNOLOGY FOR A SUPERIOR ARMY

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Briefing Agenda

SUPERIOR TECHNOLOGY FOR A SUPERIOR ARMY

- Guarded Teleoperation Concepts
- Current Research
 - Objectives
 - Simulation Environments
 - Example Application
- Future Collaboration
- Conclusion

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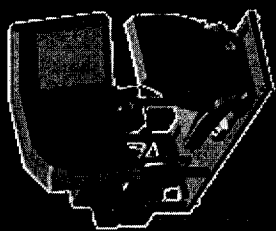
Guarded Teleoperation Concepts

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- Enhancing soldier situational awareness through feedback from unmanned vehicles
- Mitigating risks of Teleoperation
- Mitigating risks of Indirect Vision Driving
- Use of multi-modal interfaces; visual, audio, tactile (haptics)

Guarded Teleoperation Concepts (cont.)

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Human-in-the-Loop
UV Control Station

- Use of haptic displays to guide unmanned vehicles
- Feedback allows human to sense proximity of obstacles and take corrective measure and/or replan route to continue mission
- Mitigates risks

Unmanned Vehicle Control/Data Link
(sensor)

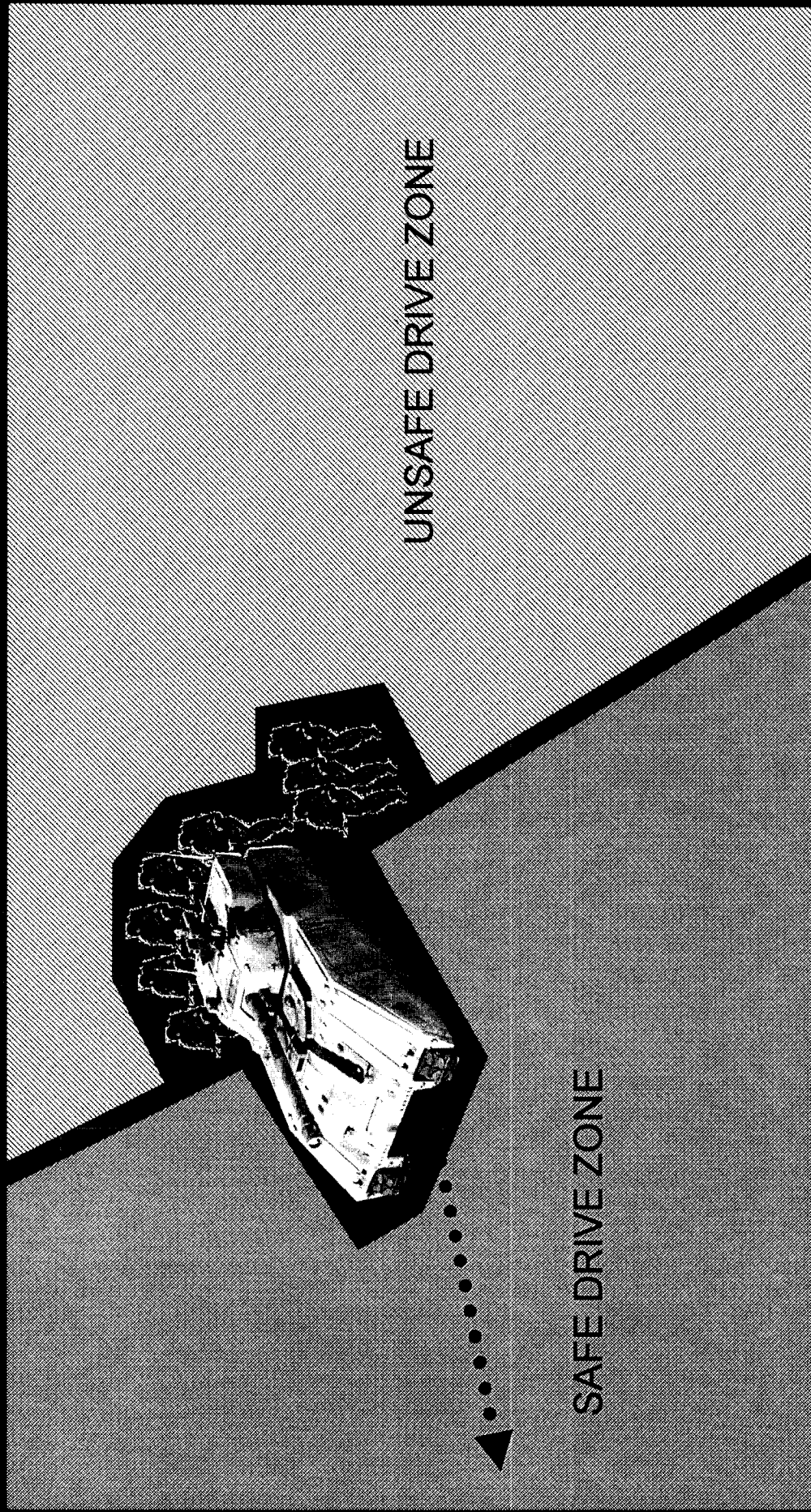


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Indirect Vision Driving (IVD) Safety

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Survivability Applications

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INCOMING THREAT DETECTION



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In-house Research Objectives

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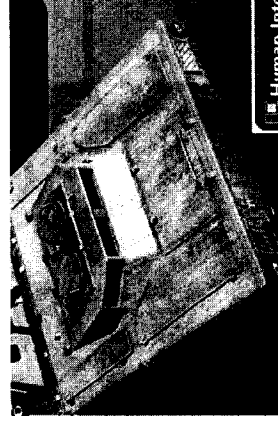
- To generate initial capability to develop and test guarded teleoperation and IVD safety concepts
- To support current research activities in the areas applicable to Human Robotics Interface (HRI)
 - Use of multi-modal interfaces?
 - Why haptics? Are there better or more efficient methods to present this data?



Simulation Environments

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- Initial capabilities using game engine / low-fidelity model representation platforms
- Delta3D
 - OpenSceneGraph/OpenDynamicsEngine
 - OpenFlight terrain database
 - Simulated sensor capability
 - DirectX for interfacing to Haptics devices



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Example Application

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Human Interface Device Demo1

Y: 1736

SAFE

Reset All Sensors

Trip All Sensors

Test Feedback

Quit

X: 250

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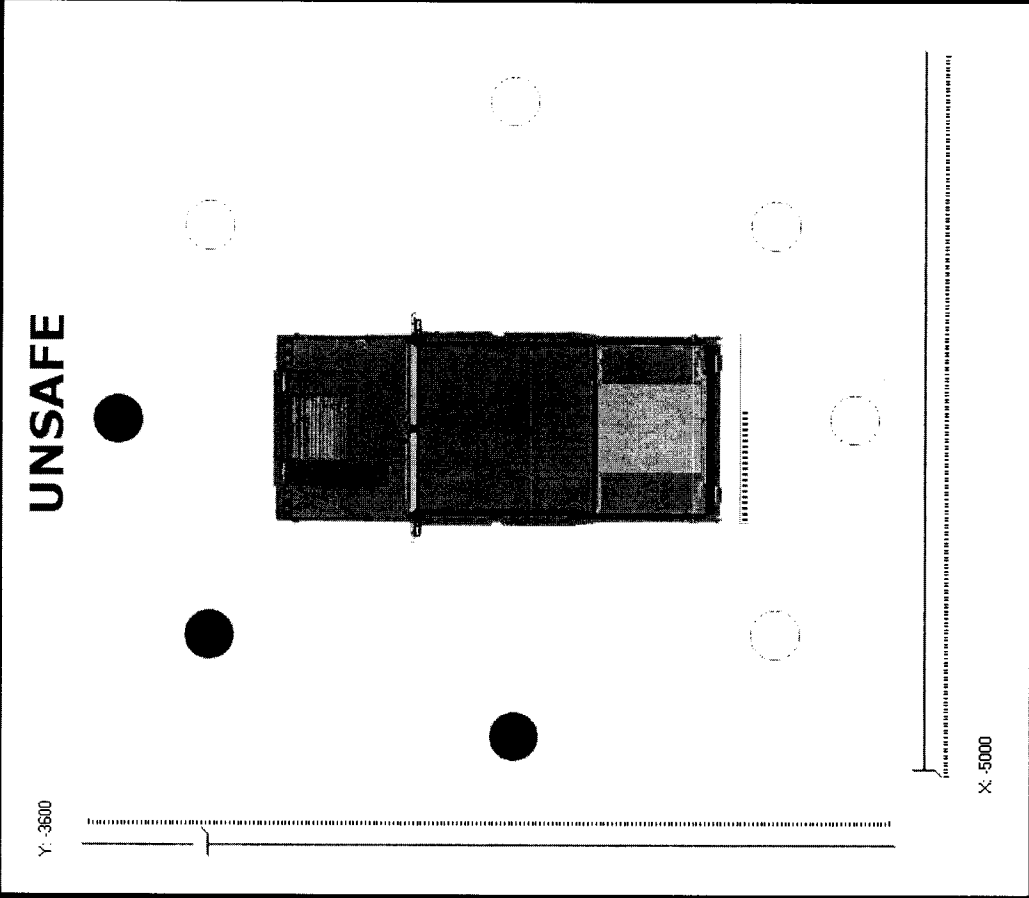
Example Application (continued)

SUPERIOR TECHNOLOGY FOR A SUPERIOR ARMY

Human Interface Device Demo1

Y: -3600

UNSAFE



X: -5000

Reset All Sensors

Trip All Sensors

Test Feedback

Quit

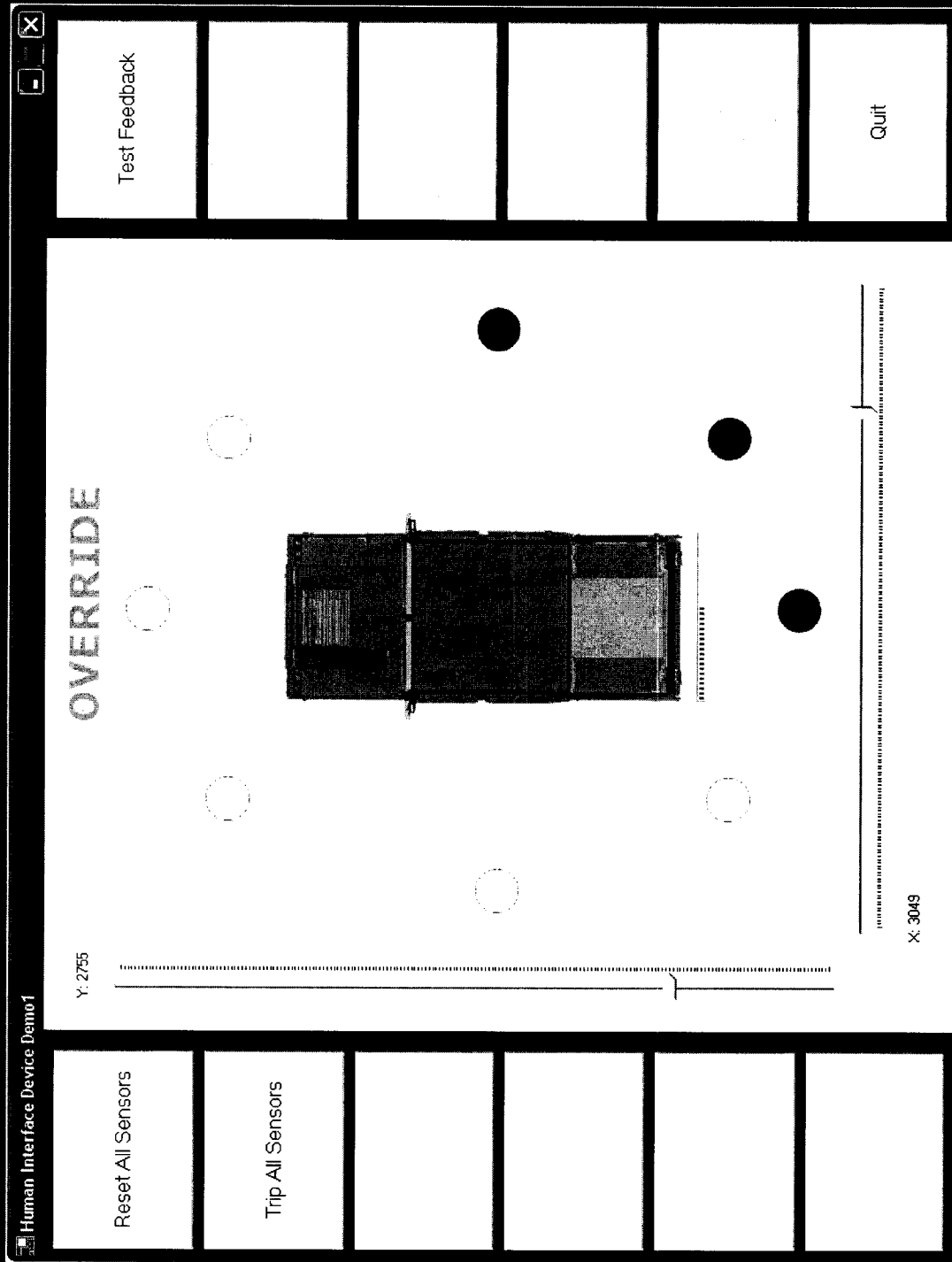
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Example Application (continued)

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Example Application (continued)

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image generator



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Future Collaboration

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- Better integration with existing human-in-the-loop hardware
- Review of commercially available haptics devices (vests, belts, straps, etc.)
- Implementation of generic drivers to allow hardware usage from various computing platforms

Conclusion

SUPERIOR TECHNOLOGY FOR A SUPERIOR ARMY

- Continued in-house research in areas of safe teleoperation pertinent to FCS objectives
- Looking for program partnerships for concepts demonstrations and testing

Questions?