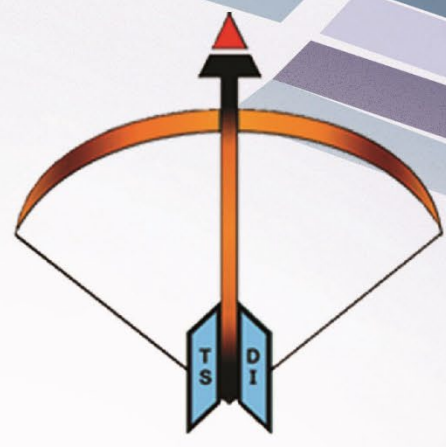




Temasek Defence Systems Institute

SCENARIO-ROBUST ROUTE PLANNING WITH NETWORK RECONSTITUTION

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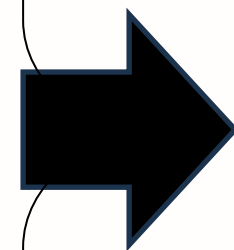
Background/ Objectives:

Military route planning through a road network that is defended with obstacles is a complex and time intensive process which requires planners to consider a multitude of factors, including time and asset allocation. As operations continue to increase in both tempo and dynamicity, it is becoming increasingly difficult for planners to keep up with intuition and manual calculations.

Therefore, we develop a scenario-robust route planning and network reconstitution model (SRRPNRM) to aid route planners and minimise the overall objective value over multiple scenarios.

Model Inputs:

- 1) Network data:
 - Transit time of units.
 - Arc capacity.
 - Obstacle locations in each scenario.
 - Penalty for concurrent usage.
- 2) Equipment data:
 - Repair times.
 - Equipment transit time.
- 3) Miscellaneous information:
 - Scenario probability.
 - Number of units required.



Model Outputs:

- 1) Starting position of all units (engineer assets and manoeuvre units) for all scenarios.
- 2) Route taken by each unit for each scenario.
- 3) Obstacle clearance plan (allocation of engineer equipment to obstacles) for each scenario.
- 4) Time required for all units to arrive at destination.

Potential Applications

- 1) Use results obtained from SRRPNRM as an initial plan for multi-agent simulations to incorporate other forms of enemy actions and test feasibility and robustness of plan.
- 2) Use results obtained from SRRPNRM in wargames as a baseline plan. Alternatively, wargames could be used to generate scenarios for the SRRPNRM.

Conclusion

The SRRPNRM allows planners to account for uncertainties in obstacle location when conducting route planning and provides a plan for each scenario that minimises the overall expected time required to complete the mission.

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