



Calhoun: The NPS Institutional Archive
DSpace Repository

CRUSER (Consortium for Robotics and Unmanned Systems Education and Research) Faculty and Researchers' Publications

2016

Optimal Intelligence Gathering and Defense Strategies against a Swarm Attack on a High Value Naval Unit

Kaminer, Isaac

Monterey, California: Naval Postgraduate School

<https://hdl.handle.net/10945/57034>

This publication is a work of the U.S. Government as defined in Title 17, United States Code, Section 101. Copyright protection is not available for this work in the United States.

Downloaded from NPS Archive: Calhoun



Calhoun is the Naval Postgraduate School's public access digital repository for research materials and institutional publications created by the NPS community. Calhoun is named for Professor of Mathematics Guy K. Calhoun, NPS's first appointed -- and published -- scholarly author.

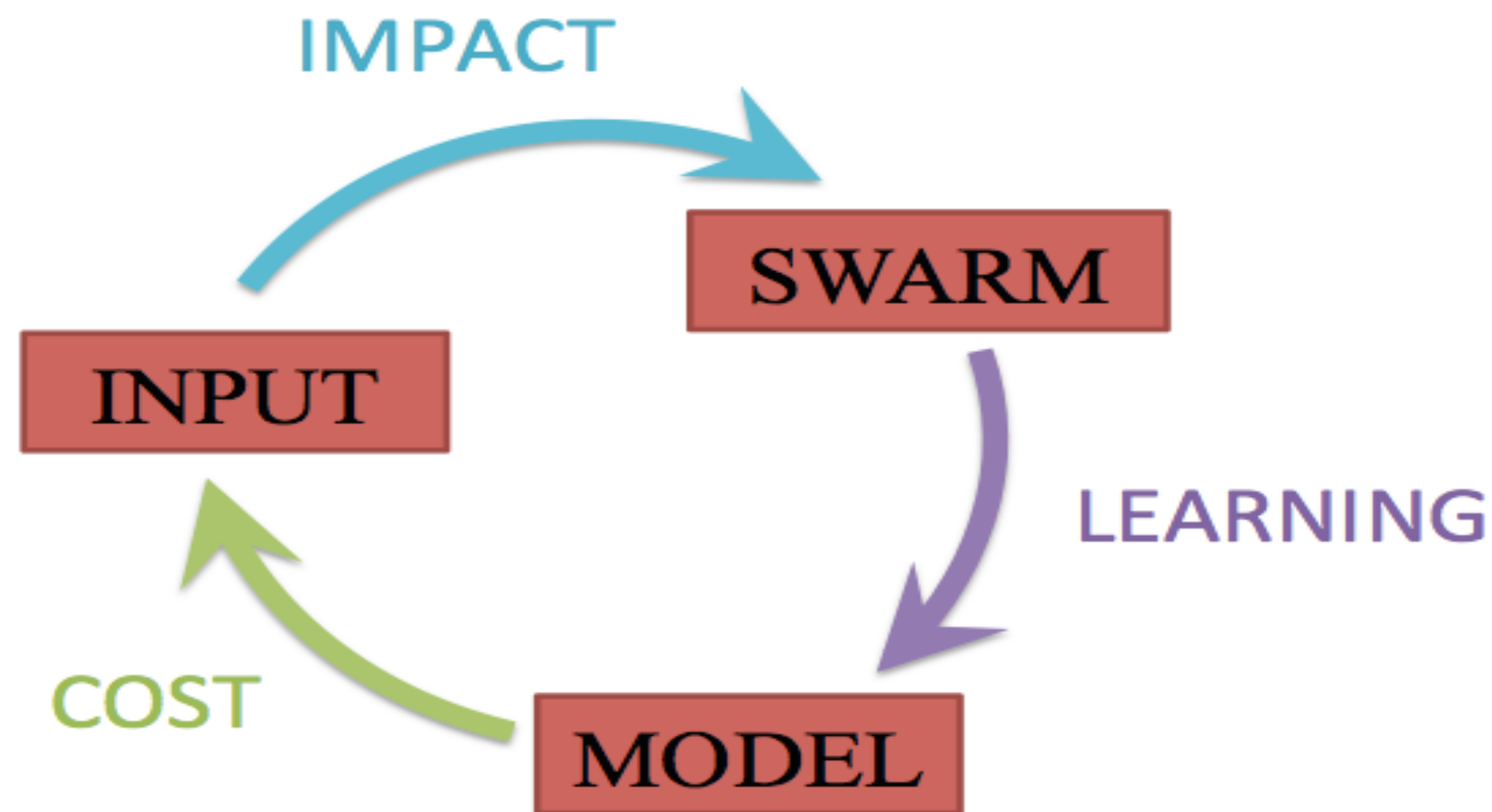
Dudley Knox Library / Naval Postgraduate School
411 Dyer Road / 1 University Circle
Monterey, California USA 93943

<http://www.nps.edu/library>

Optimal Defense Strategies against a Swarm Attack on a High Value Naval Unit



NAVAL
POSTGRADUATE
SCHOOL



- Develop new optimal strategies for intelligence gathering and defense against attack on a High Value Naval Unit (HVNU) by a swarm of Unmanned Surface Vehicles (USV).
- Previous Cruiser-funded research:
 - Optimally utilize prior information to protect HVNU from uncertain swarms
- Next Step:
 - Optimally gather information on uncertain attacker swarms
 - Ascertain swarm intelligence/structure

- Find Swarm using only probabilistic a priori intelligence
- Design an aggressive information-gathering maneuver to identify the intelligence capabilities of USV attackers
 - yields maximal information on swarm structure with regards to model identification
- Neutralize attackers
 - Utilize this reconnaissance information to ascertain attacker intelligence models
 - Use the intelligence models to design optimal defender trajectories

- Swarm intelligence/structure reveals distinct strategic possibilities
 - *Kamikaze coverage*: non-evasive attackers equipped only with target tracking; defenders cover regions of interception
 - *Herding*: attackers with collision avoidance algorithms; can **herd them away** or **have them collide**
 - *Predator Prey*: attackers with reactive onboard intelligence algorithms; larger array of possible models, information-heavy strategies.