

UPDATE:

Integrating telemetry data into SCR for improved inference about cost functions

Gates Dupont

University of Massachusetts - Amherst

`gdupont@umass.edu`

10/04/2020

Background

Model structure

Integrated likelihood framework

- Single model, composed of SCR and movement submodels
- Submodels share 2 params:
 - α_2 - Cost parameter
 - σ - Distance from home range center
- Leverages SCR data and telemetry data

(Note: I chose this approach over the RSF approach because I could understand it, and because incorporating a movement model is a better fit for the special feature as per Brett's original emails.)

The SCR model

- Basic SCR model (w/ Gaussian encounter probability model)
- Modified to estimate cost (Royle *et al.* 2013)

The movement model (Sutherland *et al.* 2018 TWS presentation)

- Basic model of Markovian movement
 - Step length determined by LCP (ecological) distance
 - Includes distance from activity center for SCR-like data
 - So, four params:

Parameter	Description
α_2	Cost value
σ	Space use - home range
v	Space use - step length
ψ	pr(Moved)

Preliminary results

SCR_{cost} (base, no telem)

Scenario settings

SCR DATA

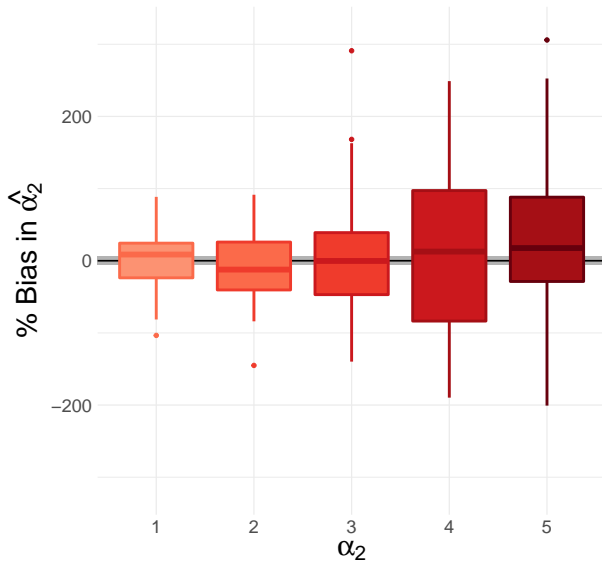
Parameter	Value	Description
abundance	300	Abundance
alpha2	1,2,3,4,5	Cost value
sigma	0.5	Space use - home range
p0	0.2	Baseline encounter probability
K	5	Number of sampling occasions

STATE-SPACE

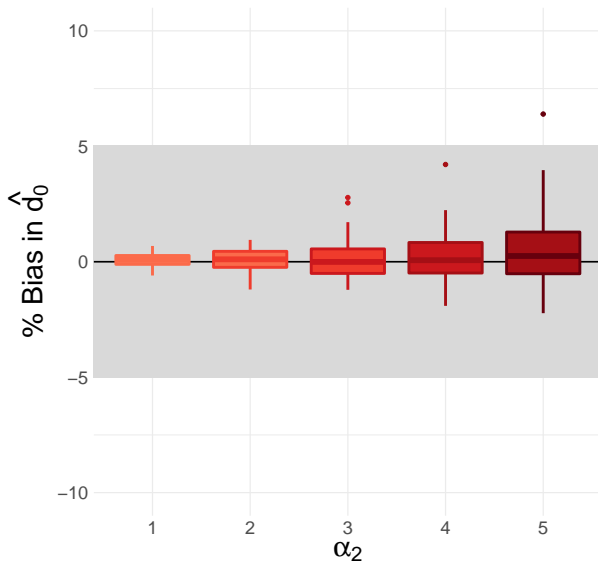
Parameter	Value	Description
rr	$\sigma/4$	State-space & cost resolution
Incol = Inrow	$10/rr$	State-space dimensions
d0	$\text{abundance}/(\text{Incol}*\text{Inrow})$	Per-pixel density

Only 50 simulations per cost value

Cost estimation



Density estimation



$SCR_{cost} + \text{telem}$

Scenario settings

SCR DATA:

- Same as above

STATE-SPACE:

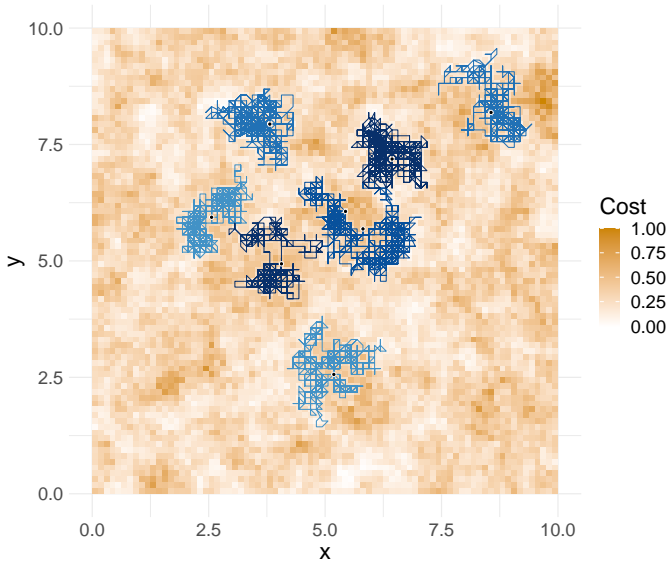
- Same as above

MOVEMENT DATA:

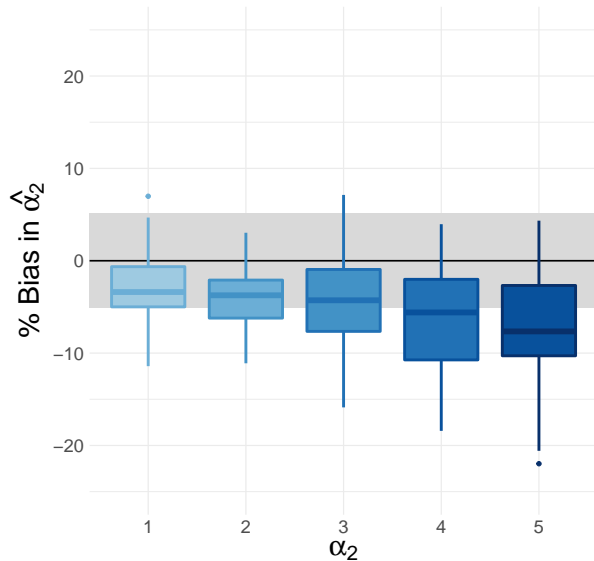
Parameter	Value	Description
upsilon	$\sigma/4$	Space use - step length
psi	0.7	pr(Moved)
nfix	90*24	Number of pings
telemetry_n	8	Number of individuals tagged

Only **50** simulations per cost value

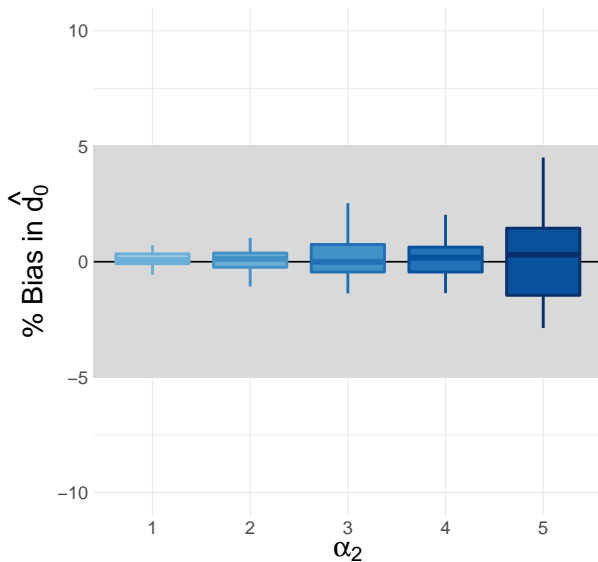
Simulating movement data



Cost estimation

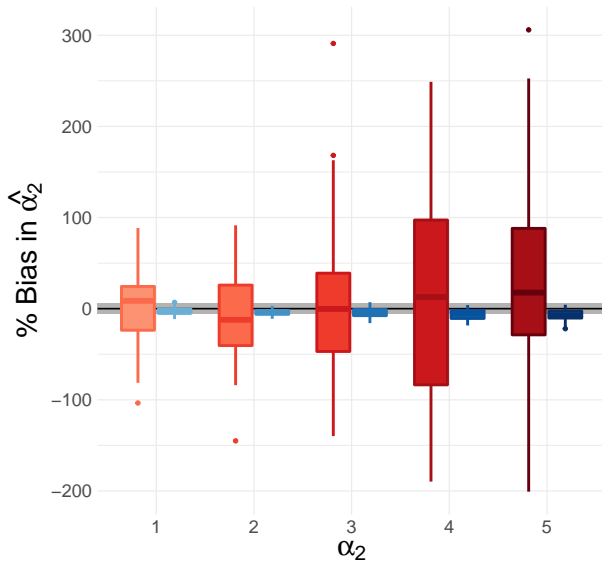


Density estimation

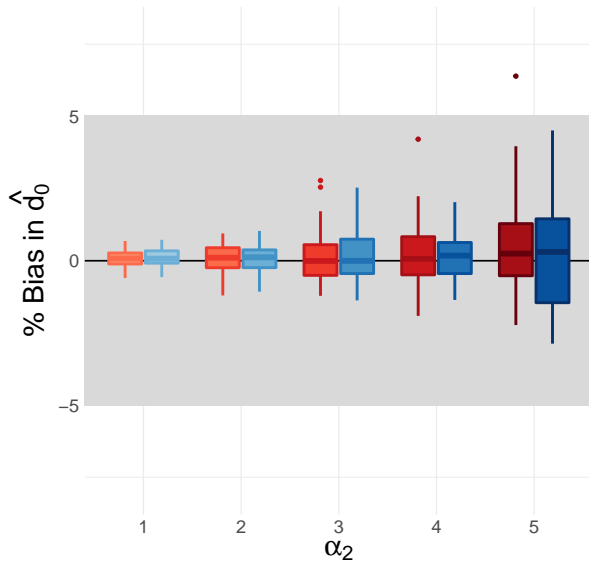


Comparisons

Compare cost



Compare density



Closing remarks

- These (preliminary) results are very promising.
- Next steps:
 - decide/finalize sim scenarios.
 - run scenarios for >50 sims.
- Introduction is written. Structure of rest of paper is bulleted.