



Vigilance Behavior

This model explores how foraging in groups can help foragers avoid predation. When the model opens you will see a field with juncos near the center (Fig. 1). Scattered around the field are food items (juncos eat insects and seeds). Click 'Go' and the juncos will begin to move around the field, occasionally putting their heads down to feed. When their heads are down they can gain energy from food that they find, but will not see a hawk attack coming. When their heads are up, they have a certain probability of spotting a hawk attack, but they do not find food. The juncos have an energy level that is recorded, and there is a per-time energy cost that accrues, but is offset by food. Hawk attacks can be manually triggered, or set to occur at a specific rate (Fig. 2). If a bird is 'captured', there is a feather left behind (but when the flock returns the dead bird is replaced). Use the information from Tables 1 & 2 to become familiar with how to work with the simulation.

Fig. 1

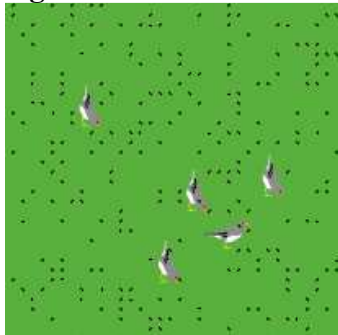


Fig. 2

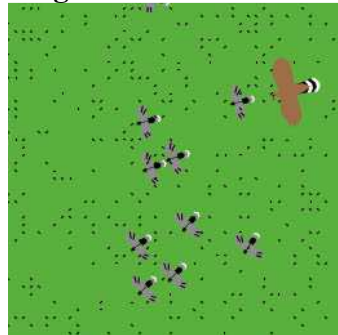


Table 1: Reporters for Vigilance Behavior (Collective)

Reporter	Description
Mean Energy	The average energy level of the juncos
Prop. Vigilant	The proportion of the junco flock that is currently vigilant
Mean Vigilance	The rolling average number of vigilant juncos
Kills	The number of successful hawk attacks
Misses	The number of unsuccessful hawk attacks

Table 2: Controls for Vigilance Behavior (Collective)

Control	Action
Reset All	Clears all values, resets model to set parameters
Go	Sets the model in motion
Stop_It	Stops the model at a specified time (in ticks)
EndTime	Specifies the stop time
Food_Density	The probability that a patch will have food
Show_Food	When 'off', the food exists but is hidden
Num_Juncos	The number of birds in the foraging flock
Detect	The per-tick probability that a vigilant bird will detect a hawk
Warning	The per-tick probability that a bird will be warned by a flushing bird
Spacing	The average distance that foraging birds will stay apart
Prop_Forage	The per-tick probability that a vigilant bird will return to foraging
Forage_Time	The average amount of time (ticks) a foraging bout will last
Hawk Attack	Triggers a hawk attack from a random location
Return Juncos	Returns the original number of juncos to the field after an attack
Auto_Hawk	When switched on, attacks and returns will occur automatically
P_Attack	The per-tick probability of a hawk attack

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