

Desert Ant Adaptive Navigation

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Ants in the Pants

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Werner



What is it all about?



Figure : *Cataglyphis fortis*¹



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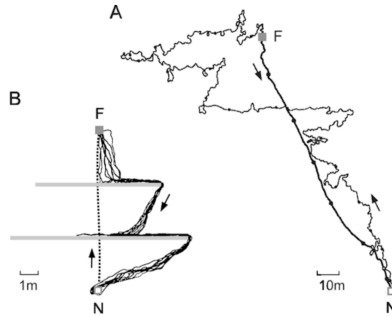


Figure : Foraging walks Wehner2003



What is it all about?

- one ant, one prey → no further communication needed

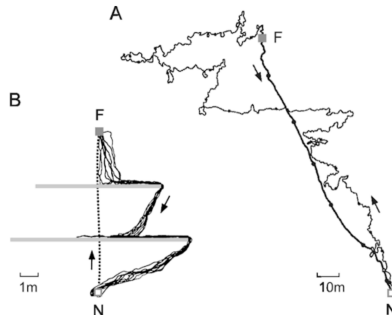


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- Why is time, hence the shortest way back so crucial?

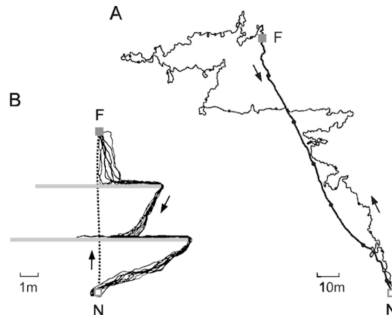


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What is it all about?

- one ant, one prey → no further communication needed
- Why is time, hence the shortest way back so crucial?
- Distances in relation to ant's size.

Speed of *cataglyphis fortis* $\approx 1 \frac{m}{s}$

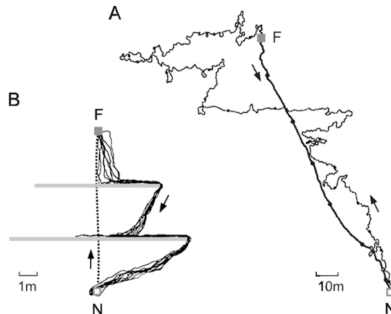


Figure : Foraging walks Wehner2003



How do they do it?

- Pathintegration



How do they do it?

- Pathintegration and
- Local Orientation

How do they do it?

Algorithm ReturnToMyNest()

```
while not at nest do  
    execute global vector;  
    update global vector;  
    if local vector recognised then  
        while local vector > 0 do  
            execute local vector;  
            update local vector;  
            update global vector;  
        end  
    end  
end  
return
```

Algorithm 1: Returning to the nest

Pathintegrator-model ¹

$$\varphi(n+1) = \varphi(n) + k \cdot \frac{(\pi + \delta) \cdot (\pi - \delta) \cdot \delta}{l(n)}$$

$$l(n+1) = l(n) + 1 - \frac{|\delta|}{\pi}$$

where k is a normalization constant, δ is the angle with which the ant is turning its current direction and the step width is assumed to be 1.

¹Wehner1988

Discussion of the pathintegrator

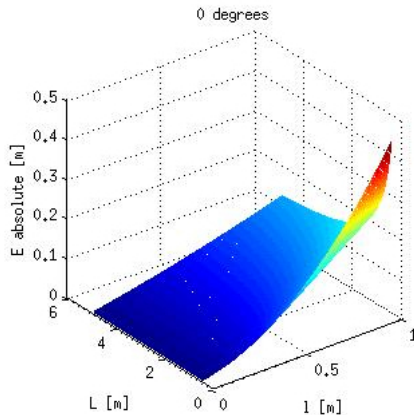


Figure : 0 degrees

Discussion of the pathintegrator

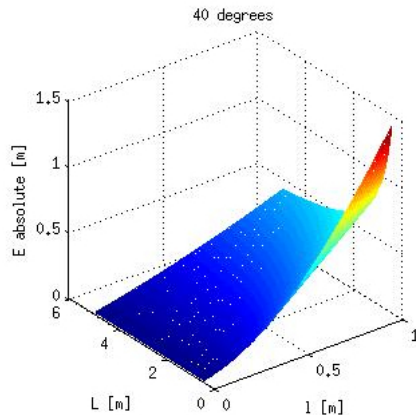


Figure : 40 degrees

Discussion of the pathintegrator

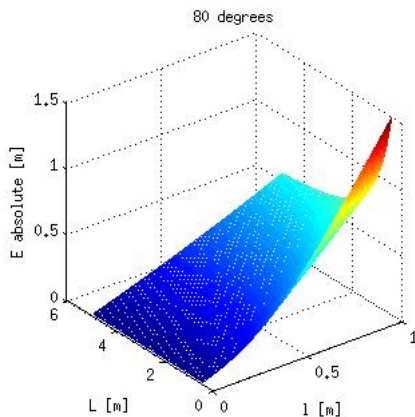


Figure : 80 degrees

Discussion of the pathintegrator

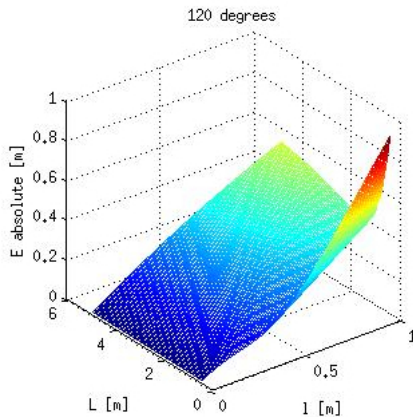


Figure : 120 degrees

Discussion of the ant's random walk

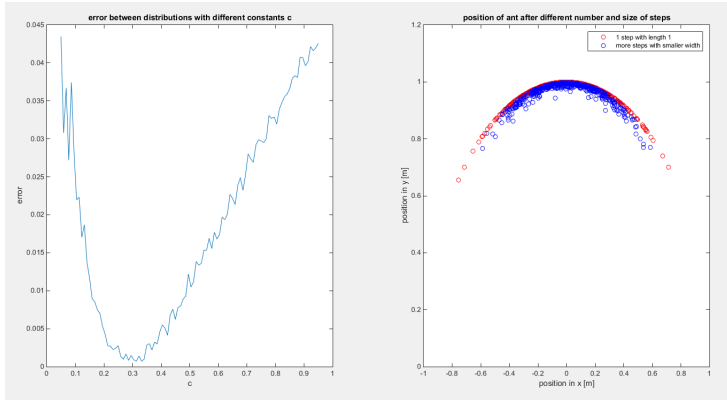


Figure : Variance for stepwidth

Results of the pathintegrator

1. ant walks 12 m in a fixed direction
2. then turns an angle α walks 5 more meters, where it finds food
3. the ant returns with a certain error.

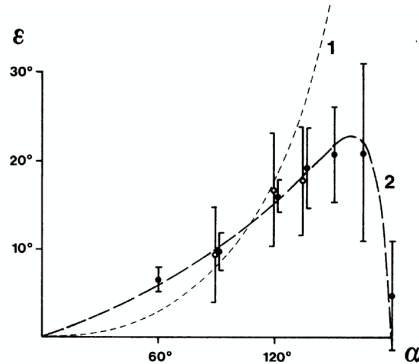


Figure : Angular Error according to Wehner1988

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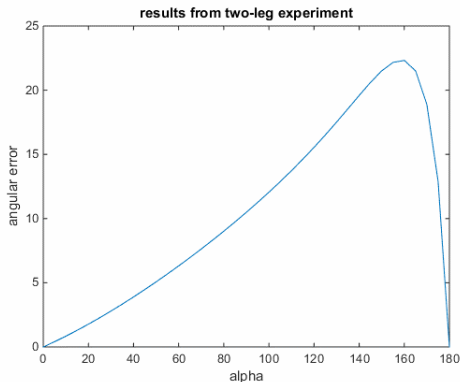


Figure : Angular error produced by our model

Results of the pathintegrator

Comparison

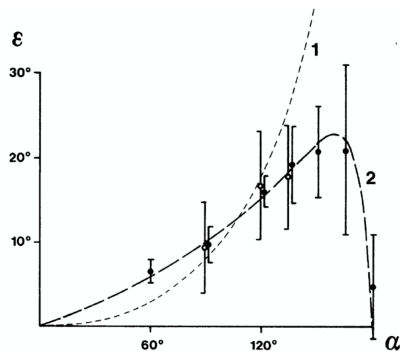
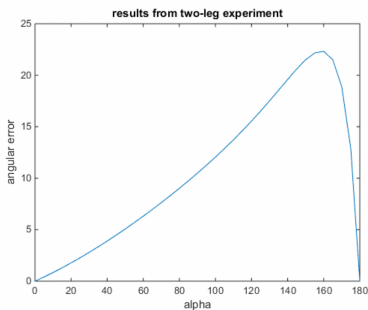


Figure : Comparison

Local Orientation

Bla bla

Outlook and Conclusions

Bla bla

Thanks for your attention

Questions ?