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# AntBot: a Fully Insect-Inspired Hexapod Homing like Desert Ants

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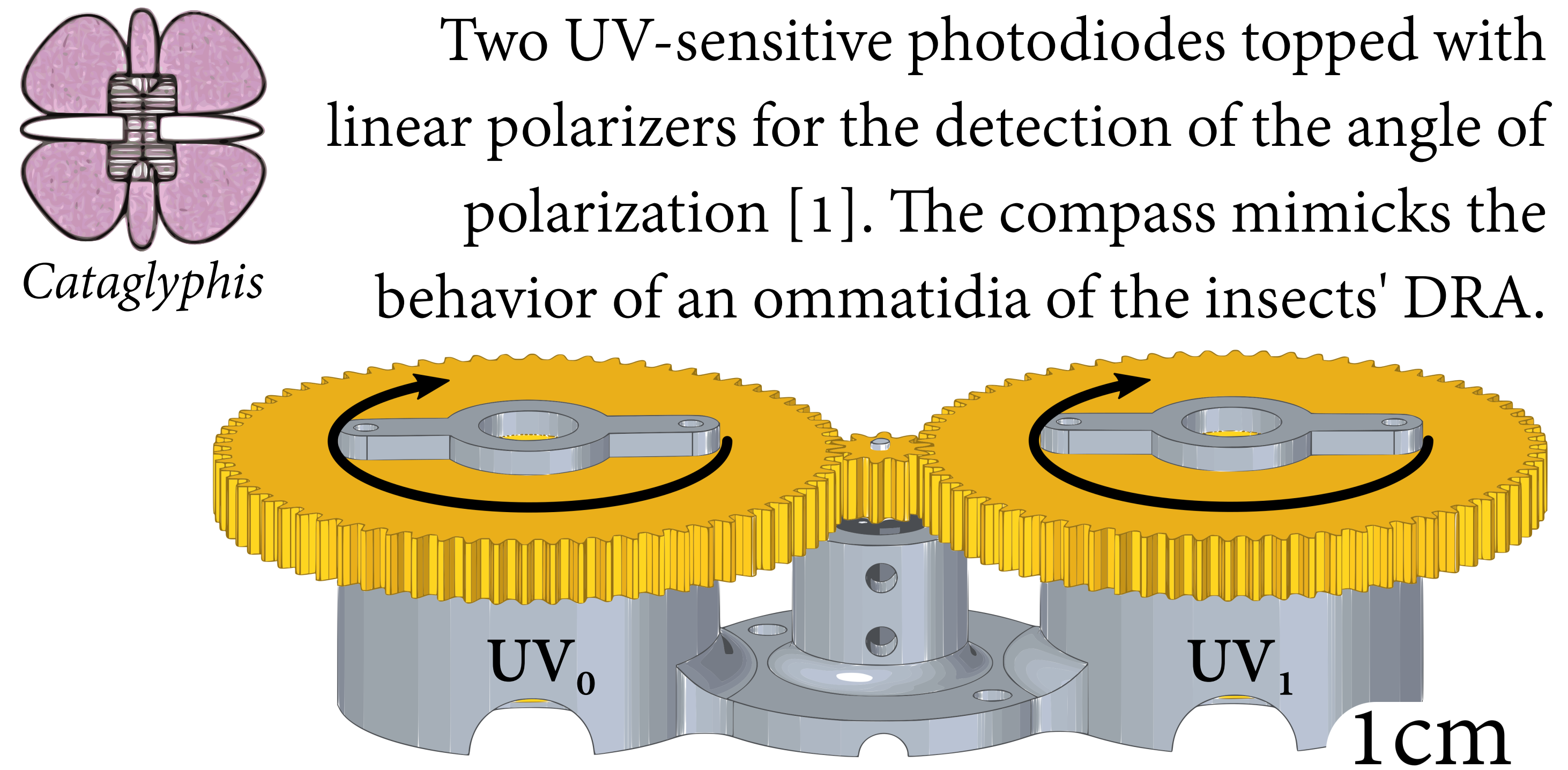
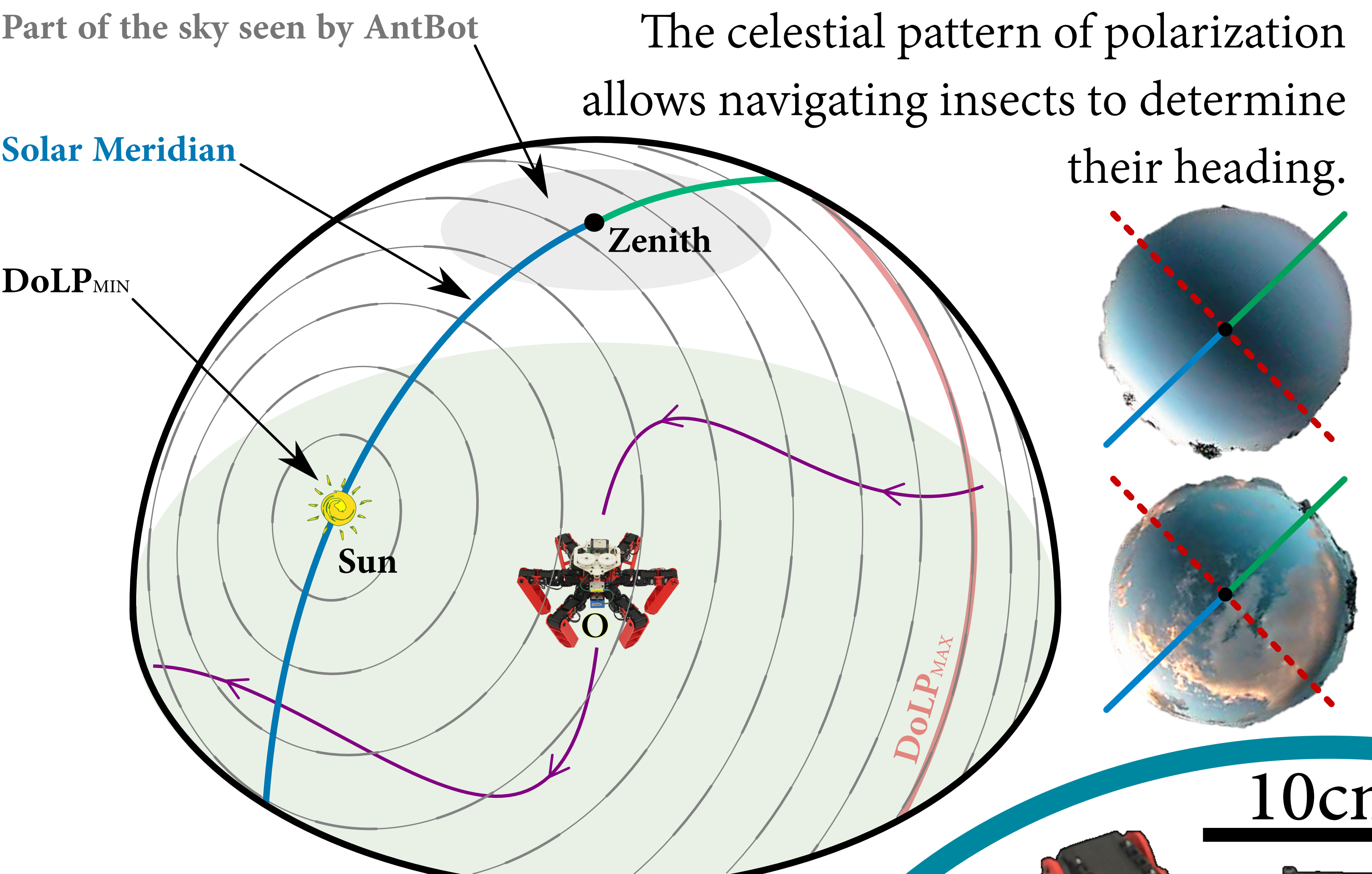


# AntBot: a Fully Insect-Inspired Hexapod Homing like Desert Ants



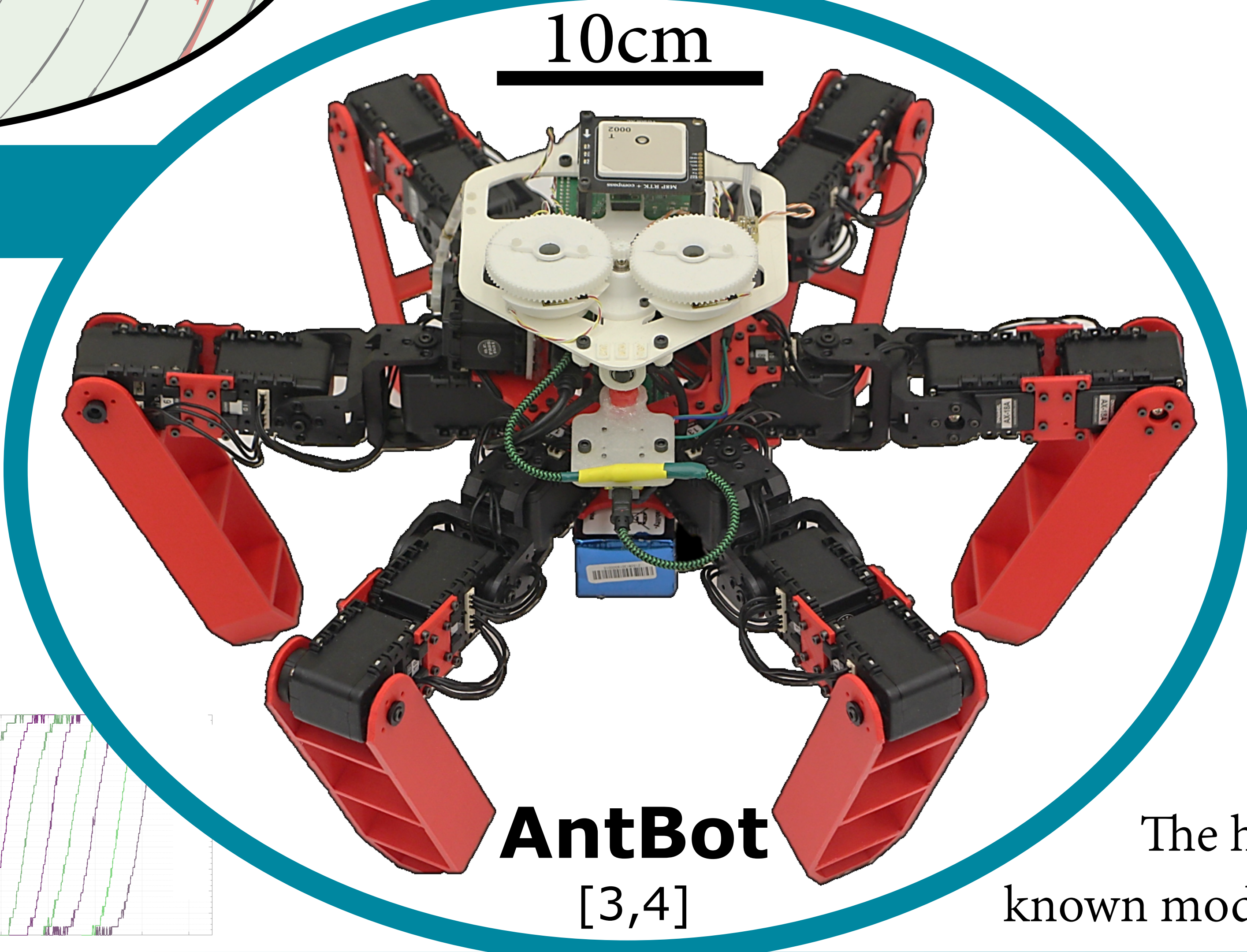
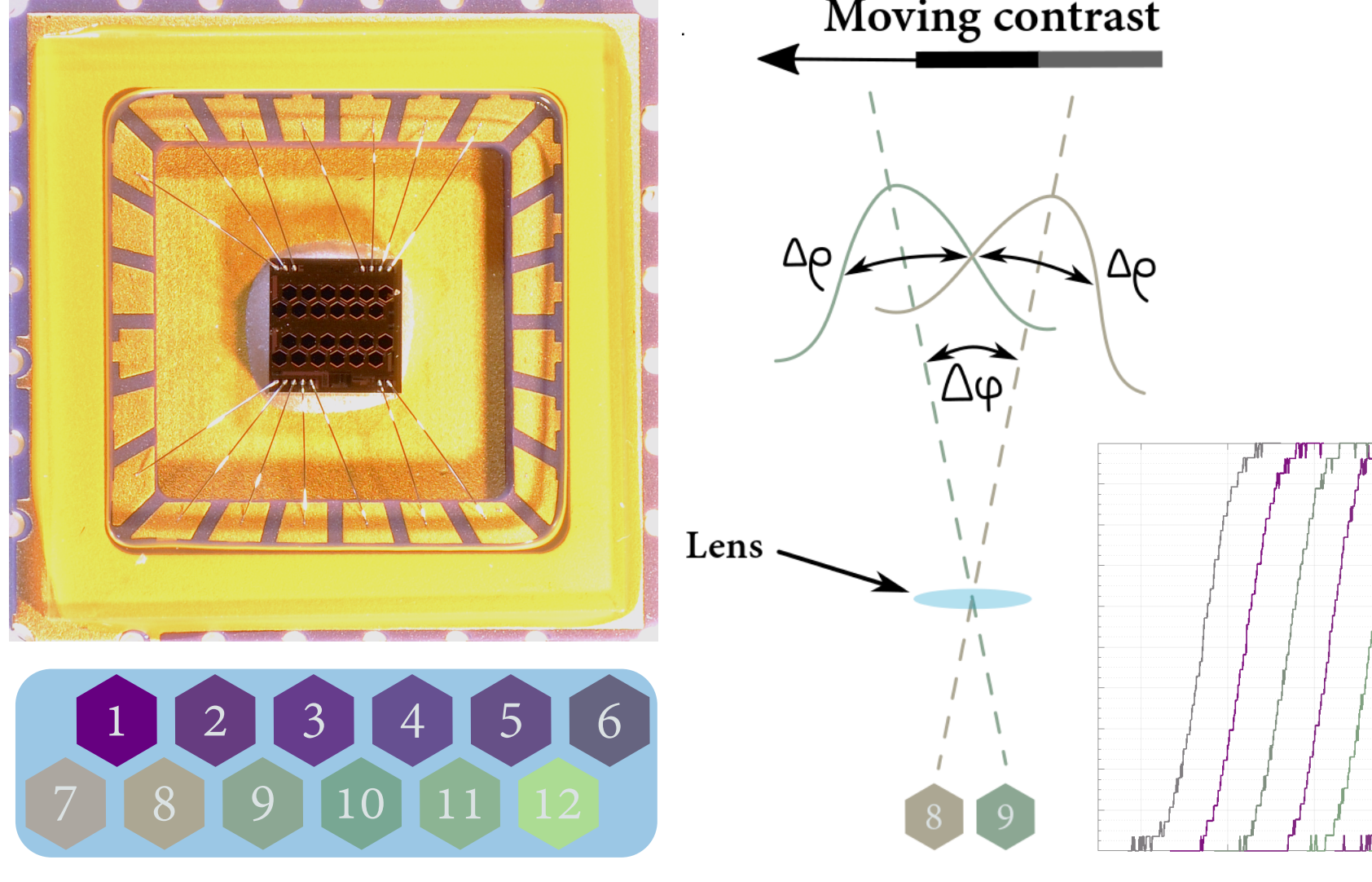
## The celestial pattern of polarization

## The insect-inspired celestial compass

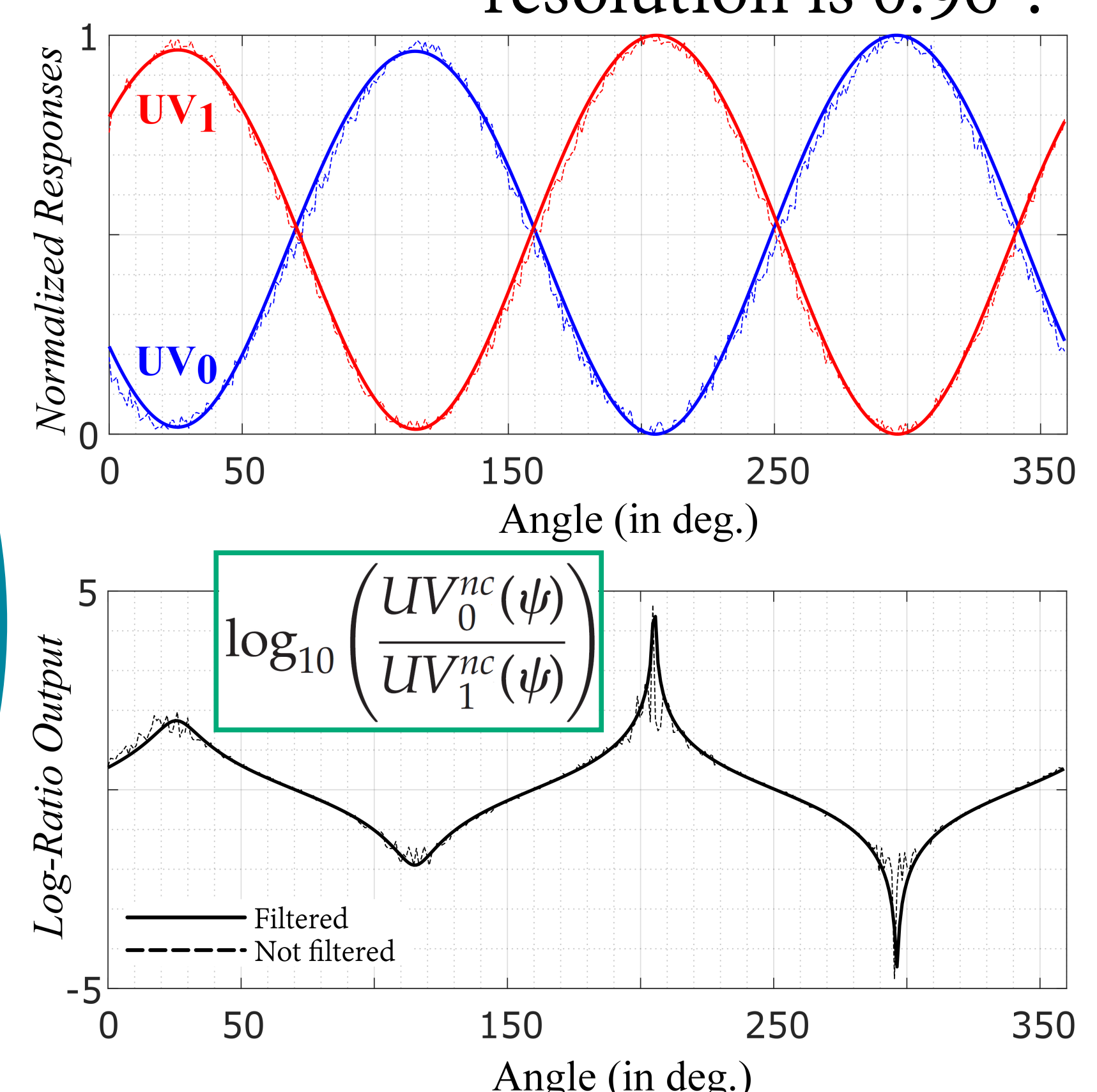


## The optic flow sensor

The M<sup>2</sup>APix sensor: 12 Michaelis-Menten Auto-adaptive Pixels that can auto-adapt to light changes [2].



The signals measured by the POL-unit are first low-pass filtered and normalized. The angular resolution is 0.96°.



The heading is known modulo 180°:

$$\psi = \frac{1}{2}(\psi_1 + \psi_2 + \text{sgn}(\psi_1 - \psi_2))$$

## The path integrator

PI Mode	Stride Counting	Ventral Optic Flow	Celestial Compass
PI-ST (blind)	×	×	
PI-Full	×	×	×

Distance Heading Distance Heading

The modes were tested over 26 outdoor navigation tasks.

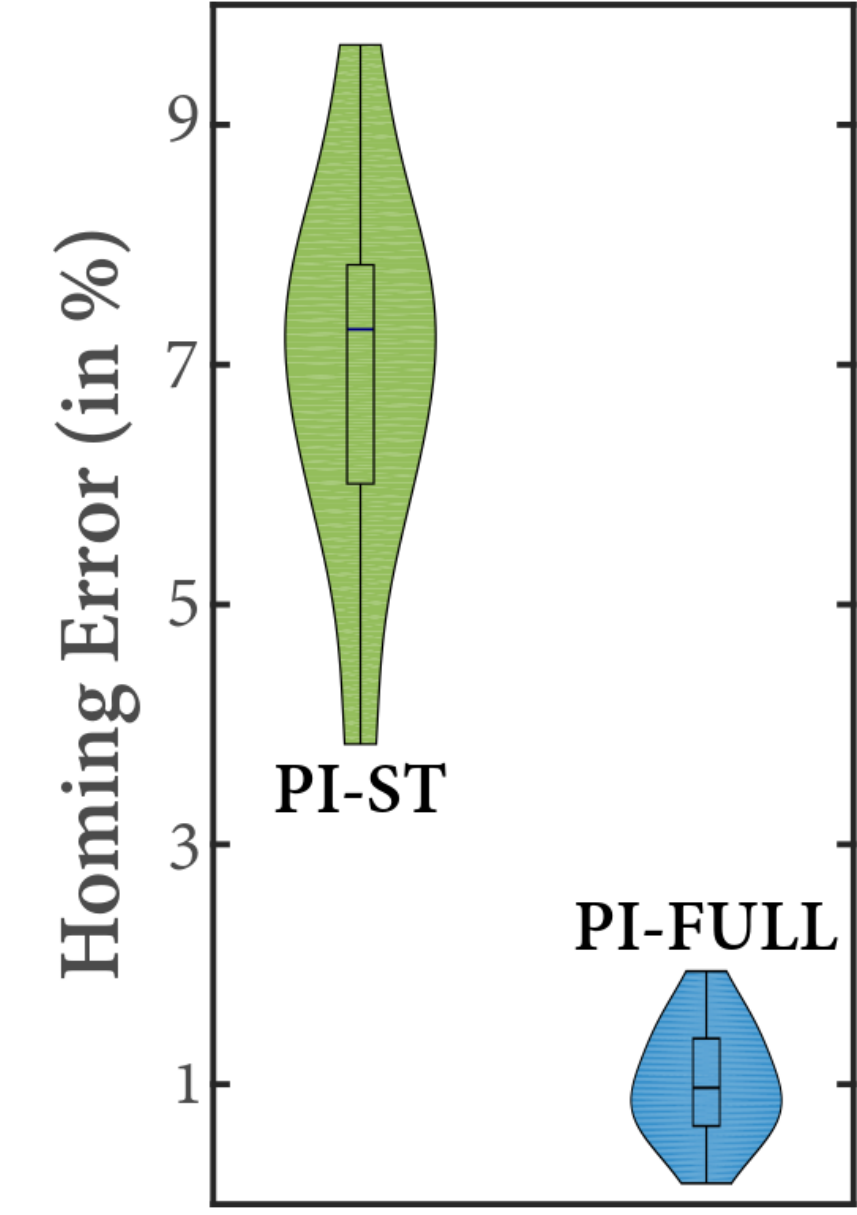
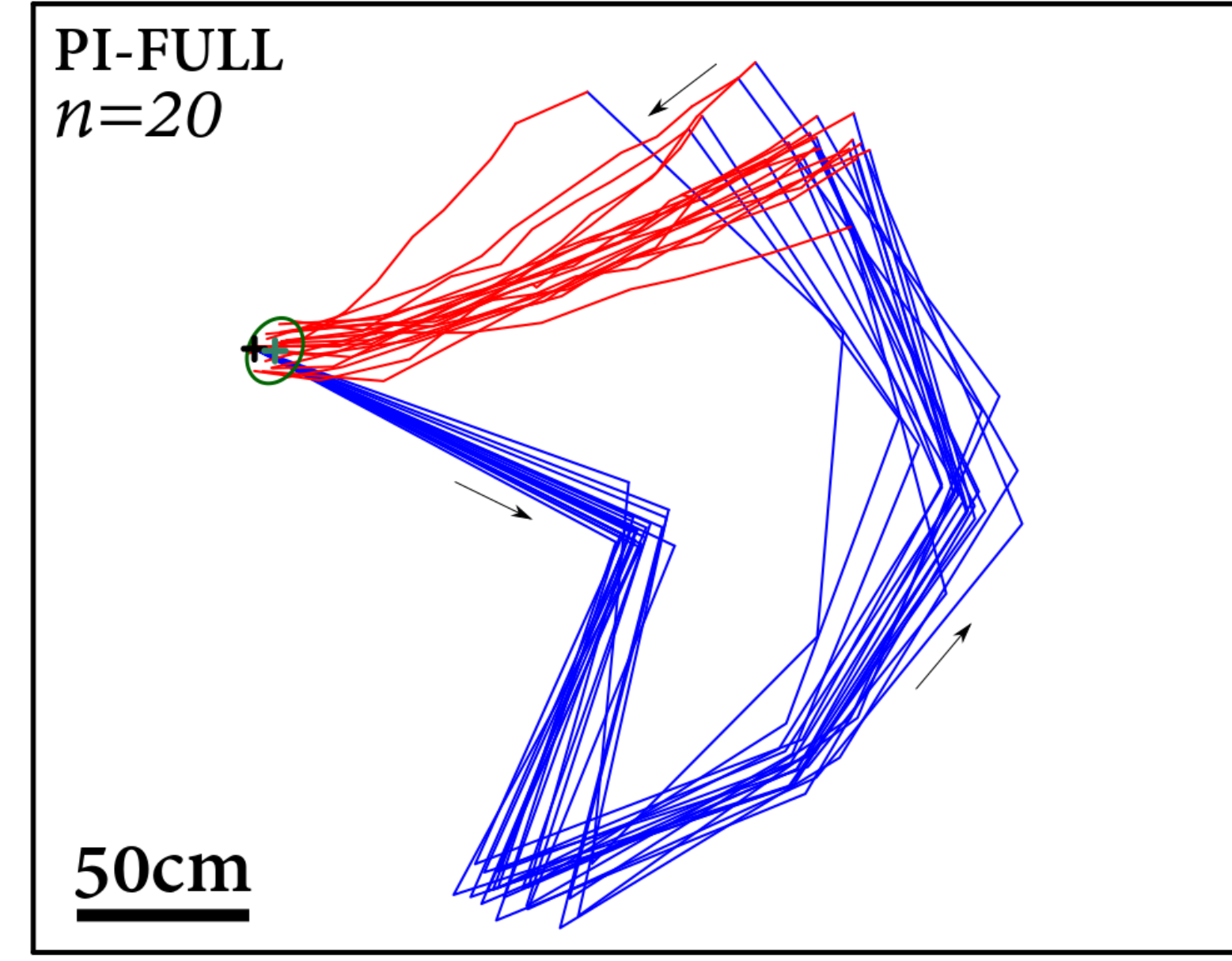
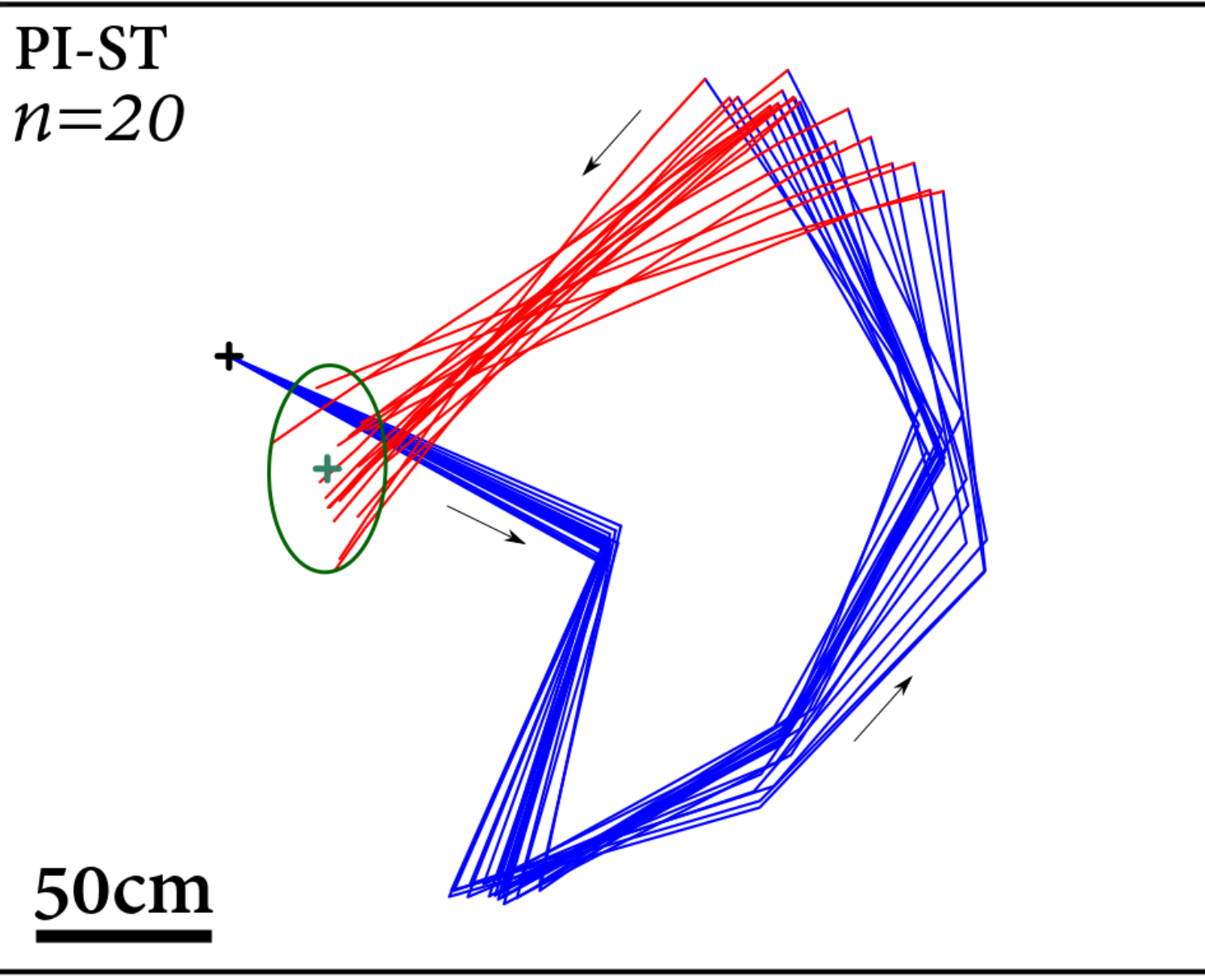
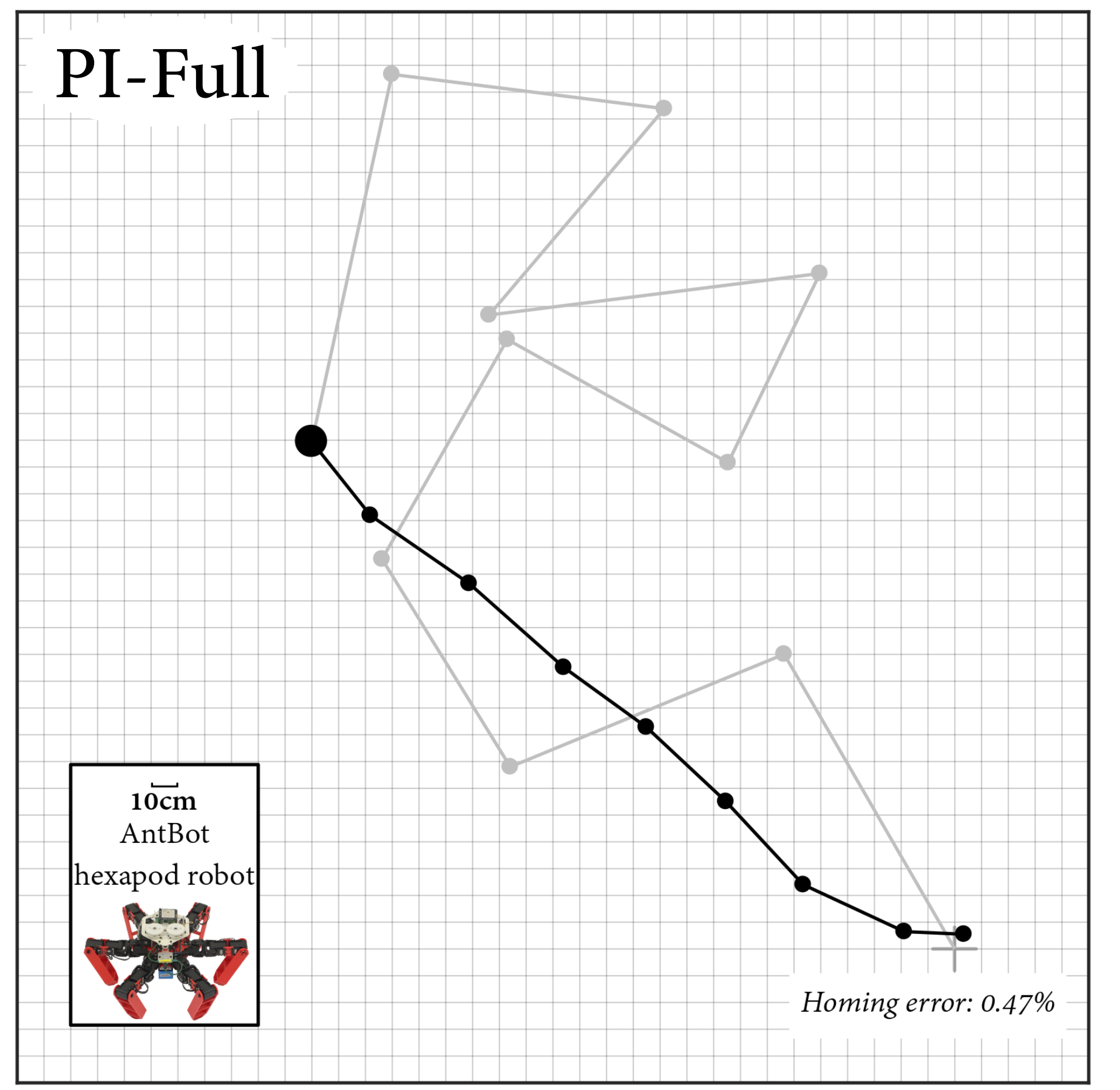
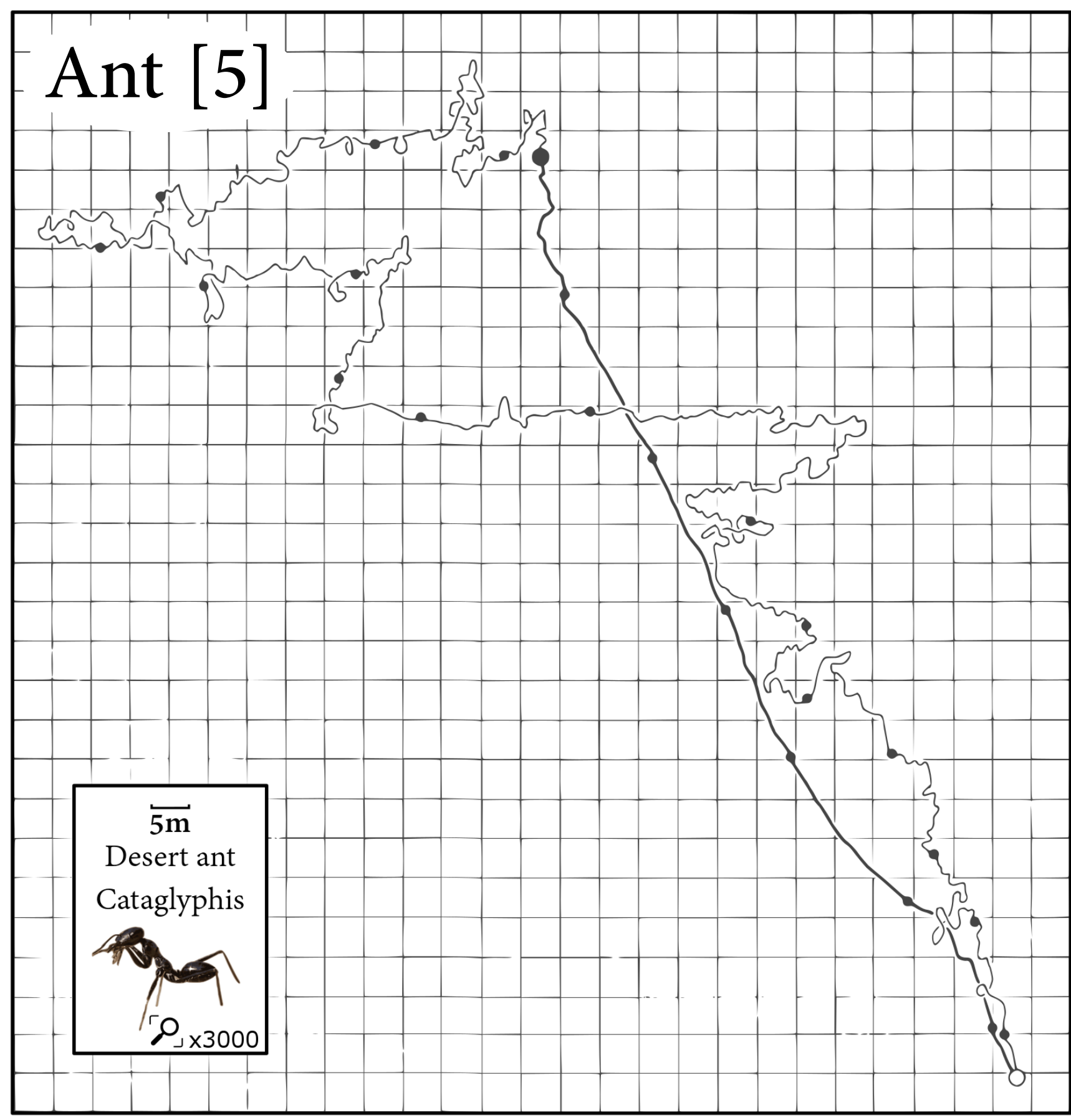
Mode	Mean	sd
PI-ST	9.65%	3.45%
PI-Full	0.67%	0.27%

n=26 for each PI mode

The ant-based mode PI-Full yielded strong navigation performance with a high resilience toward:

(i) the trajectory shape and length;

(ii) the meteorological conditions.



[1] Dupeyroux et al. (2019) J. Roy. Soc. Interface, 16 (150), 20180878.  
 [2] Mafria et al. (2015) Optics Express, 23(5), 5614.  
 [3] Dupeyroux et al. (2019) Science Robotics, 4(27), eaau0307.  
 [4] Dupeyroux et al. (2019) Robotics and Autonomous Systems, 117, 40-56.  
 [5] Wehner & Wehner (1990) Ethology, Ecology & Evolution, 2(1), 27-48.