

# Biologically Inspired Landmark Based Navigation

Savvas Loizou, University of Pennsylvania

[sloizou@seas.upenn.edu](mailto:sloizou@seas.upenn.edu)

<http://www.seas.upenn.edu/~sloizou/>

Abstract:

Ants tend to use landmarks to navigate. However the landmark information that they use, seems to only rely on retinal positions of the landmarks. These observations lead us to study whether it is possible to derive a landmark based navigation scheme that only incorporates bearing measurements between the landmarks. We show that both navigation and homing tasks as well as the tandem running behavior observed in ant house hunting are possible using only bearing measurements. A control theoretic approach is proposed and the safety and stability properties of the resulting controllers are rigorously analyzed. The resulting controllers are fully decentralized and with low computational complexity, making them suitable for implementation in large scale robotic swarms consisting of robots without any communication or global positioning capabilities and with only limited computational and sensing capabilities.