

Physically Based Rendering

The art of the science of Light

$$L_o(p, \omega_0) = L_e(p, \omega_0) + \int_{S^2} f(p, \omega_0, \omega_i) L_i(p, \omega_i) |\cos \theta_i| d\omega_i$$

Sohaib Alam

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St Bartholomew's School
United Kingdom
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1 Introduction

Ever since the advent of computers, there has been a concerted effort to imitate the behaviours we notice in our world by computers, creating an "uncanny" semblance, that some would call too realistic. For example, Craig Reynolds in his seminal paper [1] is an excellent case study, of such an example. Reynolds defined three very simple rules pertaining to the behaviours of birds in a flock. These rules are:

- Alignment: the birds will steer towards the average heading of their peers.
- Cohesion: the birds will steer towards the center of the mass of its peers.
- Separation: the birds will steer away from colliding with their peers.

These simple laws, though primitive, produce a "realistic" approximation of how birds behave in actuality, so much so, that the US Army uses this algorithm, for their UAV-UGV programs [2].

1.1 Motivation

References

- [1] Craig W. Reynolds. “Flocks, Herds and Schools: A Distributed Behavioral Model”. In: *Proceedings of the 14th Annual Conference on Computer Graphics and Interactive Techniques*. SIGGRAPH '87. New York, NY, USA: Association for Computing Machinery, Aug. 1, 1987, pp. 25–34. ISBN: 978-0-89791-227-3. DOI: [10 . 1145 / 37401 . 37406](https://doi.org/10.1145/37401.37406). URL: <https://dl.acm.org/doi/10.1145/37401.37406> (visited on 03/11/2024).
- [2] Martin Saska et al. “Coordination and Navigation of Heterogeneous MAV–UGV Formations Localized by a ‘Hawk-Eye’-like Approach under a Model Predictive Control Scheme”. In: *The International Journal of Robotics Research* 33.10 (Sept. 1, 2014), pp. 1393–1412. ISSN: 0278-3649. DOI: [10 . 1177 / 0278364914530482](https://doi.org/10.1177/0278364914530482). URL: <https://doi.org/10.1177/0278364914530482> (visited on 03/13/2024).