

---

# Breathers in two-dimensional lattices

Jonathan Wattis\*<sup>1</sup>

<sup>1</sup>School of Mathematical Sciences [ Nottingham] – University Park, Nottingham, NG7 2RD, United Kingdom

## Abstract

We use asymptotic techniques to construct approximations to breathers in two-dimensional lattices. We consider scalar Fermi-Pasta-Ulam lattices, that is, where there is only one variable at each lattice node, and there is no onsite potential, only nonlinear nearest neighbour interactions. Through the use of multiple scales, we obtain a nonlinear Schrödinger reduction. We are able to solve this system in two cases - (i) stationary breathers in an arbitrary potential, and (ii) moving breathers in a symmetric potential. In this latter case, there is an ellipticity criterion for the existence of breathers. We summarise results for the square lattice, as well as the triangular and honeycomb geometries. If time permits, we may also present preliminary results on the analysis of a vector two-dimensional lattice.

---

\*Speaker