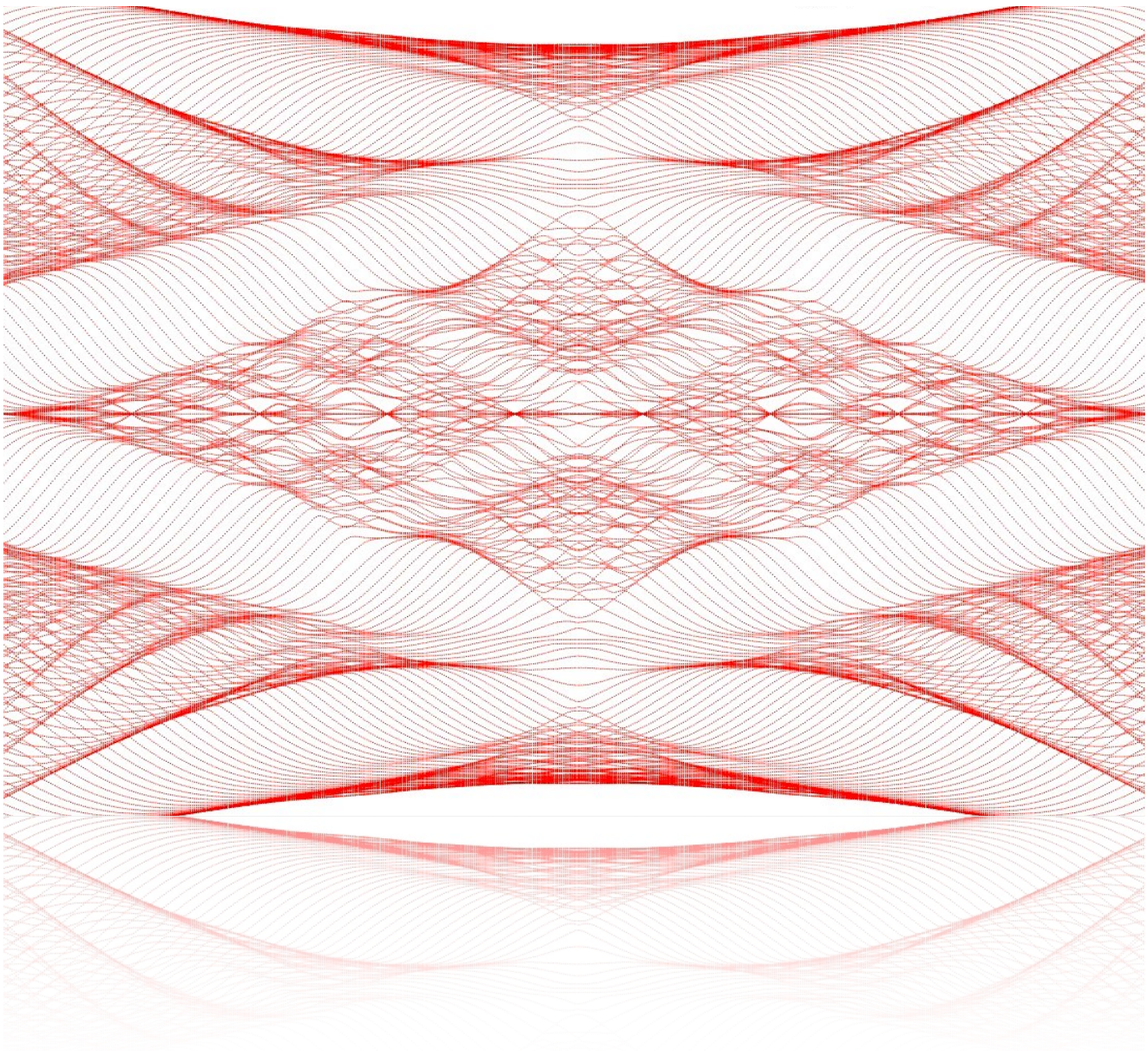# Lanczos transformation

For impurity problems

A short report from the previous work - May 21, 2014

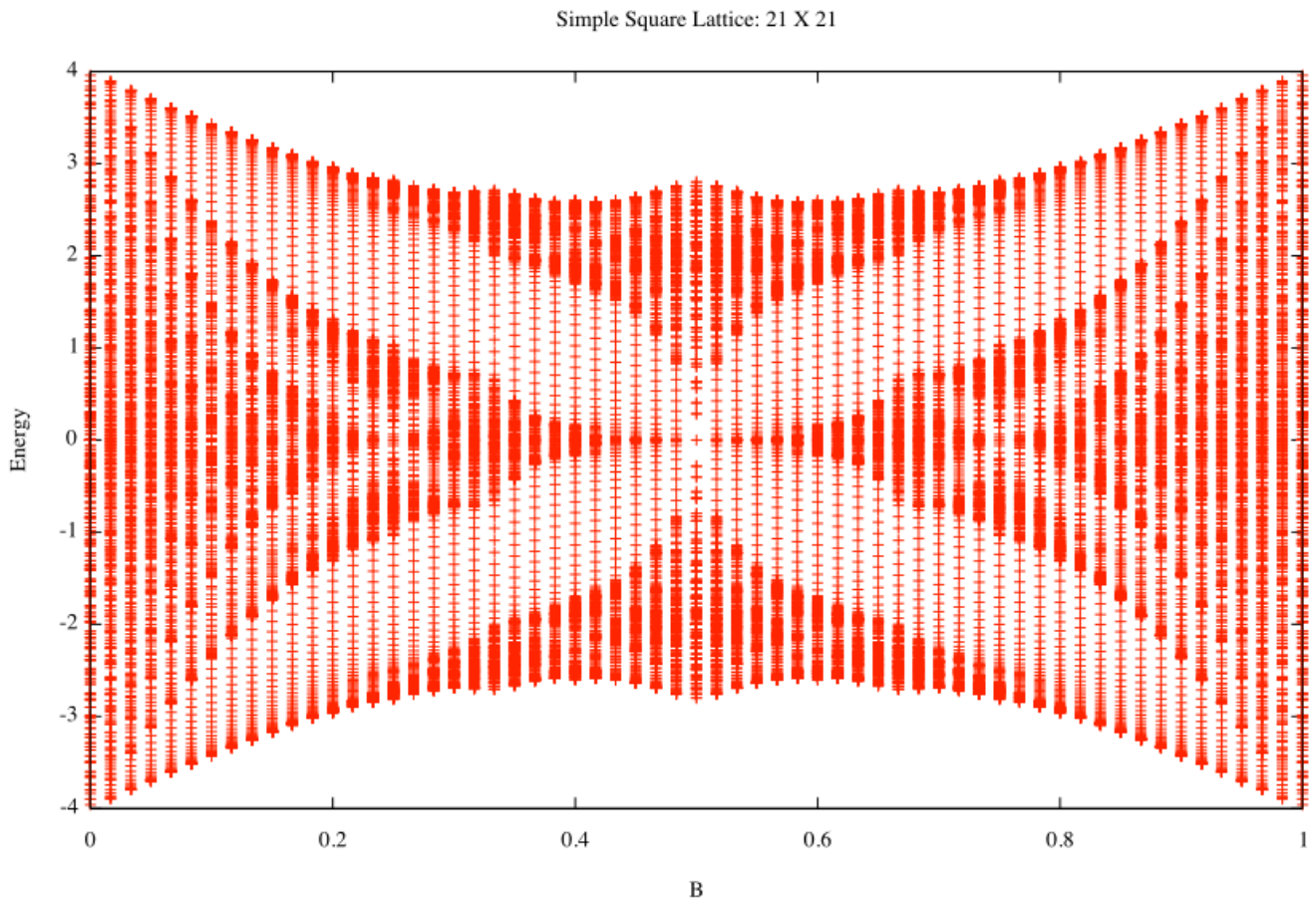# Introduction

Hofstadter's Butterfly in a Square Lattice

$$\langle \psi(r) | \psi(r \pm a\hat{y}) \rangle = t \qquad \langle \psi(r) | \psi(r \pm a\hat{x}) \rangle = t \exp(\pm \frac{i}{\hbar} \int \vec{A} d\hat{x})$$

Let's say magnetic vector A is in the x direction; we get the energy levels as:

Simple Square Lattice: 21 X 21

Simple Hexagonal Lattice 15 X 6