SYNCHRONIZATION STABILITY AND

ROBUSTNESS OF DIFFUSIVELY

COUPLED LATTICE OSCILLATORS

by

ROTICH K TITUS

A DISSERTATION SUBMITTED TO THE SCHOOL OF MATHEMATICS IN PARTIAL

LFILLMENT FOR A DEGREE OF MASTER OF SCIENCE IN APPLIED MATHEMATICS.

September 2006

Summary of contents

This project presents a rigorous study of the condition for stability and persistence of synchronized manifold of diffusively coupled oscillators of linear and planar simple Bravais lattices. This is done by considering n $(n \geq 2)$, d-dimensional oscillators each with an assymptoticaly stable limit cycle coupled by a nearest neighbour linear diffusive like path. In chapter two we review what has been done in relation to the three aspects; namely synchronization, stability and persistence of the synchronized manifold. In Chapter three, we state and prove a theorem that gives the conditions for stability and persistence of the synchronized state. Invariant manifold Theory and Lyapunov exponents are used to establish the range of coupling strength for stability and robustness of synchronized state. In chapter four, we compare the trajectories of oscillators in the manifolds, to justify the results obtained in chapter three. This is done by comparing the amplitude of graphed trajectories generated using $ode45$ Matlab solver. Chapter five is the conclusion and recomendations.