

### **Motivation and Background**

- structured improvisational dance:
  - among pre-defined dance modules.



## **Bifurcation and Singularity Theory**

**Scalar Bifurcation Problem**: Change in scalar solutions as the bifurcation parameter changes. Pitchfork Bifurcation: • A single solution transitions into three solutions.  $\circ$  Normal Form:  $\psi(x,\lambda)=x^3-\lambda x=0$ • Recognition Problem:  $\psi_x(x^*,\lambda^*) = \psi_{xx}(x^*,\lambda^*) = \psi_\lambda(x^*,\lambda^*) = 0$  $\psi_{xxx}(x^*,\lambda^*) > 0$  $\psi_{\lambda x}(x^*,\lambda^*) < 0$ 

# **Universal Unfolding**: Define $\Psi(x,\lambda,\alpha)$ such that $\Psi(x,\lambda,0) = \psi(x,\lambda)$



Evolution of population fractions executing different dance module



exploiting current modules, which adds depth.

□ We modeled the social decision-making process using the replicator-mutator equations from evolutionary dynamics. strategies evolve as a function of replication (commitment to strategies with high "fitness") and mutation (spontaneous switching among strategies).



