Self Organization in Vowel Systems
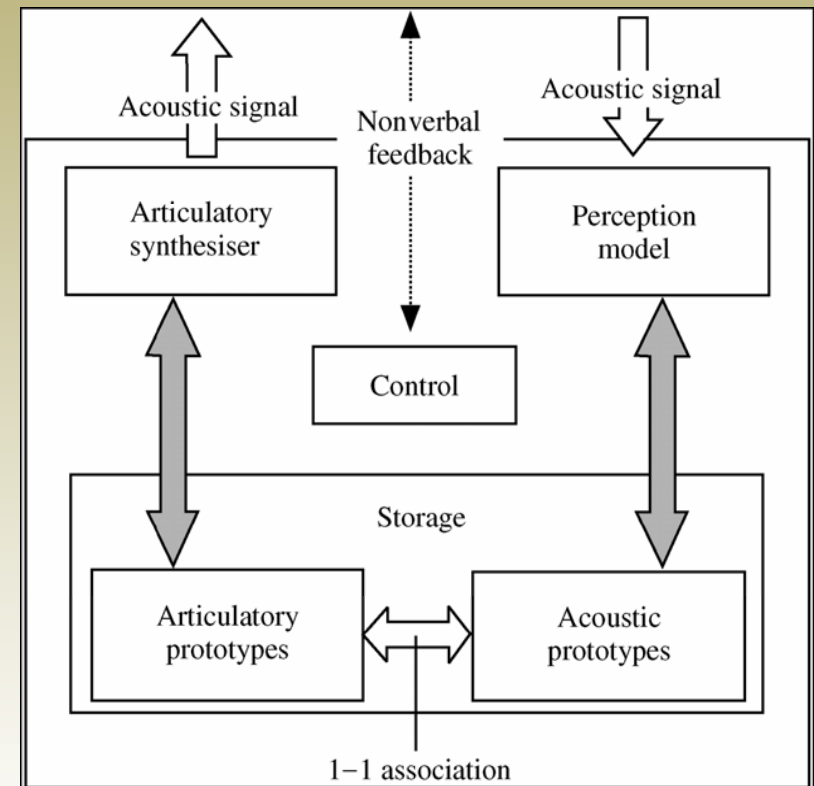
Siddharth Jain
Rohit Gupta

Previous Works

- Glotin: Agent Interaction.

- Berrah's Work: Only Acoustic.

- Problems with the work:
    - Genetic aspect to the simulation.
    - Calculation of the mapping from acoustic differences onto articulatory changes is computationally demanding.

The Simulation

- Self-Organization

- Features of the simulation
  - Population of **interacting agents** : imitation
  - **Game:**
    - Initiator chooses vowel.
    - Noise is added.
    - Imitator hears it and chooses the closest vowel from its repertoire.
    - Noise is added.
    - Initiator hears the spoken vowel and gives feedback..
    - Update.
  - **Darwinian Concept:** Age, preferential selection.
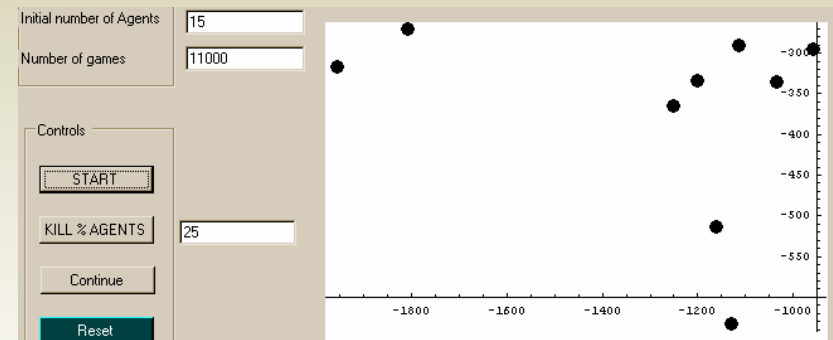 - **Complex System:** Behavior is indirect, non-hierarchical consequence of interactions.

Experiments
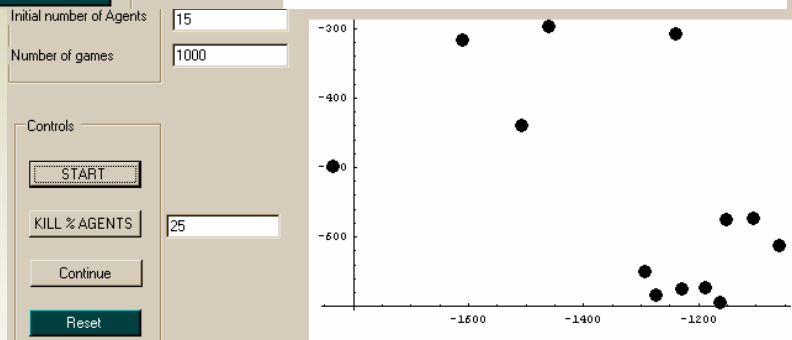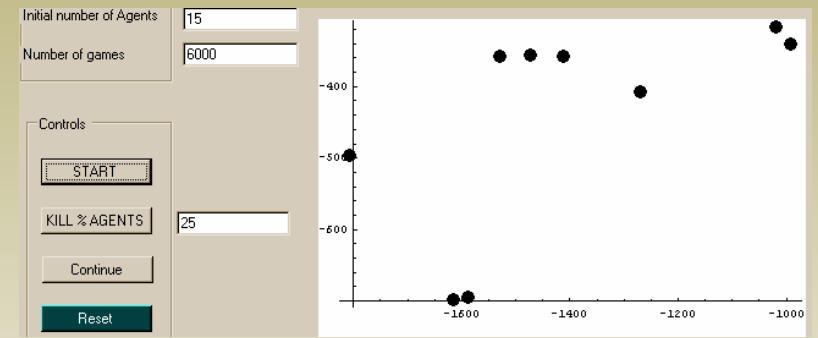
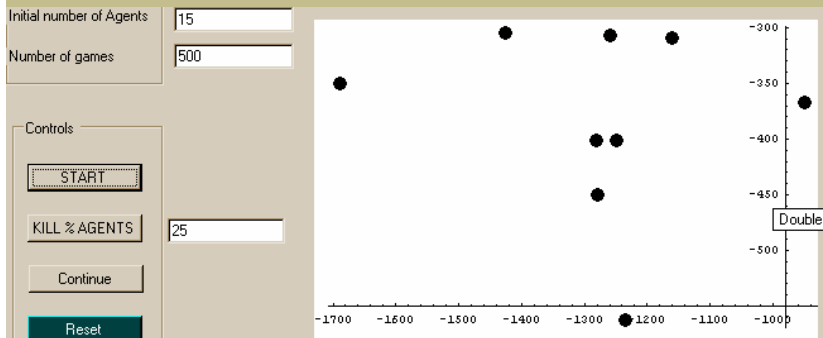- <u>F$_1$ vs. F$_2$'</u> (varying number of games)

Experiments
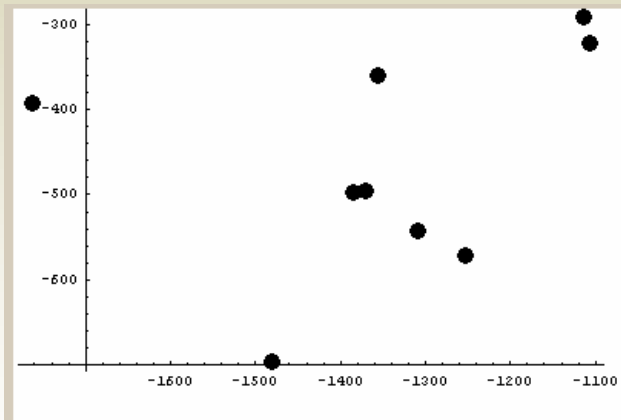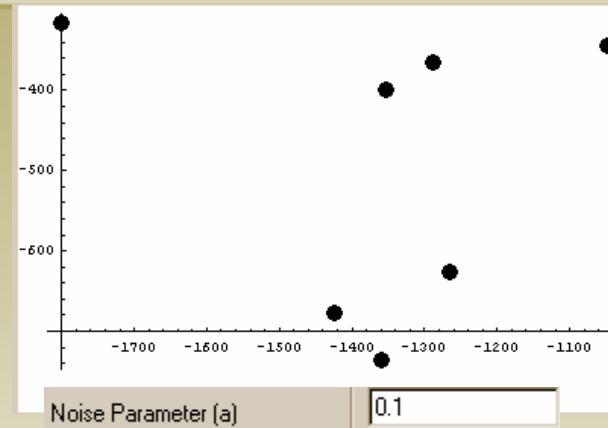
- <u>F_1</u> vs. F_2' (varying number of games)   contd..

Experiments

- <u>F1 vs. F2' (varying noise)</u>

Experiments
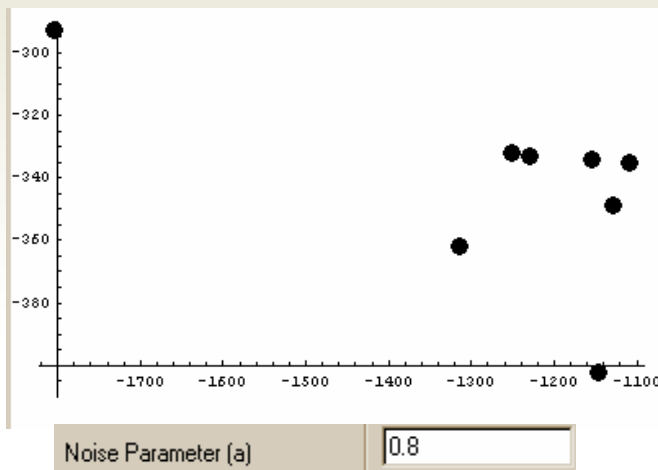
- <u>F1 vs. F2' (varying noise) contd..</u>
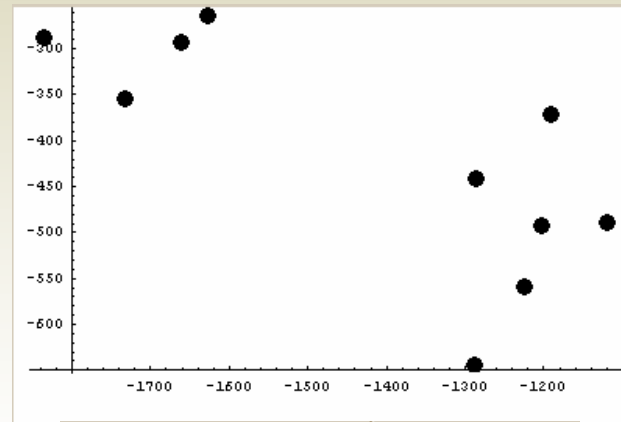
Noise Parameter (a) 0.6

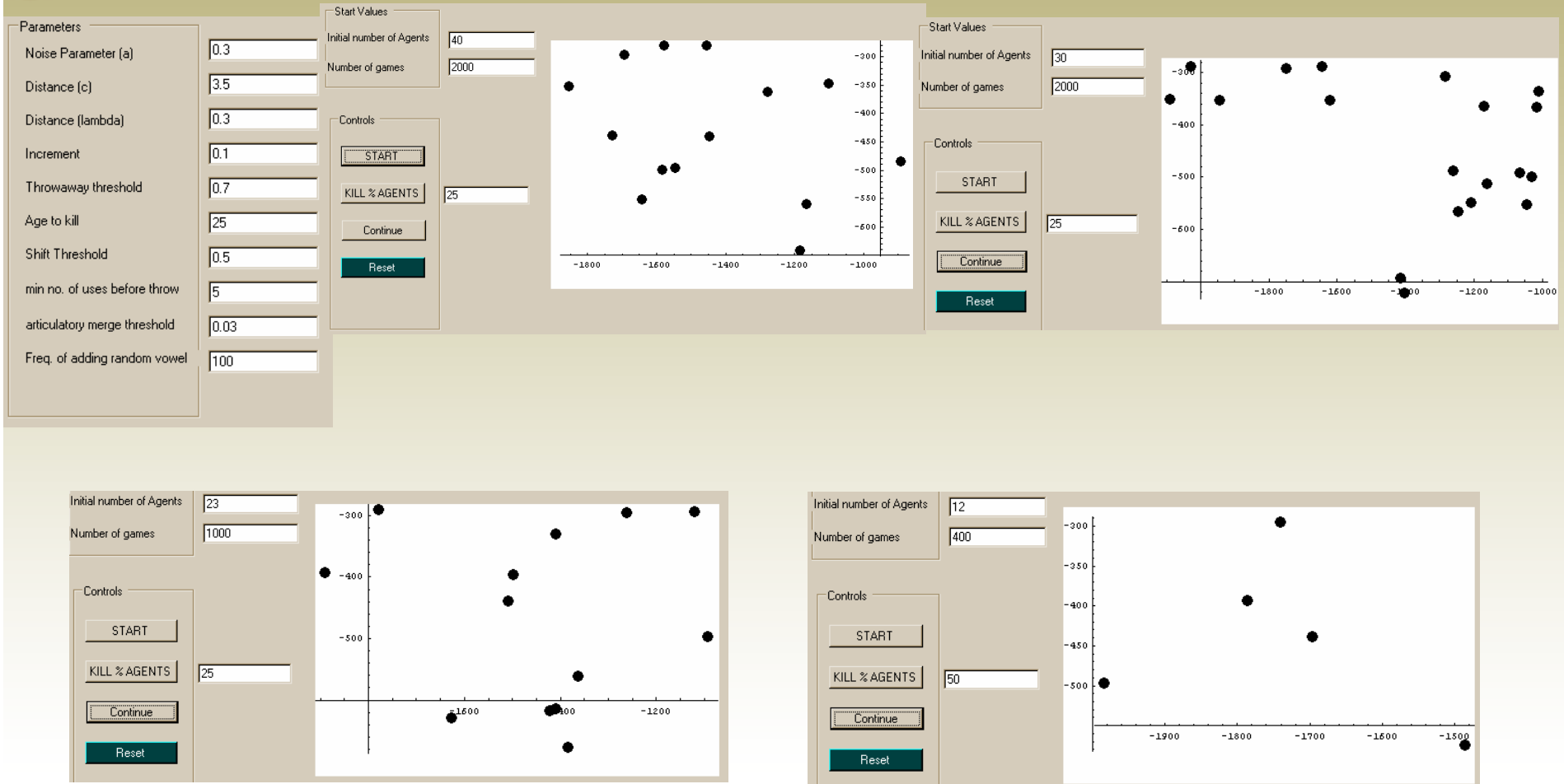Noise Parameter (a) 1

Noise Parameter (a) 0.8
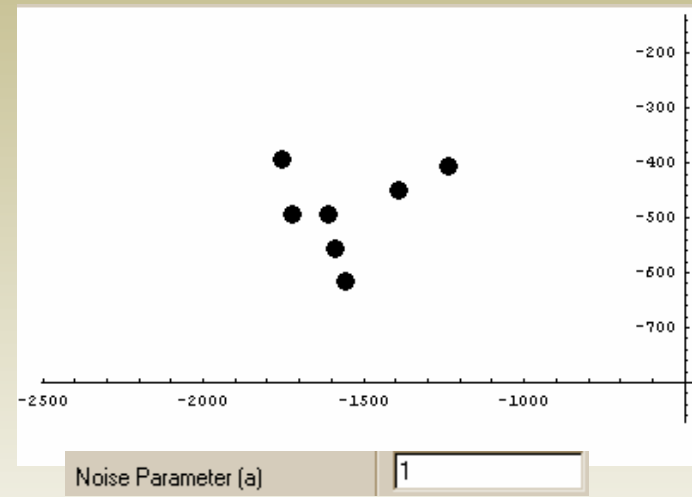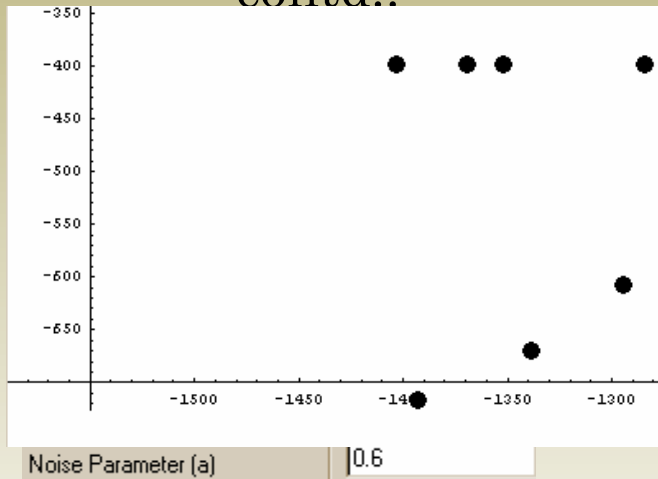
Experiments

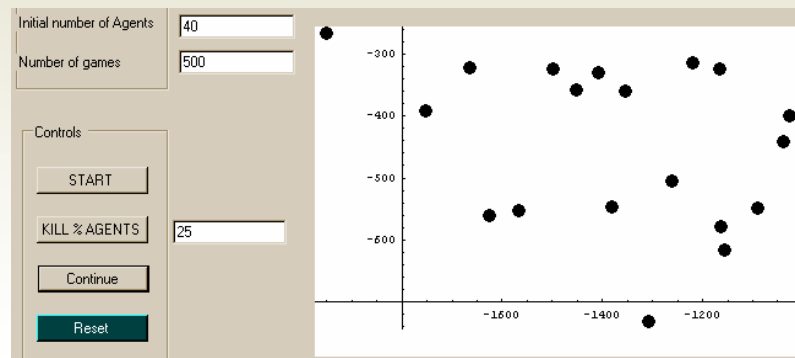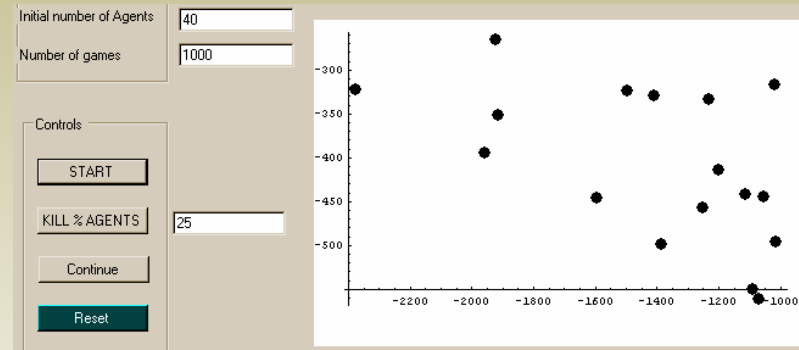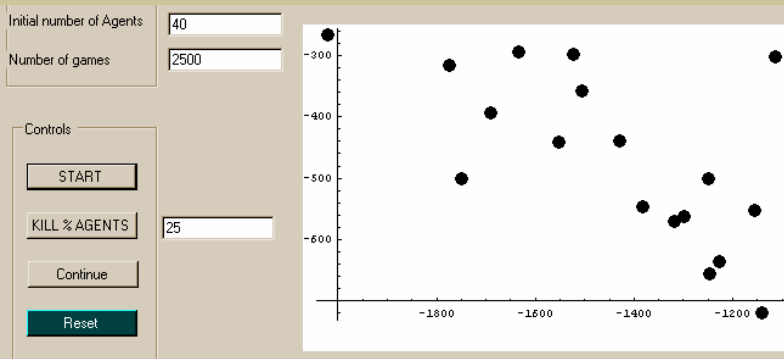- Killing of agents: Language is a complex system

When agents are killed – appreciable change in vowel space

Experiments

- Killing of agents: Language is a complex system

When agents are not killed – almost constant shape of the vowel space

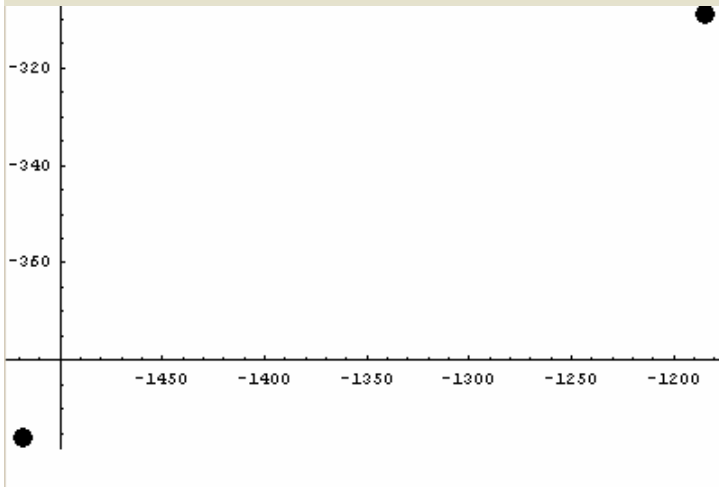# Experiments

- F_1 vs. F_2' (varying the age to kill)
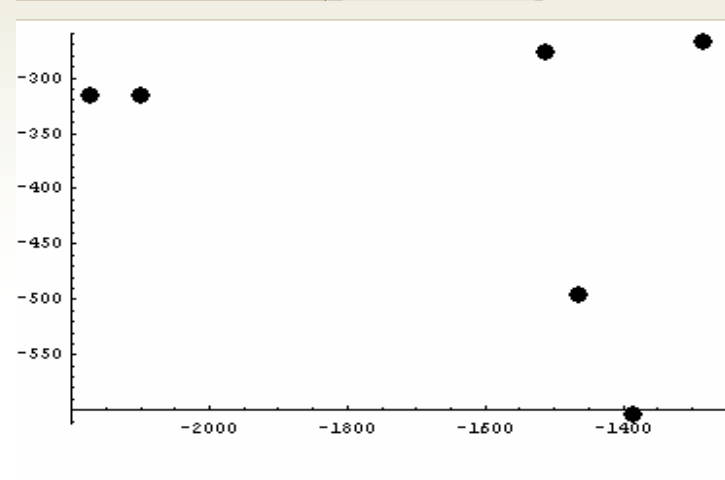
Experiments

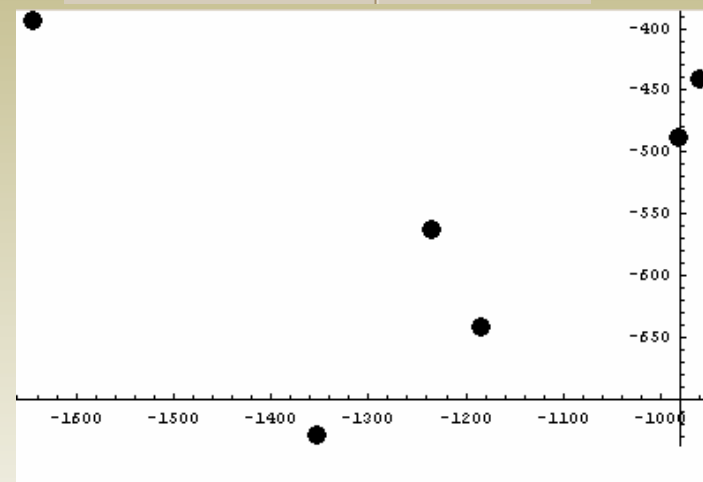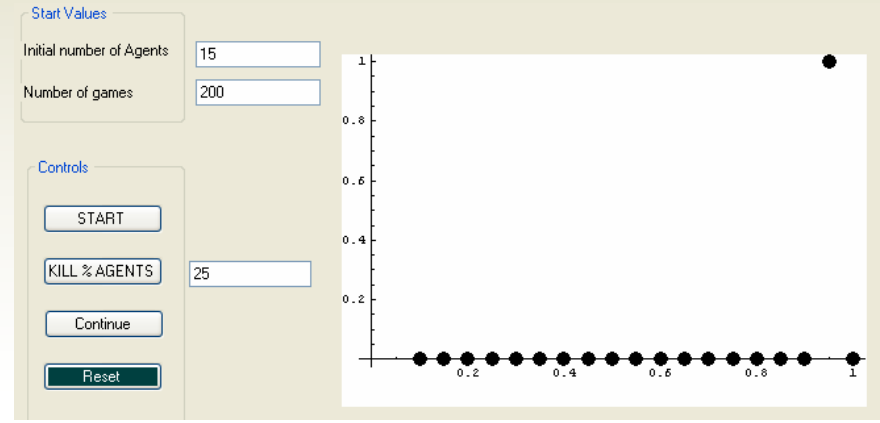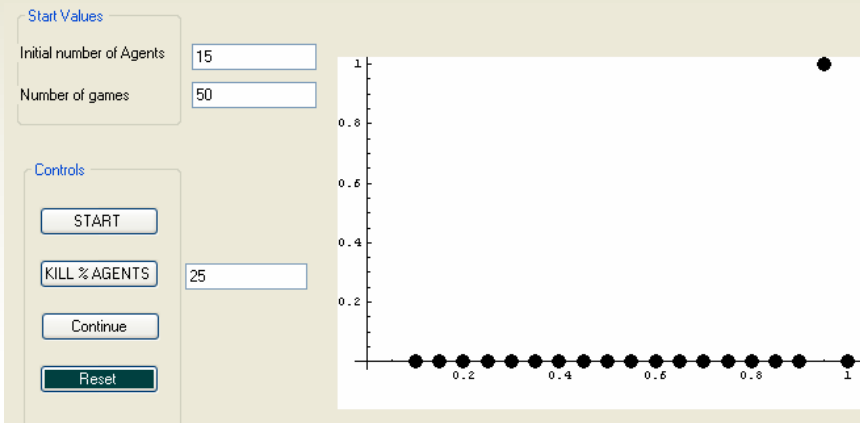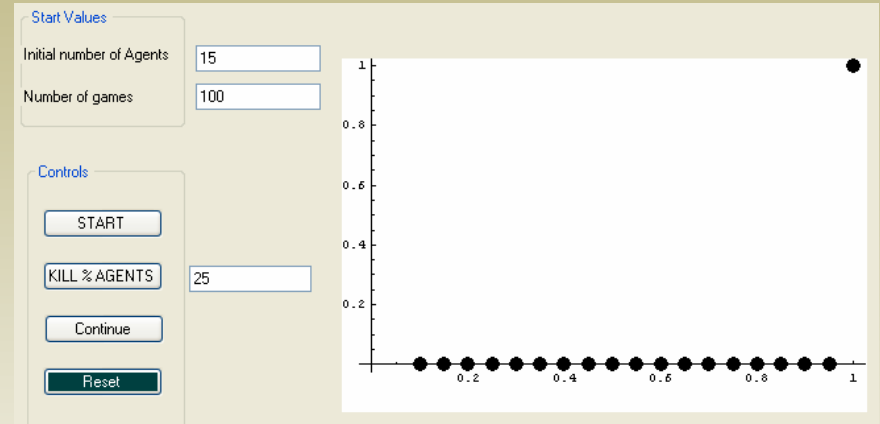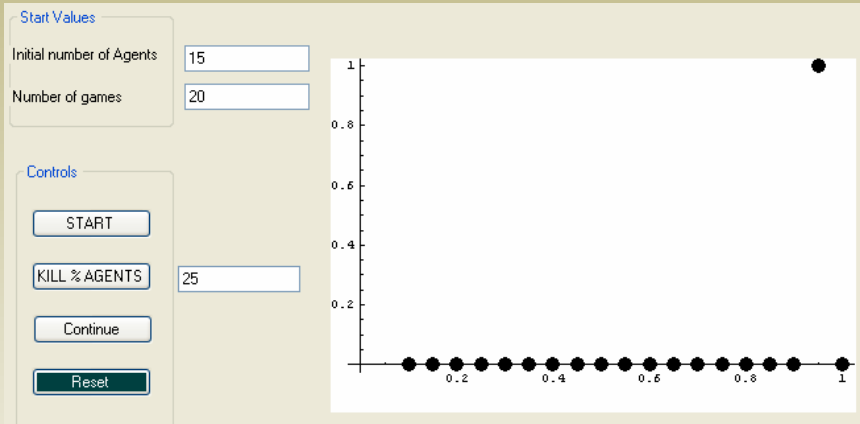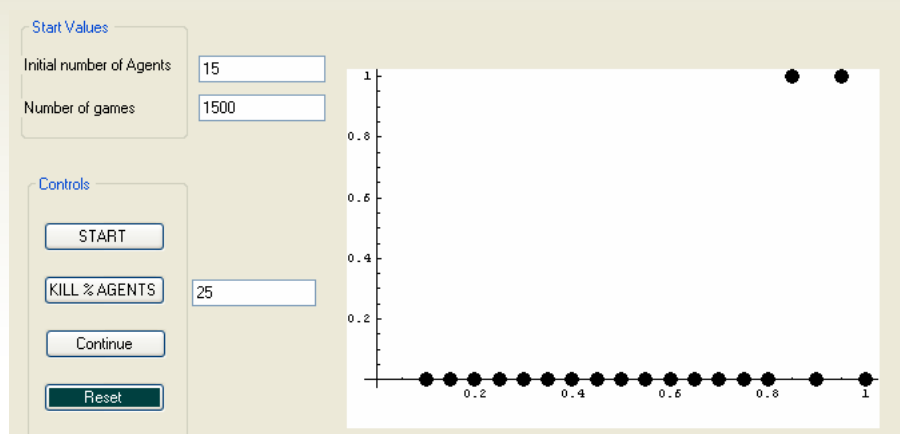- <u>F_1 vs. F_2' (varying the age to kill) contd ...</u>
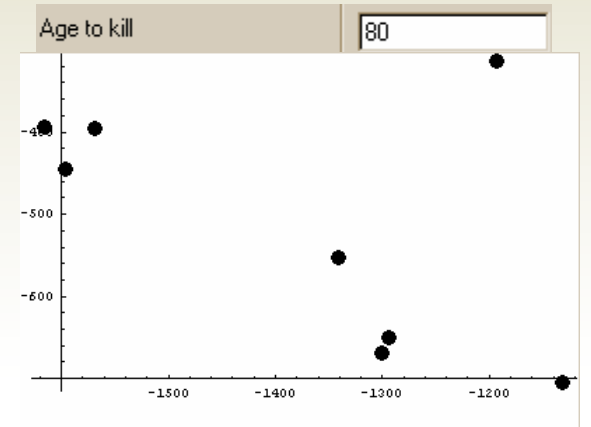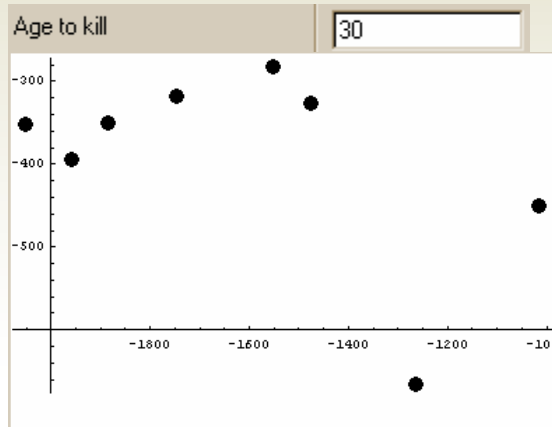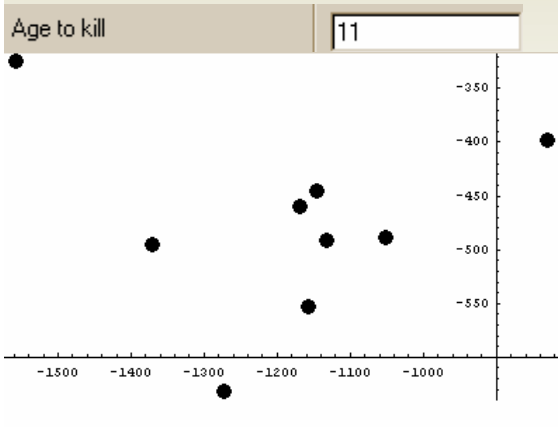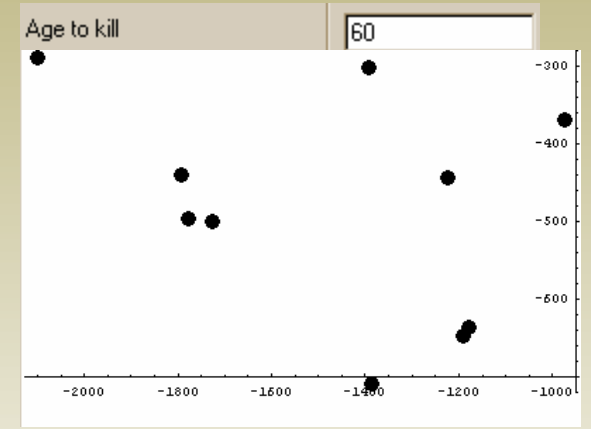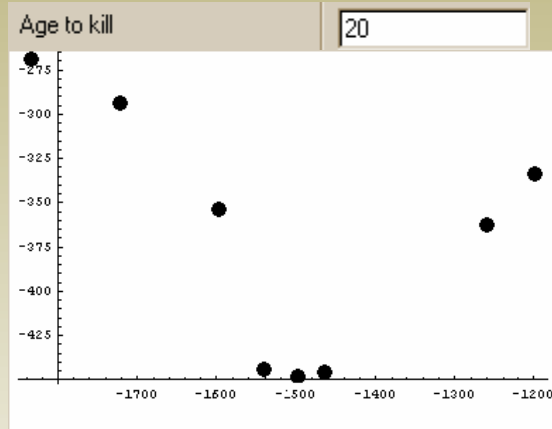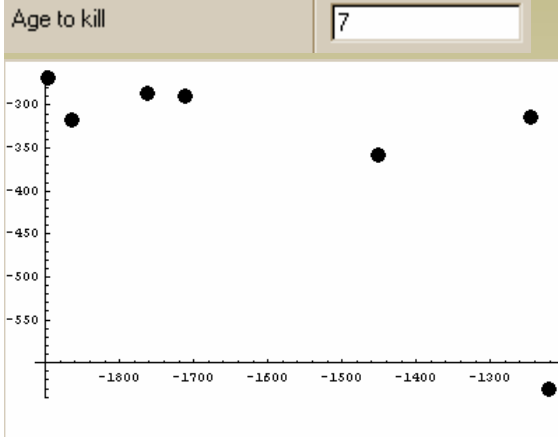
Experiments

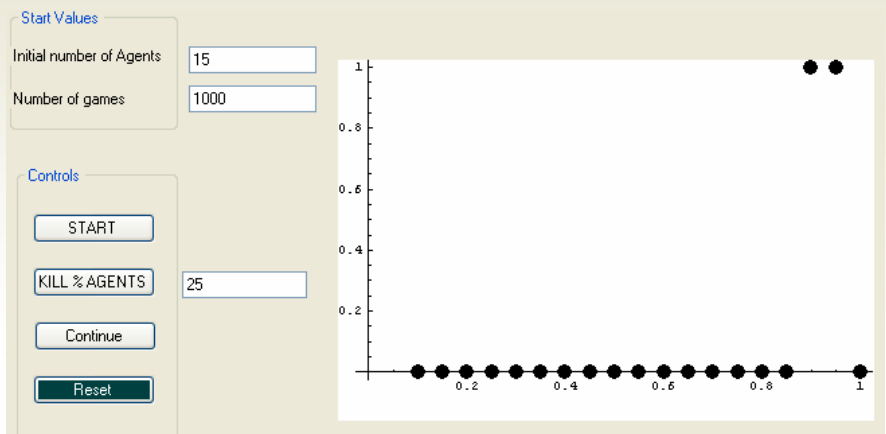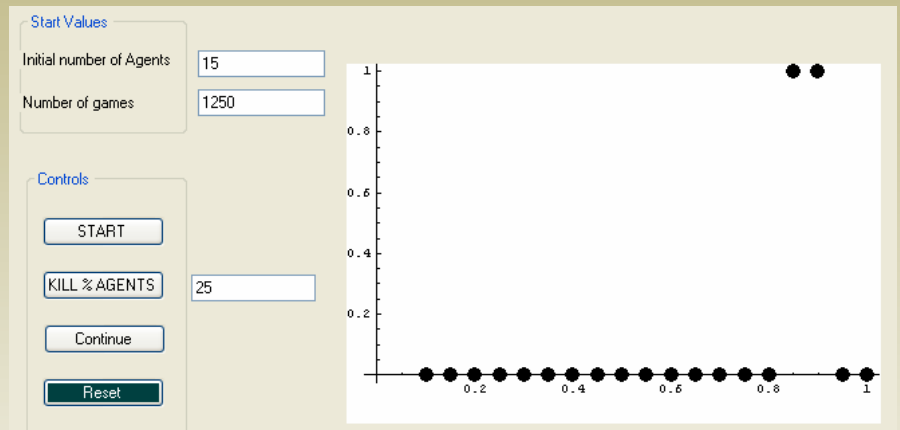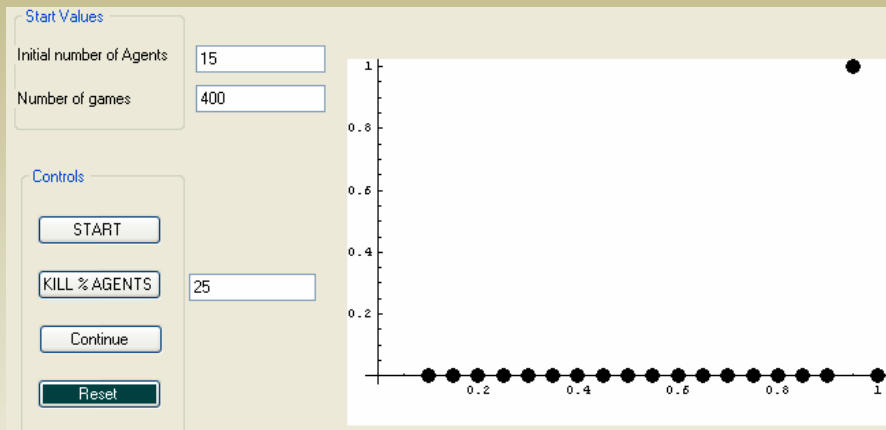- <u>Success Ratio(with varying no. of games)</u>

Experiments

- <u>Success Ratio(varying no. of games) contd….</u>

Questions and comments invited

THANK YOU