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Project Proposal 1st Quarter 2008
Evolving Cutting Horse and Sheepdog Behavior
on a Simulated Flock

In the course of farming, humans have trained some of the more intelligent creatures to control a herd of livestock or flocks of poultry through planned movement. The sheepdog and the cutting horse are two good examples of this behavior. The sheepdog is used to herd and guard sheep, but the focus of their training is on moving a herd. The cutting horse is used with cattle, to "cut" a single cow off from the herd, allowing farmers to access it. The principal of using a specially instructed single agent, or a small group of agents, to direct the movement of a large group of agents presents an interesting challenge.

This project aims to develop instructions for these specialized agents without explicitly programming it. The nature of different herds varies based on the species of the animals, their condition, and environmental factors. It would be helpful to have a dynamic system for creating this sheepdog behavior, to allow for a later, robotic herding agent to adapt to different conditions. There is also the possibility of discovering new techniques for controlling the movement of the herd, which could be applied to real life.

In addition, it would be interesting to explore methods that a group of coordinated sheepdogs might use to direct a flock more efficiently. From what I have gleamed from my research, sheepdogs might be used together, but the farmer directs each one independently; the dogs do not coordinate. It's possible that cooperation could lead to much more efficient techniques.

Many sources were consulted in the design of this project. Some of the more useful ones are listed below.

Flocks, Herds, and Schools: A Distributed Behavioral Model, Craig Reynolds
Low Stress Methods for Moving and Herding Cattle on Pastures, Paddocks, and large Feedlot Pens, Temple Grandin

The evolution program, and the herding simulator will be both written in python. TKinter will be the graphical display system used. Screen shots should be available from the herding trials. They will most likely take the form of a birds eye view, two dimensional image.

    * What kinds of testing can be done for verification of your project's
       performance?
My project should create simulations of creatures moving about and possibly
herding a swarm of boids into an area, or preforming other objectives.
I will need to create a heuristic to evaluate the creatures performance, which can
also be used to track progress on the project.

  5. Expected Results & Value to Others
     * What results do you expect to obtain from your project, and how can

these results and analysis be presented? What sorts of visuals can
can you use? If the project were completed, how do you imagine it
will perform?

I expect that I will be able to create clear and interesting media of my creatures
in action. Breve renders the creatures in real time, so video capture should be
simple. The end result of this project should be a program that can evolve
unique herd-dog behavior without a human programming that behavior directly.