ALVINN:
Autonomous Land Vehicle in a Neural Network

By Dean Pomerleau

Presented by Ryan Liegh
Introduction

- Navigation is slow!
- Noise and unpredictability presents problems
- Neural Nets are noise insensitive and can be trained to perform well under a variety of scenarios
Architecture

• Single hidden layer back-propagation network
• Three sets of units
  – 30x32 unit video camera
  – 8x32 unit laser range finder
  – One intensity feedback unit
Architecture

- Output layer
  - First 45 units describe curvature
    - All zeroes except for one hill
  - Last output unit is another feedback unit
Training

- Neural Nets need training material to work
- Generate 1200 images that are indistinguishable from real pictures do to low res
- Feedback unit has random activation
- After 40 epochs, the neural net has 90% accuracy
Intermission
Conclusions

- Neural Networks get results fast; a half hour vs. months
- Past systems were inflexible, this can be trained to a multitude of conditions
- Weights are automatically discovered in training
Future Work

- Test under more lighting and weather conditions
- Exploit new networks
  - Additional feedback through recirculating hidden activation levels
  - Adding a second layer
  - Adding local connectivity to give a priori knowledge of input
Future Work

- Add Extensions to stop or avoid obstacles
- Dealing sensibly with forks and intersections
- Integrate map for global planning
Conclusion