Long-Term Learning with TankSoar
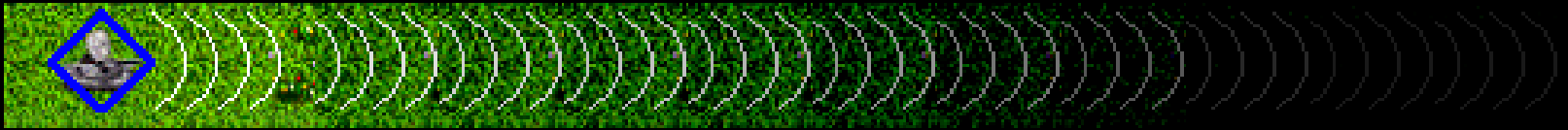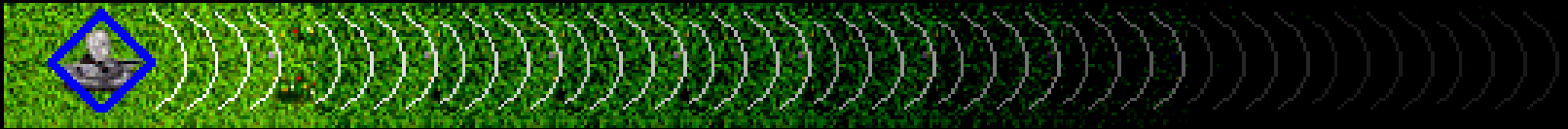
Bill Kennedy

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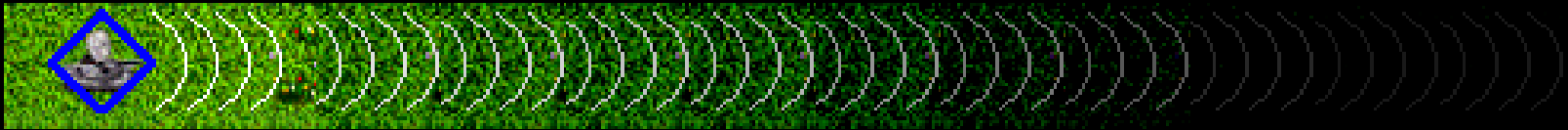21st Soar Workshop
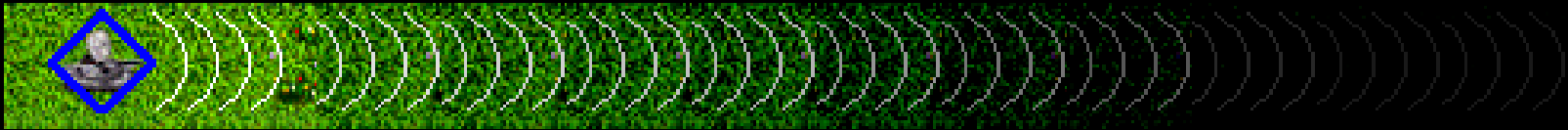
Sunday, May 6, 2001

- Will learning go on forever?

- How much of learned knowledge is ever used?

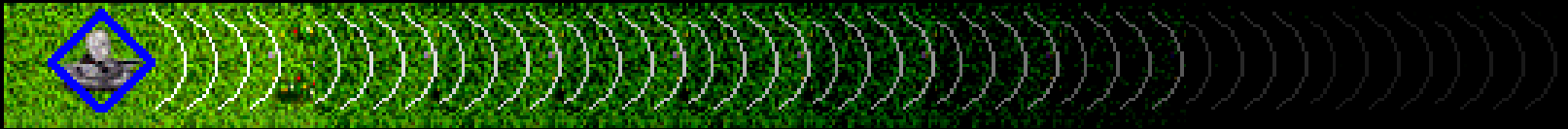# *Previous work related to the fundamental questions*

- Will learning go on forever?

  - Bob Doorenbos' 100K chunks in 20 problem spaces: mixed
  - Experiments with physics demo: trending toward stopping
  - Experiments with blocks-world: ended by 150 problems
  - Experiments with SCA: 1 chunk per example, of course

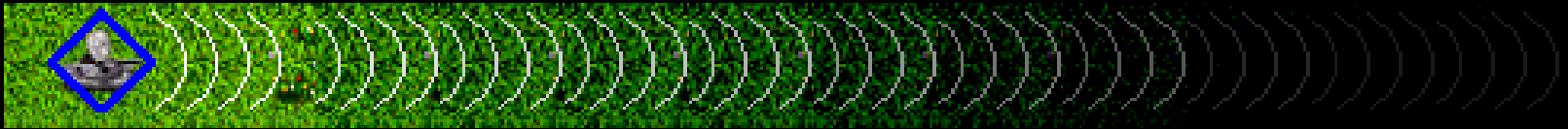# *Previous work related to the fundamental questions*

- ## How much of learned knowledge is ever used?

  - Bob Doorenbos' 100,000 chunks in 20 problem spaces: unknown
  - Experiments with physics demo: constant "average" use but ...
    - different chunks used to make up the constant average
    - most recently learned used more
    - earlier chunks continue to be used
  - Experiments with blocks-world: all used, but 2-3 were ~75% of use
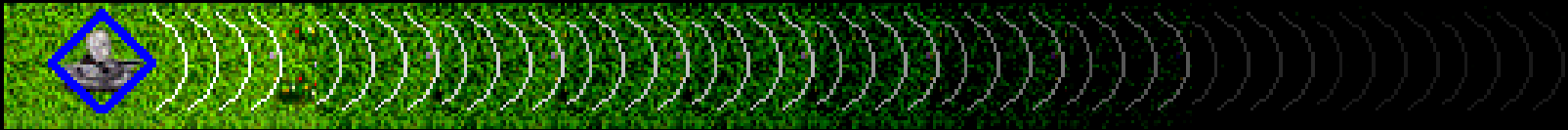 - Experiments with SCA: less than about 10% after 300 examples

- Experimental design:
  - Modify "simple" tank to learn at "T" intersections
  - Extend "score limit" to allow to time out at 4,000 decision cycles (dc)
  - Collect stats every 50 dc
  - Run both alone and with a "simple" tank

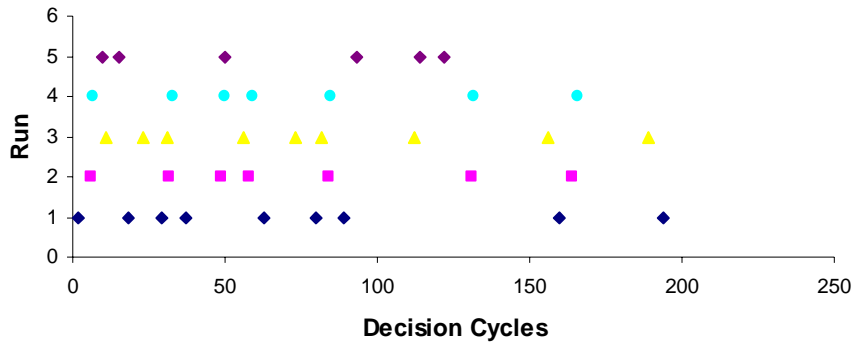# *Experiments with "simple-learner" alone*

- At least 7 occasions for chunking

- More depending on starting position

- Initial circuit is 140 dc

- After chunking, 132 dc

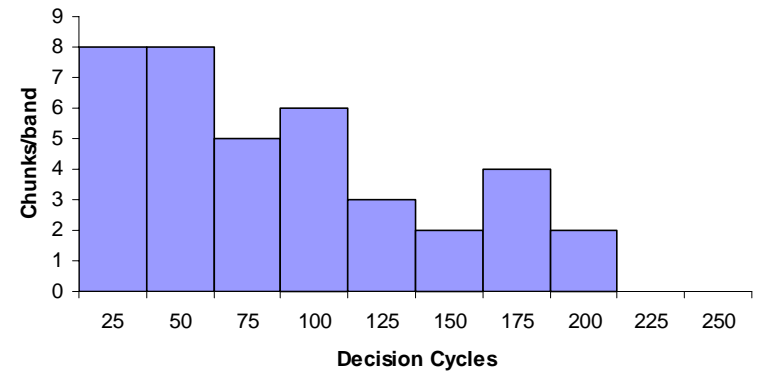- Chunking ends & all chunks on circuit are used each cycle
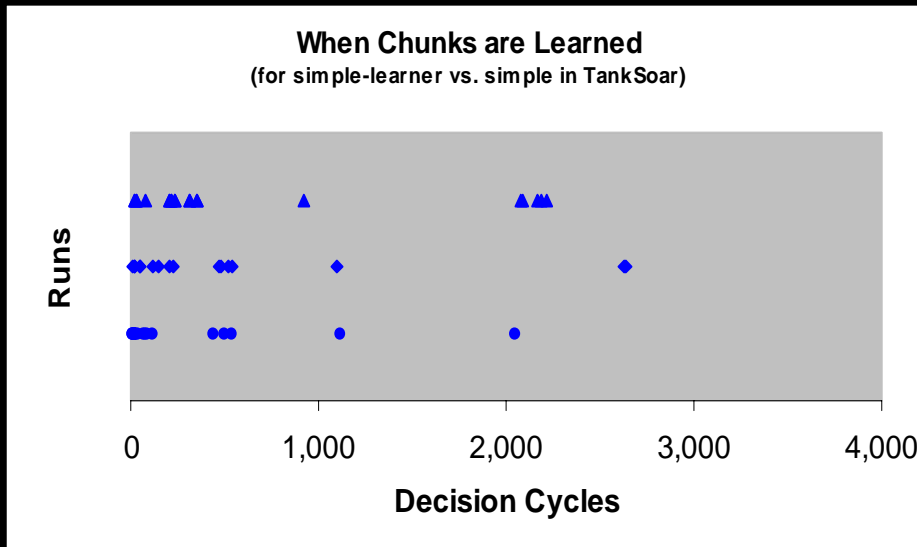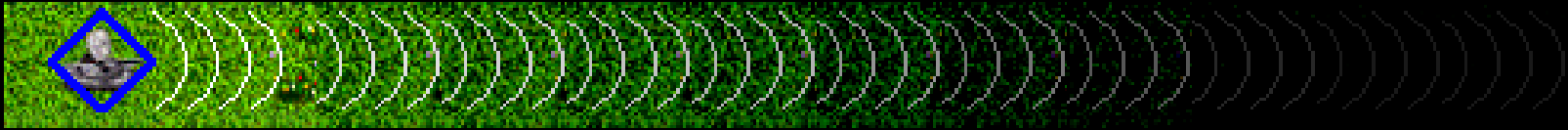
Chunk Learning in "simple-learner" alone

When Chunks are Learned
(for simple-learner alone in TankSoar)

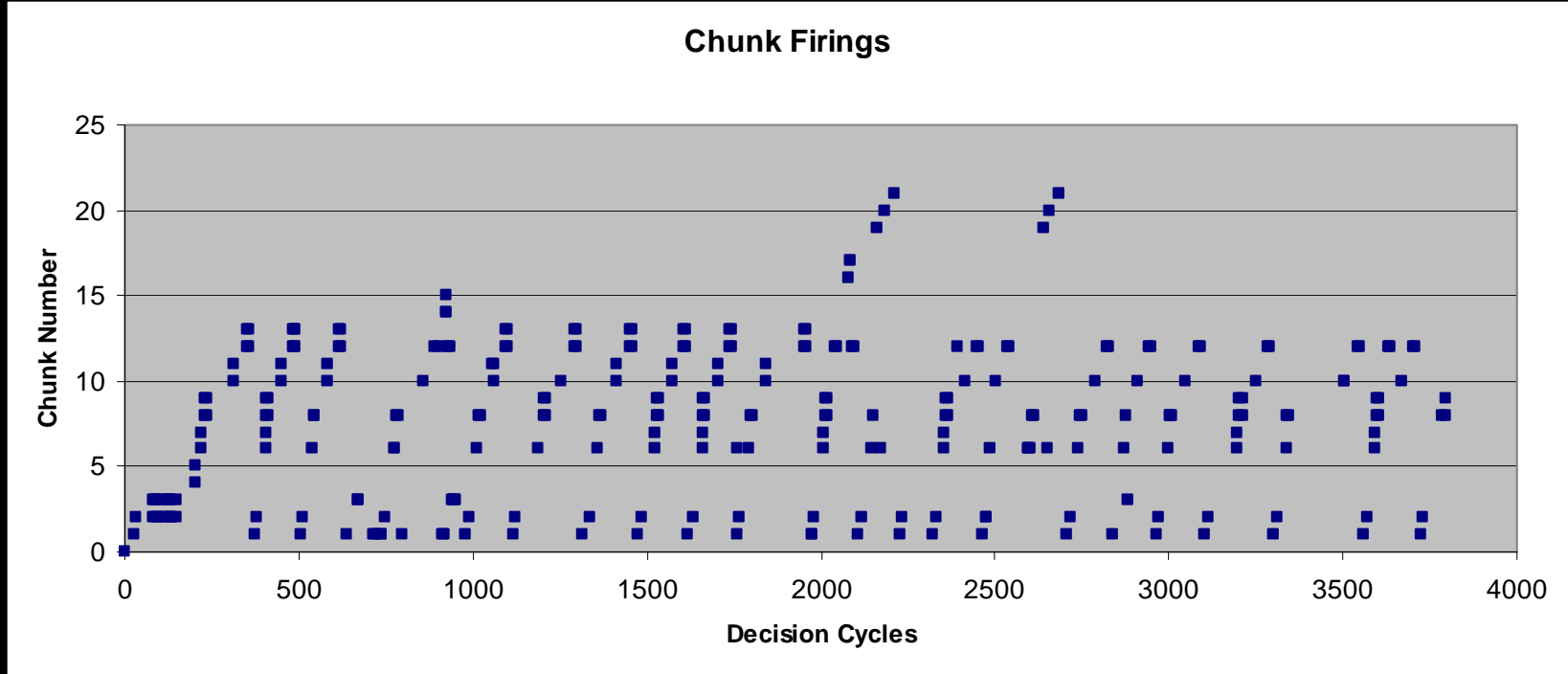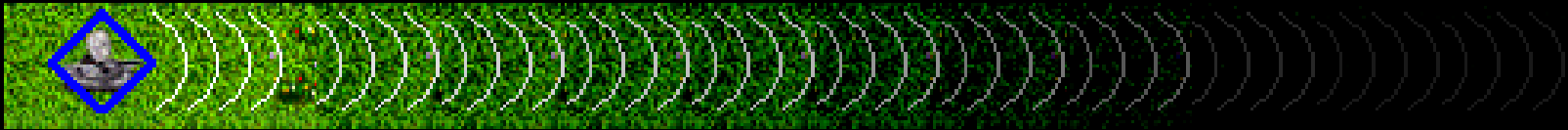### Chunking Rate (in 25 DC bands)
(for simple-learner alone in TankSoar)

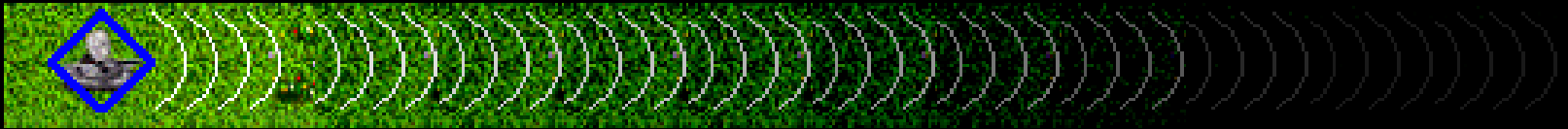# *Experiments with "simple-learner" with "simple" tank*

When Chunks are Learned
(for simple-learner vs. simple in TankSoar)

Runs — Decision Cycles (0, 1,000, 2,000, 3,000, 4,000)

- Learning forever?
  - Learning continues much longer
  - Learns more chunks

Experiments with "simple-learner" with "simple" tank

Chunk Firings

Future long-term experimenting with TankSoar

- Plans:
  - Make tank's learning more meaningful
  - Use more sophisticated opponents
- Advice?
  - Experimental design change?
  - Advice on making learning more meaningful?
  - Other advice?