**Learning**

Process of acquiring new, or modifying existing:

1. Knowledge
2. Behaviors
3. Skills
4. Values
5. Preferences

The ability to learn is possessed by:

1. Humans
2. Animals
3. Some Machines

NOTE: No evidence for some kind of learning in certain plants.

Learning is immediate, induced by a single event (e.g. being burned by a hot stove).

Much skill and knowledge accumulate from repeated experiences. Changes induced by learning often last a lifetime, and it is hard to distinguish learned material that seems to be “lost” from that which cannot be retrieved.

**Factors affecting learning**

**External**

1. Heredity
2. Status of students.
3. Physical Environment

**Internal**

1. Goals or purposes
2. Motivational Behavior
3. Interest.
4. Attention.
5. …

Epi

**Social Learning in Animals**

Social Learning Theory integrated behavioral and cognitive theories of learning in order to provide a comprehensive model that could account for the wide range of learning experiences that occur in the real world.

For this project we focus on using behavioral theories of learning since:

1. Learning can occur by observing a behavior and by observing the consequences of the behavior (vicarious reinforcement).
2. Learning involves observation, extraction of information from those observations, and making decisions about the performance of the behavior (observational learning or modeling). Thus, learning can occur without an observable change in behavior.
3. Reinforcement plays a role in learning but is not entirely responsible for learning.
4. The learner is not a passive recipient of information. Cognition, environment, and behavior all mutually influence each other (reciprocal determinism).

**Individual/Asocial Learning**

"Life is a Process that Can be Abstracted Away from Any Particular Medium."

Ouroboros programs

-The quine concept can be extended to multiple levels of recursion, originating "ouroboros programs", or quine-relays. This should not be confused with Multiquines.

- Conway's Game of Life showed examples of how emergence and self-organization can emerge without objective direction.

- The Garden of Eden pattern

- Von\_Neumann Universal Constructor

Based on the Game of Life:

1.There should be no explosive growth.

2.There should exist small initial patterns with chaotic, unpredictable outcomes.

3.There should be potential for von Neumann universal constructors.

4.The rules should be as simple as possible, whilst adhering to the above constraints.

Universal Concepts

-In Evolutionary Systems mutation increases diversity in the population and selection acts as a force increasing quality.

-Many Aspects of Evolution are Stochastic, random.

-On the other hand, selection operators can be either deterministic, or stochastic.

-In the latter case, individuals with a higher fitness have a higher chance to be selected than individuals with a lower fitness,

but typically even the weak individuals have a chance to become a parent or to survive.

Termination conditions:

- Fixed Number of Generations

- Average Web Browser time to Compute and diplay the simulation is exceeded by a certain factor

- Manual Inspection

Motility and Motion

- Taxis is the movement of an organism in response to a stimulus such as light or the presence of food. Taxes are innate behavioural responses. A taxis differs from a

- Tropism which is a turning response, often growth towards or away from a stimulus

In the case of taxis, the organism has motility and demonstrates guided movement towards or away from the stimulus source.

Kinesis, a non-directional change in activity in response to a stimulus.

Mnemotaxis is the use of memory to follow trails that organisms have left when travelling to or from their home.

The dimensions of the world grid is any finite number of dimensions.

- Genetic Algorithms are used to generate high quality solutions ot optimization and earch problems relying on bio-inspired operators such as mutation and selction.

- The Price equation shows that a change in the average amount of a trait in a population

from one generation to the next is determined by the covariance between the amounts of the

trait for subpopulations, together with the expected change in the amount of the trait value

due to fitness.









