


Executive Summary of Adaptron

Version 2.0
15th March, 2022



1 of 7

© 2022, Adaptron Inc. 

This is a short summary of Adaptron and the ground breaking Artificial General Intelligence research that I do.
Adaptron is the name for the AGI architecture and its associated software.

Research

- Artificial General Intelligence (AGI)
 - Software that learns to do tasks that humans can perform
 - Including reasoning / thinking
- AGI Research, 1968 – Now
- Invented Binary Neurons (Binons), 2002
- Published
 - Perceptrons, 2013 [1]
 - Perception-action hierarchy, 2020 [2]



2 of 7

© 2022, Adaptron Inc. 

The company performs AGI research. Adaptron is designed to be general purpose.

It should be able to learn to do anything a human can do.

That include recognizing things, performing tasks and learning how to think.

It was started as a hobby in 1968. It became more focused in 2002 when I invented binons and

founded the company to take advantage of the Canadian SR&ED tax credit.

The ultimate objective is to develop software that can be embedded in a robot to make it learn, think and act autonomously.

Research Philosophies

- Mechanistic / Functional / Deterministic
 - Principles of operation
- Keep it simple (Occam's Razor)
 - The simplest explanation that works
- General purpose
- Iterative
 - Can't get it right the 1st, 2nd or even 3rd time

The operation of Adaptron is based on functional / mechanistic principles.

Deterministic means avoiding stochastic functions or probabilistic explanations.

This allows for models that focus on the mechanistic aspects of how it works. It also allows for direct explanation of how it makes decisions.

The Adaptron model is proven in software.

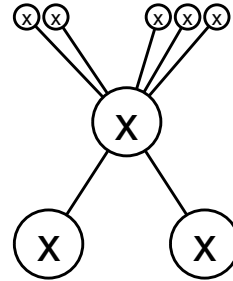
Another research principle is to explain things at the simple level first. Then add complexity because the problems needs to be solved at the lowest level of detail.

Solutions must be general purpose so they can learn and think given any combination of senses and action devices.

This is research. Not everything I have discovered is correct. There is guaranteed to be mistakes and things that are wrong. The processes of general purpose learning and thinking are too complicated to get right the first, second or even third time. So one keeps on reading, theorizing, and experimenting.

Hierarchical ANN

- Growing Artificial Neural Network (ANN)
 - Deep compositional hierarchical architecture
- Simplest possible node – two input links
 - Binary neuron → binon
- No weights on links
- No probabilities
- Nodes contain ratio values
 - Relationships between things



Adaptron uses a deep compositional hierarchical ANN.

Unlike most current deep ANNs this one continues to grow (adds new nodes) as it learns (evolves).

Its based on the simplest possible node – a binon.

Binons represent things that are recognized or actions that are performed.

They are combined in a growing multi-level tree structure which reuses lower level binons to form more complex binons.

It differs from many such deep architectures in that it has no weights on the links and makes no use of probabilities.

This allows one to explain exactly how it makes decisions and behaves.

However the binons contain ratio values that represent relationships between things.

Integrated Network

- A single hierarchical network
 - Pattern recognition and action control
- Reuses simpler learnt tasks
 - Combined to perform more complex tasks
- Builds on successful random actions
 - Motor babbling → action control
 - Orienting responses → attention control

The ANN is an integrated hierarchical network of nodes that is used for both perception (pattern recognition) and action (motor control).

The simpler tasks are learnt first and represented at the lower levels of complexity in the ANN.

Then these previously learnt recognition and motor tasks are combined to perform more complex tasks at higher levels in the hierarchy.

Action control is learnt from motor babbling.

Controlling attention is learnt from reflexive orienting responses. This could be called attention babbling.

Detailed Presentations

- Introduction
- Requirements
- Perception
- Recognition
- Action and Thinking
- Adaptron Architecture
- Senses, Sensors and Action Devices
- Binons
- Temporal Recognition
- Perception–Action Learning [2]
- Thinking

This is a summary of the content of the more detailed presentations as currently planned.

References

- [1] Martensen, B. N. (2013). Percepra: A new approach to pattern classification using a growing network of binary neurons (binons). In R. West & T. Stewart (Eds.), *Proceedings of the 12th International Conference on Cognitive Modeling (ICCM 2013)*.
- [2] Martensen, B. N. (2020). The perception–action hierarchy and its implementation using binons (binary neurons). Post proceedings of the 10th Annual International Conference on Biologically Inspired Cognitive Architectures, BICA 2019. *Procedia Computer Science*, 169, 489-500.

NeuraBASE by Neuramatix Sdn Bhd - <http://www.neuramatix.com/bigIdea.php>

Hercus RG (2009) Neural Network with Learning and Expression Capability, U.S. Patent 20090119236

NeuraBASE, by R.G. Hercus, is an Artificial Neural Network (ANN) that uses a similar binary neuron approach to representation as Adaptron.