

ICRA 2022 DodgeDrone Challenge

Delft Dodgers by
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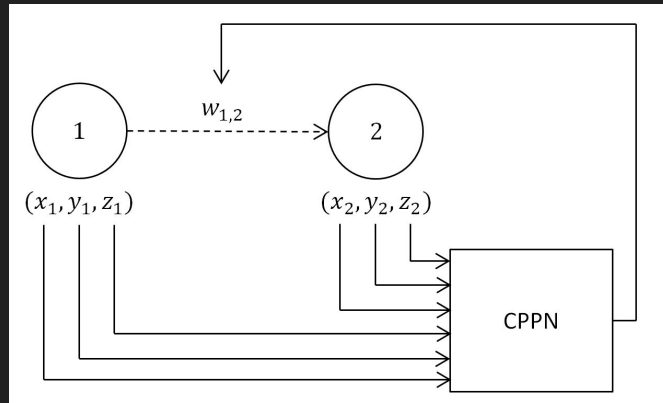
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Inspired by HyperNEAT [1]

Evolving indirect encoding of weights.

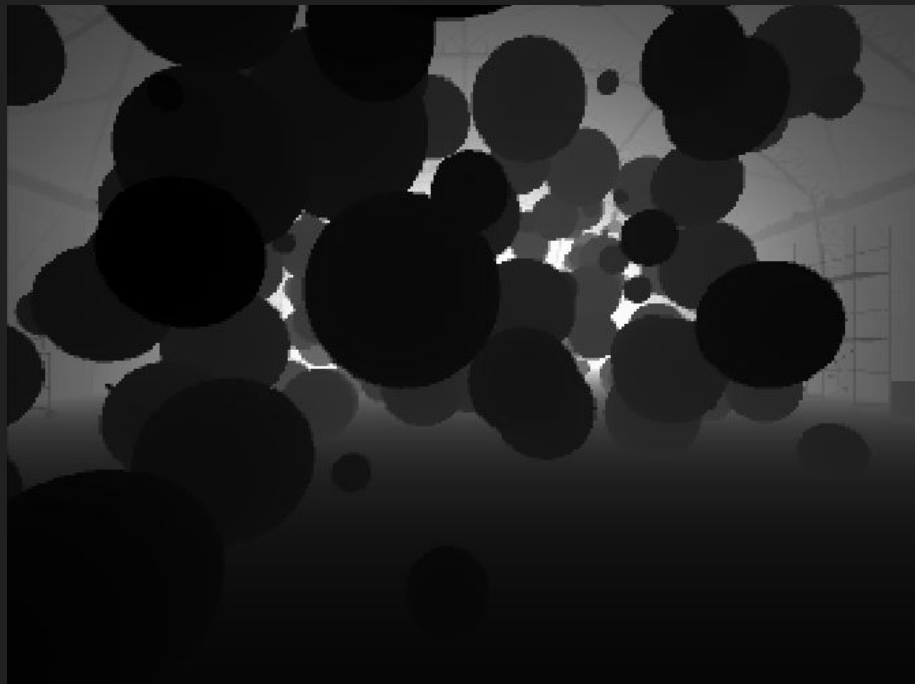
Using coordinates of input and output nodes to calculate weight.



[1] Stanley, Kenneth O.; D'Ambrosio, David B.; Gauci, Jason (2009-01-14). "A Hypercube-Based Encoding for Evolving Large-Scale Neural Networks"

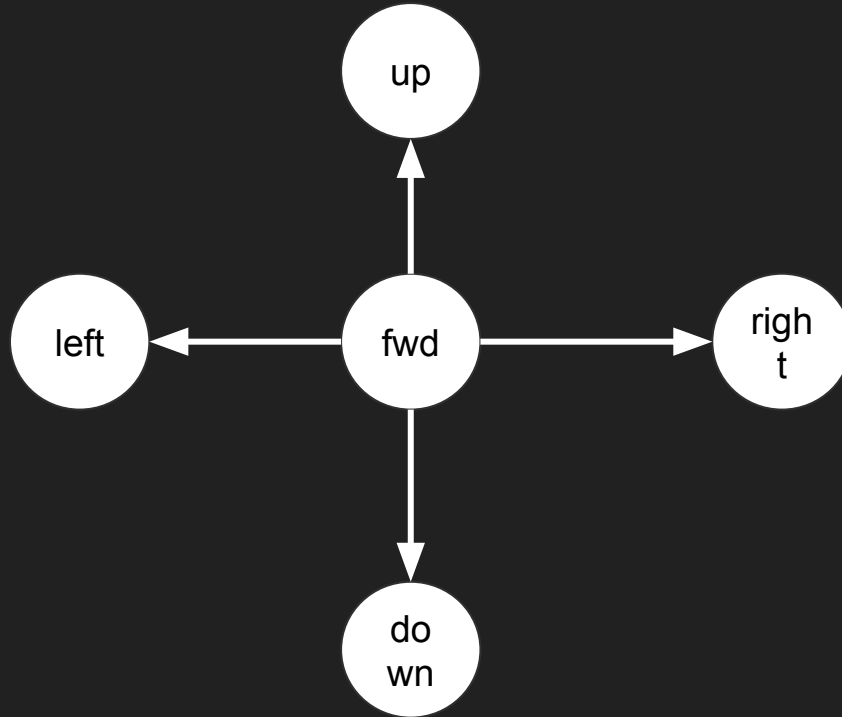
Input space

Rescaled (inverse) depth image to 16x16 (by max-pooling).



Output space

5 actions:

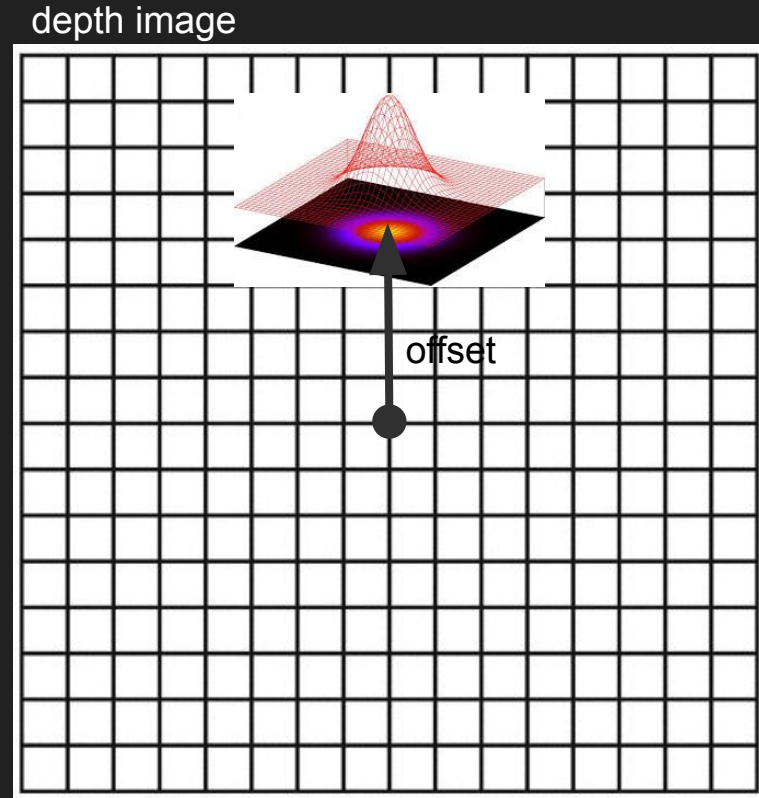


Mapping to weights

Example of 1 gene and its weights from input pixels to the *up* output node.

This same gene maps weights symmetrically to the other output nodes (offsetting in corresponding direction).

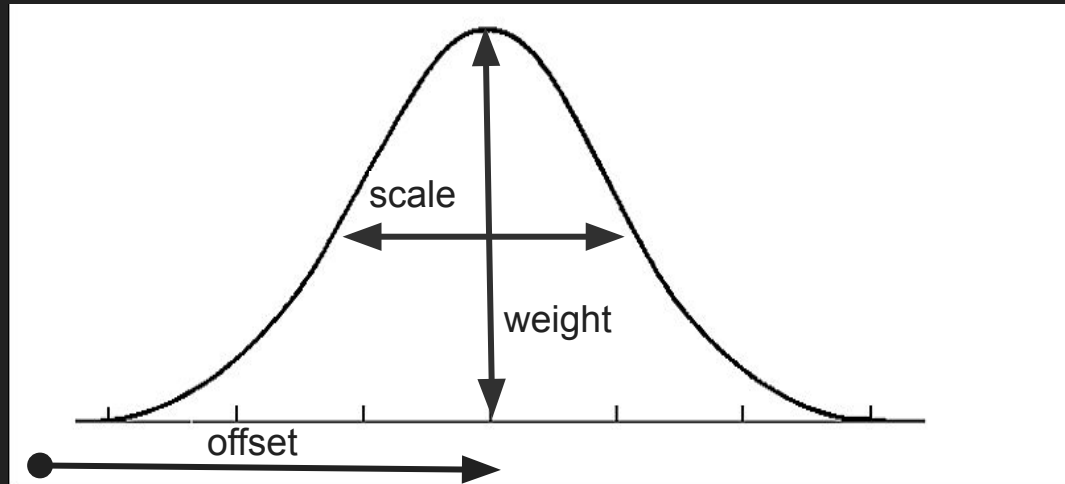
Analogue to receptive fields.



Indirect encoding

A gene represents a Gaussian function with 3 attributes:

- offset factor
- scale factor
- weight factor



Activation function

Linear model from input pixels to output nodes.

Weights are aggregation of all genes.

Action corresponding to highest output wins.

Output is linear velocity commands (with yaw rate kept at 0).

Final solution

Optimized by evolutionary algorithm
based on distance traveled till
out-of-bounds / collision.

Final solution consists of only 1 gene.

Final solution was reached after only
4 generations.

