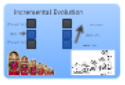
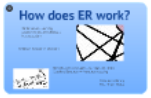
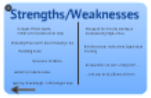
Speed Limit for Evolution



Evolutionary Robotics and SmartData — Inman Harvey





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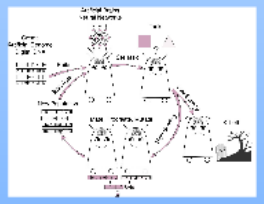

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Measuring Fitness

Operational tests in the real world.

Noise, multiple trials (zillions!).

Weight of false positives versus false negatives.

Implicit vs Explicit fitness

Fixed task, or ongoing adaptation?

Avatar Fitness

Open to Discussion !

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What is the world the agent is to 'live' in?

What are its interfaces with that world - 'sensorimotor' inputs and outputs?

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All sorts of questions to be answered.

Avatar type (1) or (2) or (3) ... ... ?

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Debug code (both syntactically and semantically) by initially trialling in Toy Worlds.

But ultimately has to be extended runs with real data.

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Hybrid approaches if necessary.

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Where Next ?

The main purpose of iterating through these questions and answers is to
Clarify
and make
Operational
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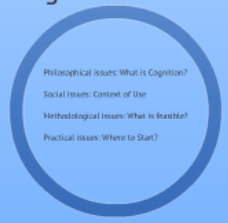

... the rest should be relatively easy! ...
(... though this may be very hard ... ...)

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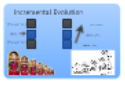

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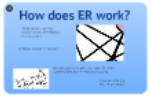

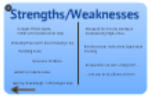

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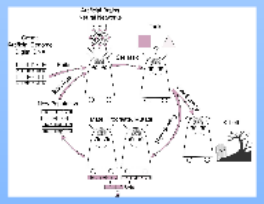

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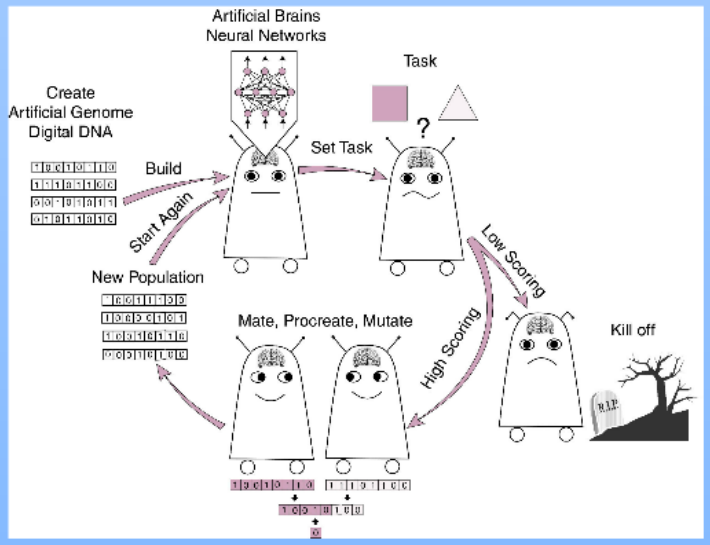

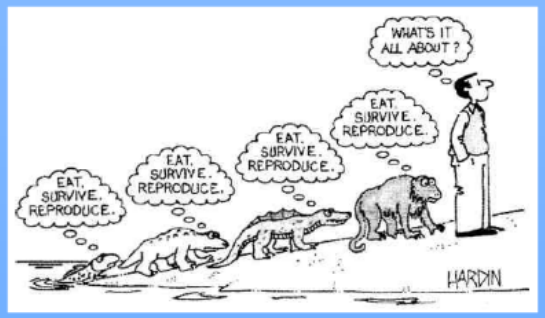

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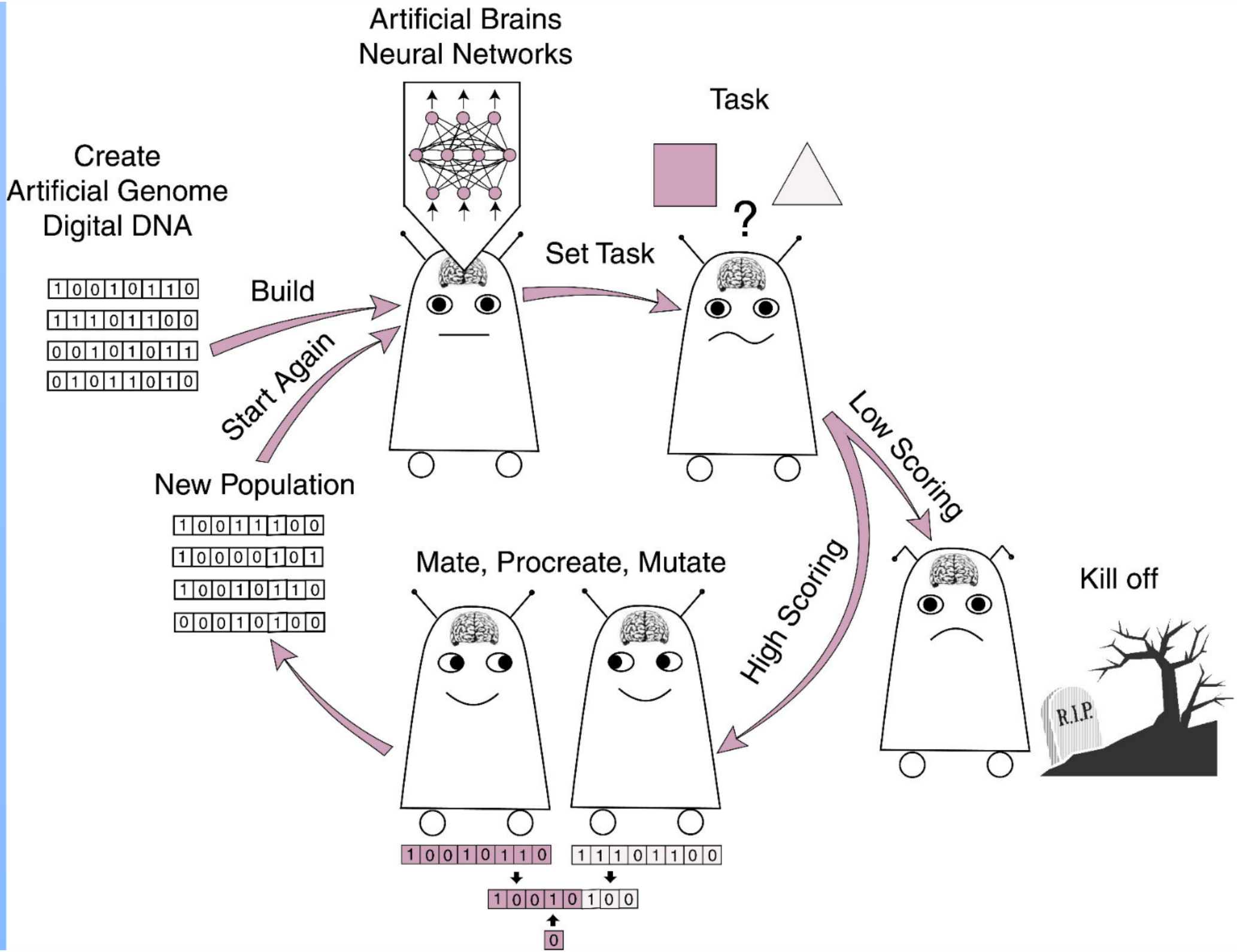
Artificial Brains
Neural Networks
Task
Create
Artificial Genome
Digital DNA
Build
Set Task
Start Again
Low Scoring
New Population
Mate, Procreate, Mutate
High Scoring
Kill off
R.I.P.

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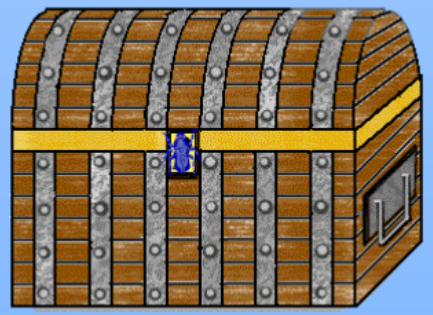

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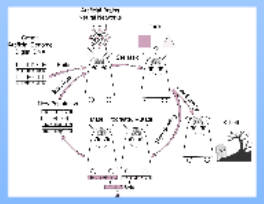

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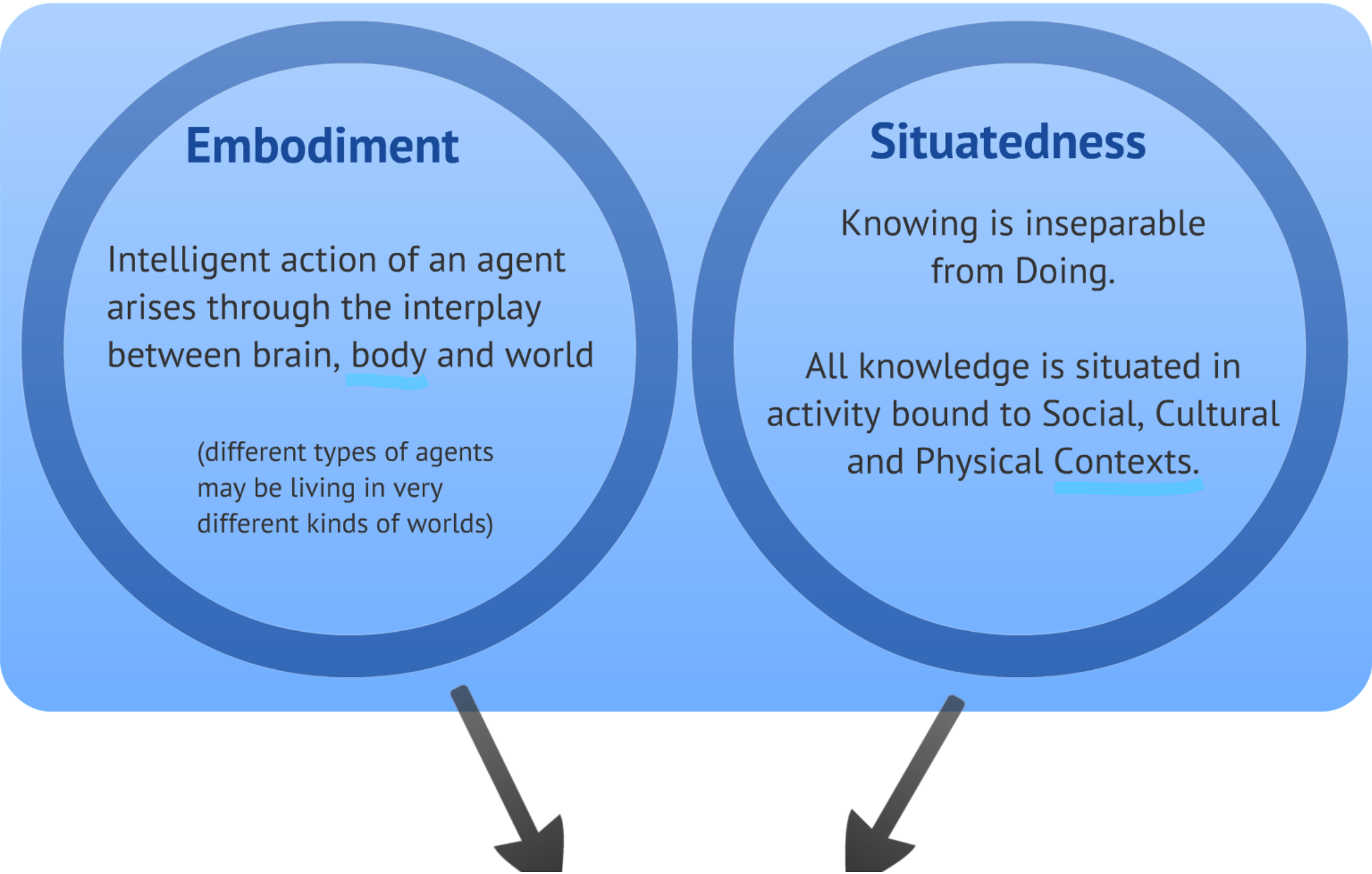

Embodiment
Intelligent action of an agent arises through the interplay between brain, body and world
(different types of agents may be living in very different kinds of worlds)
Situatedness
Knowing is inseparable from Doing.
All knowledge is situated in activity bound to Social, Cultural and Physical Contexts.

1. Intelligence is not located "in-the-head"

2. Actually it is stupid to be even asking "where is Intelligence located"

...but if you really insist on asking...

3. Best answer: "in the ongoing skilful adaptive actions of the agent relating to its world"

One very important skill developed by humans ...

Speech

Text

One very important skill developed by humans ...

Speech ⇄ **Text**

Data is Disembodied and Unsituated !

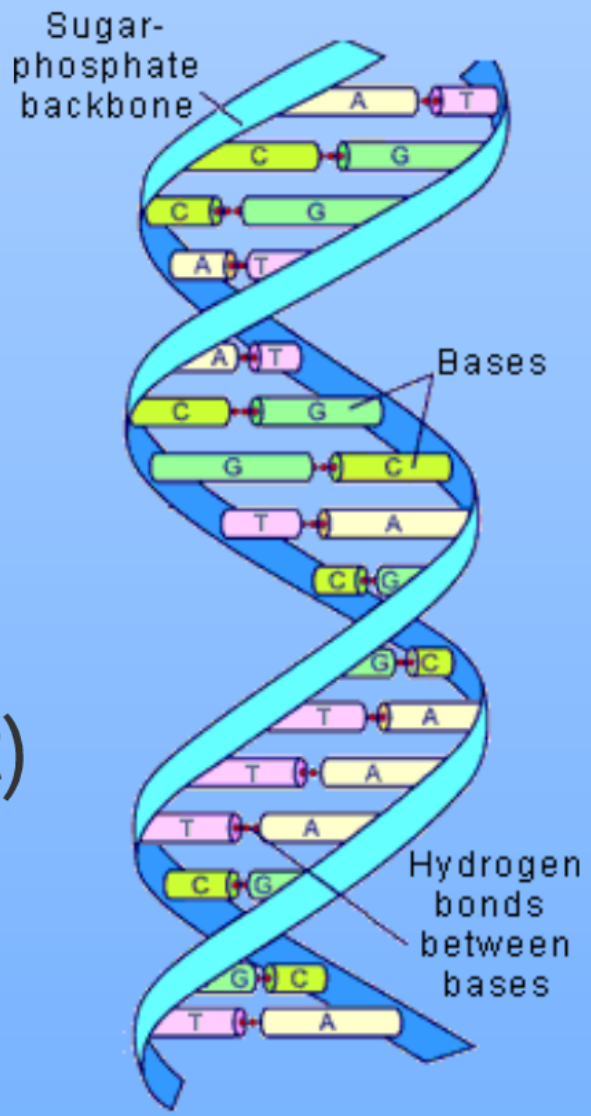
(as far as possible)

But the USE of data must be both Embodied and Situated in some context

writing ... reading

DNA is Data, metaphorically

But it is not written like text
(... mutations + selection)
and it is not read like text
(... recipe more than blueprint)



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differs from human writing/reading

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Know-How, Skills

Know-That, Data

Speech

Writing

Reading

Text

I.R.H

I.R. Harvey

Password1234

Hard-to-Copy

Easy-to-Copy

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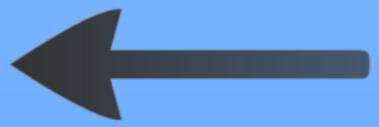

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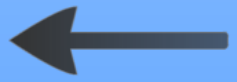

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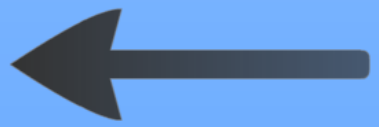

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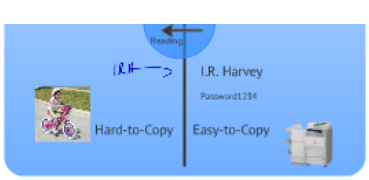

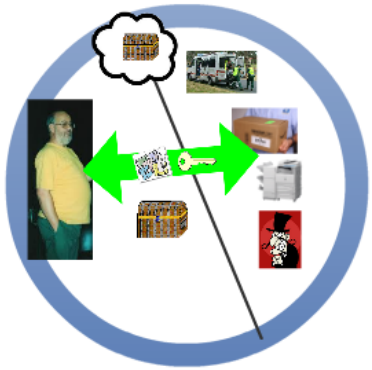

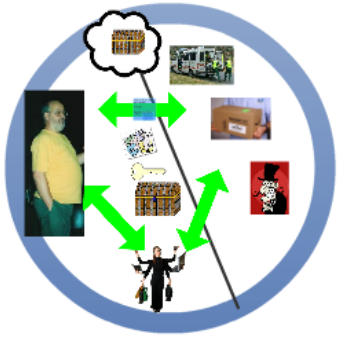

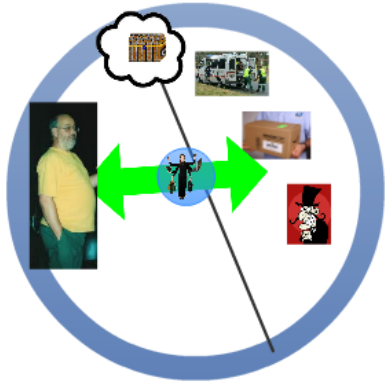

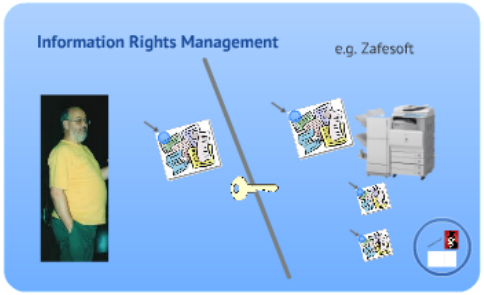

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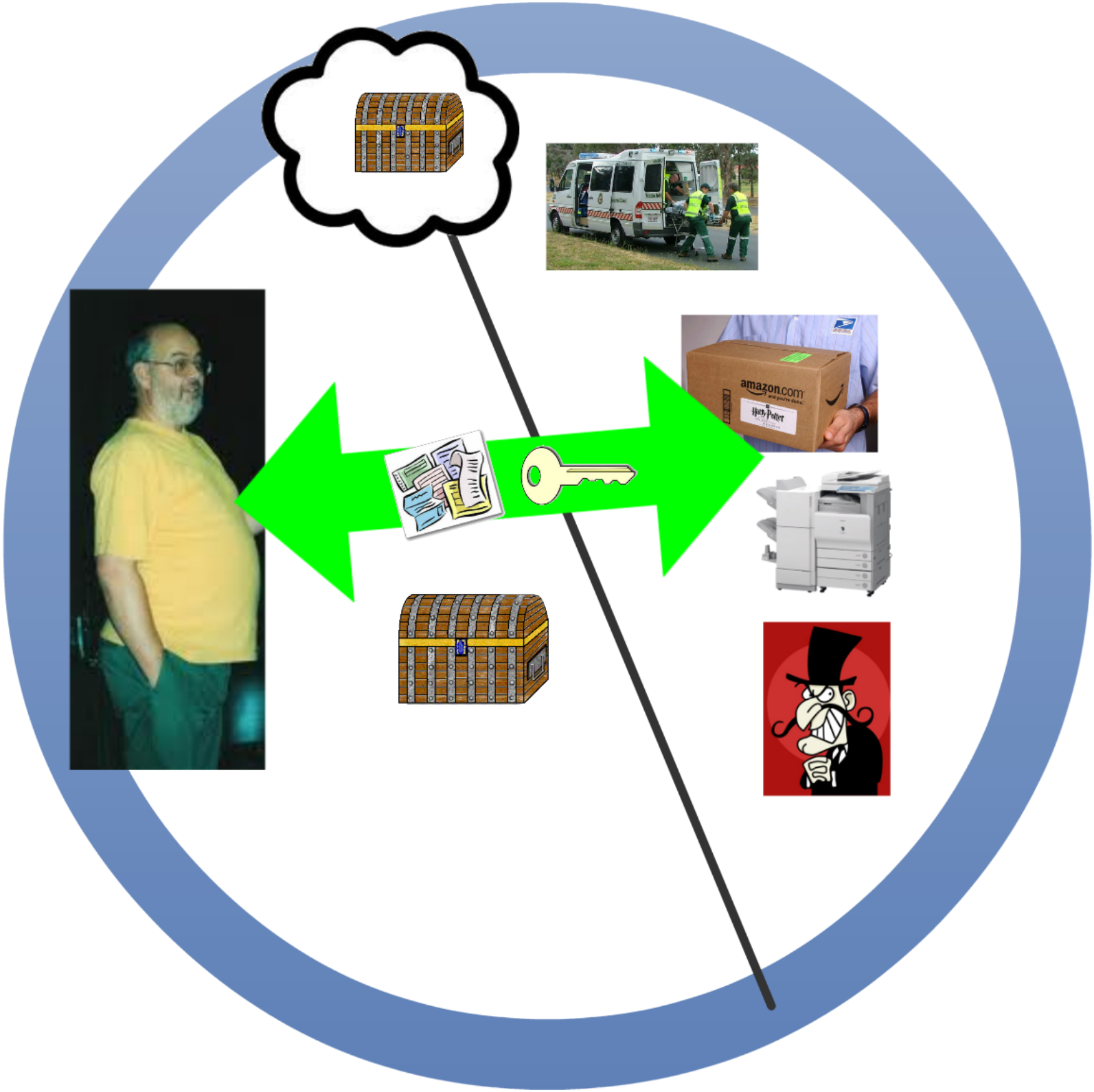
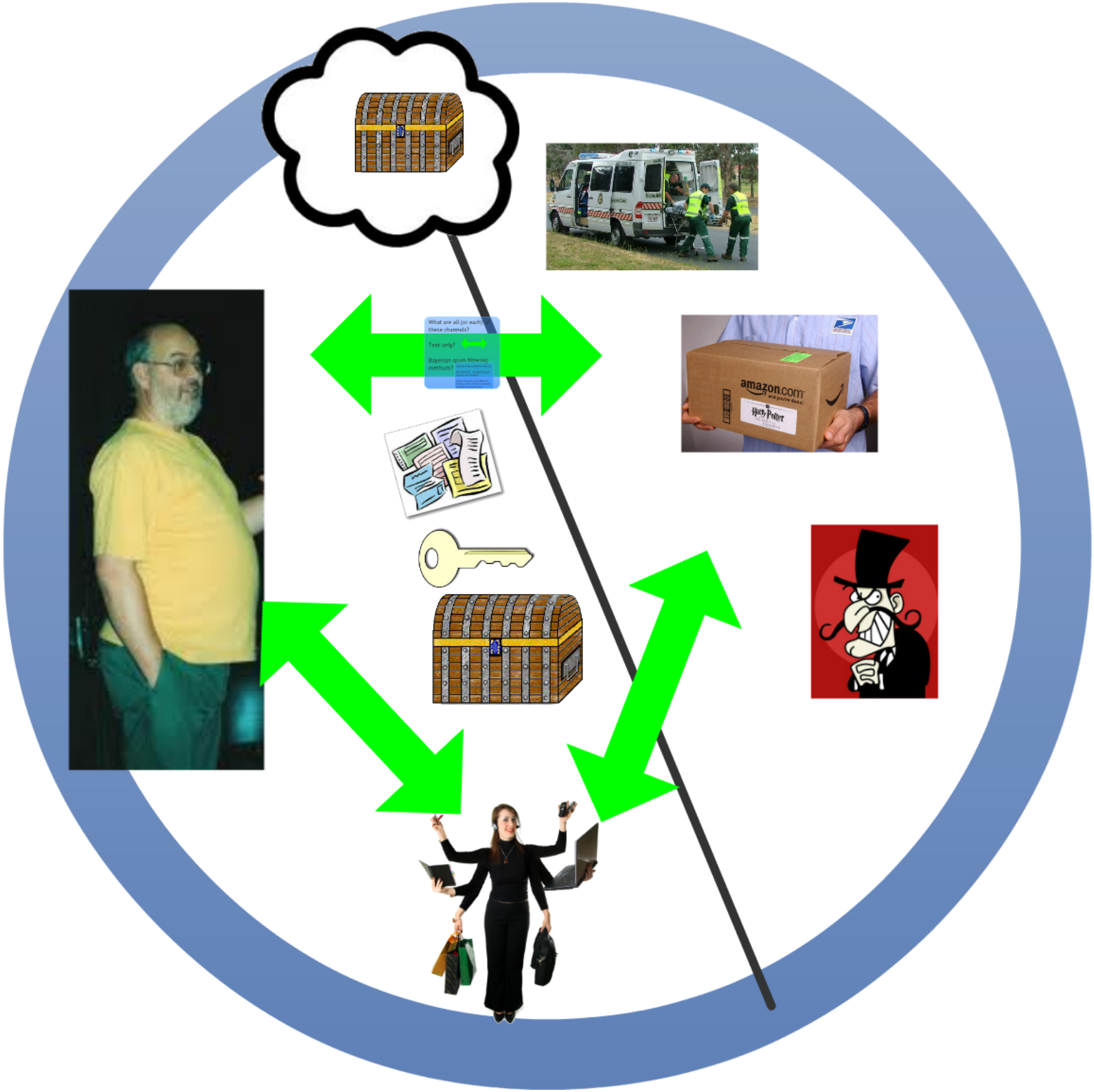
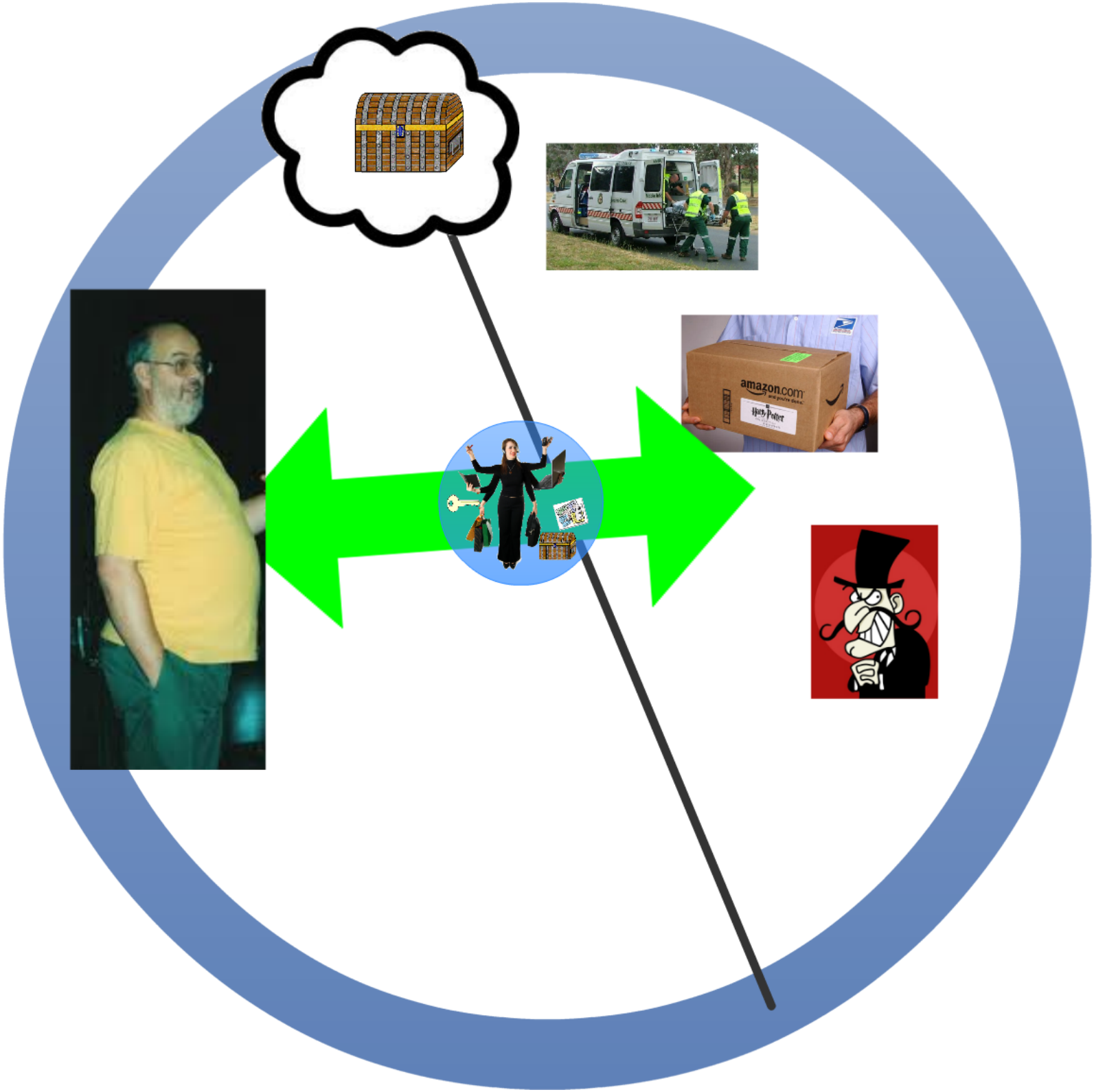
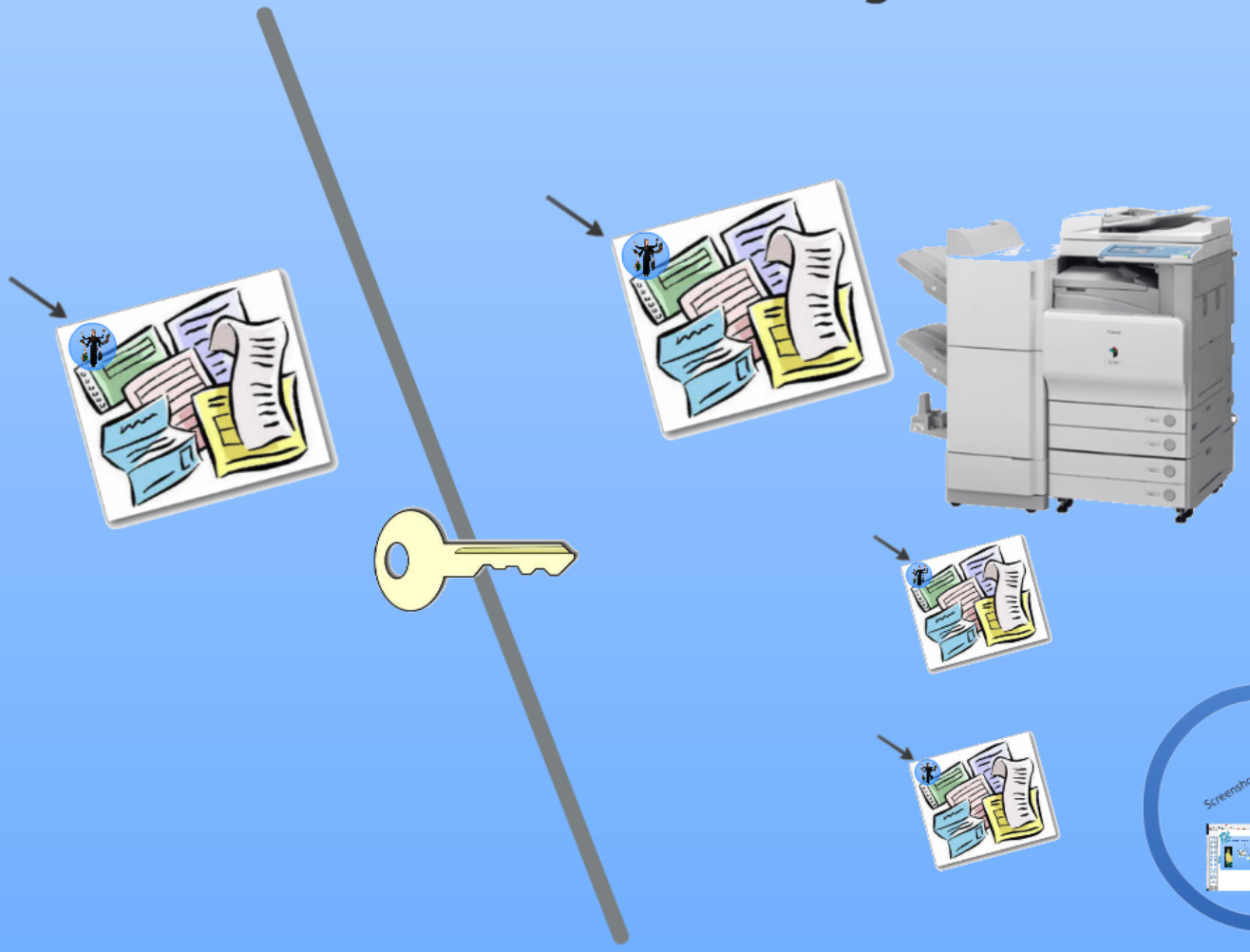

amazon.com


What are all (or each) of these channels?
Text only?
Bayesian spam filtering methods?
amazon.com


amazon.com

Information Rights Management

e.g. Zafesoft



Measuring Fitness

Operational tests in the real world.

Noise, multiple trials (zillions!).

Weight of false positives versus false negatives.

Implicit vs Explicit fitness

Fixed task, or ongoing adaptation?

Avatar Fitness

Open to Discussion !

Can we start coding yet?

A major strength of the ER methodology is that it forces you to clarify the nature of the problem very clearly and operationally before you can start.

What is the world the agent is to 'live' in?

What are its interfaces with that world - 'sensorimotor' inputs and outputs?

What will count as good performance?

Can we start coding yet?

All sorts of questions to be answered.

Avatar type (1) or (2) or (3) ... ... ?

Iterative process

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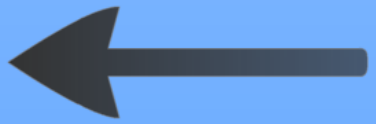

Coevolution

Predator/Prey - each provides the (shifting) Fitness Landscape for the other species

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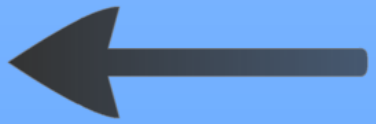

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Debug code (both syntactically and semantically) by initially trialling in Toy Worlds.

But ultimately has to be extended runs with real data.

Is the requisite amount of 'training data' available?

Evolutionary Runs

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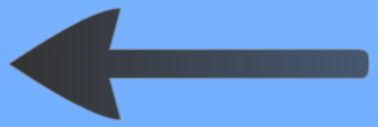

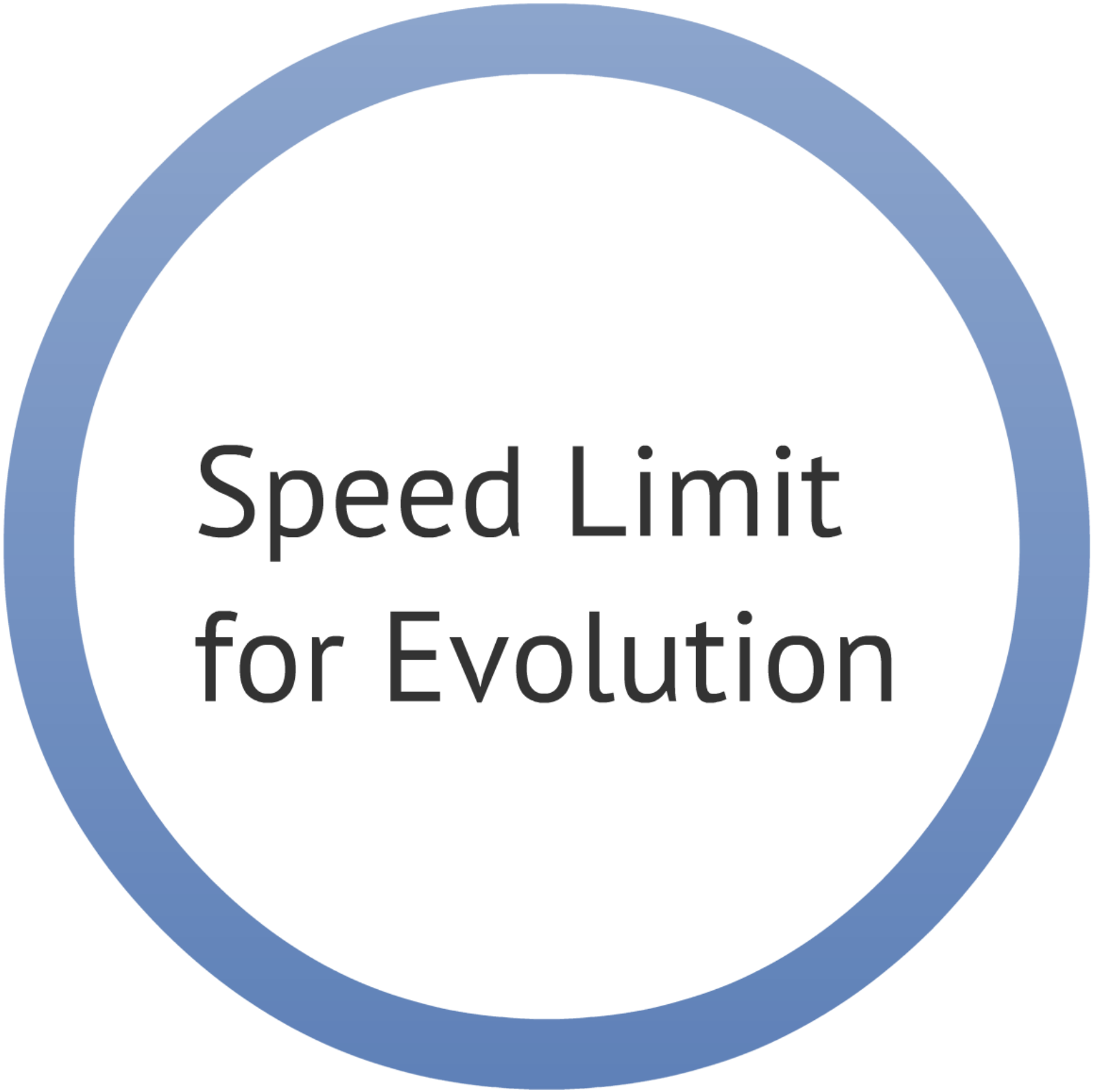
Speed Limit
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Is the job clearly defined yet?

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Which bits of the design of a SmartData Avatar appear viable for ER?

Hybrid approaches if necessary.

Can SD be made to fit ER?

Given the virtues and vices of Evolutionary Robotics (and of Classical AI and Neural Networks) can the original version of the SmartData Avatar design problem be reshaped to use their strengths?

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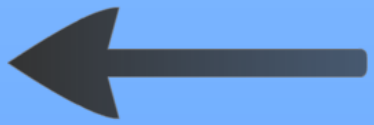
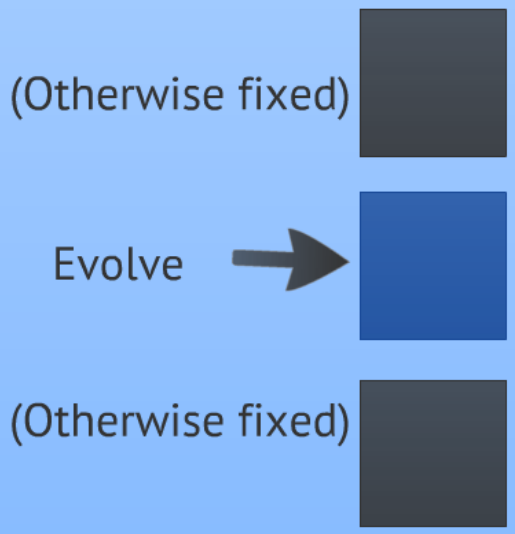
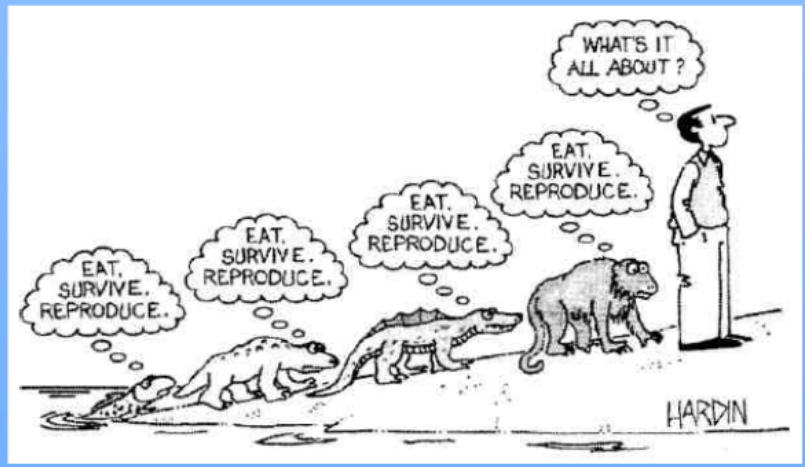


Incremental Evolution





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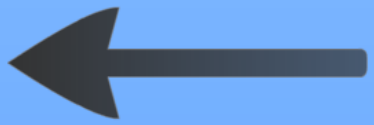

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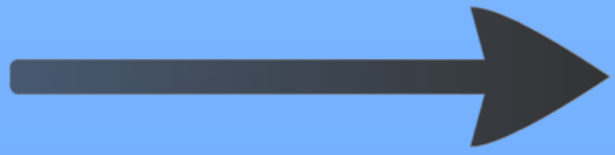

What is the simplest Toy World scenario for a potentially Evolved SmartData Avatar

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The main purpose of iterating through these questions and answers is to
Clarify
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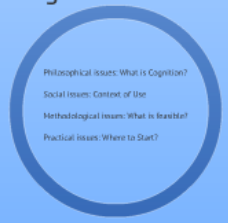
Operational
the nature of the task.



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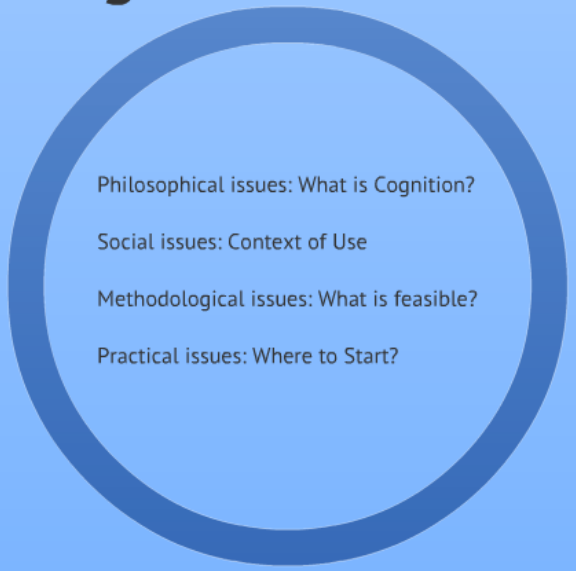

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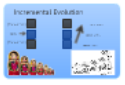
Philosophical issues: What is Cognition?

Social issues: Context of Use

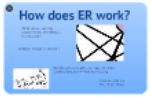
Methodological issues: What is feasible?

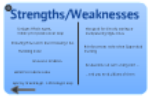
Practical issues: Where to Start?

Speed Limit for Evolution



Evolutionary Robotics and SmartData — Inman Harvey





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