Nanotechnology Design Space

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1 Attributes

1.1 Numerical Attributes

Assembly Method :
Description: The degree, on a scale from 0 to 1, to which the assembly is top-down, as opposed to bottom-up.
Scale: [0..1]

Assembly Procedure :
Description: The degree, on a scale from 0 to 1, to which the assembly is deterministic, as opposed to random.
Scale: [0..1]

Bio-Integration Index :
Description: The degree, on a scale from 0 to 1, to which the product interacts with carbon-based life.
Scale: [0..1]

Distinct State Variables :
Description: The number of distinct variables used to describe all states of the product.
Scale: [0..∞)

Activity Metric :
Description: The amount of entropy, in eu (4.184 J/K-mol), per second leaving the system while it's in use.
Scale: [0..∞)

Macro-Dimensions :
Description: The number of required dimensions which are larger than 50nm.
Scale: [0..3]

Nano-Dimensions :
Description: The number of controlled dimensions which are 50nm or smaller.
Scale: [0..3]

Organic Composition :
Description: The degree, on a scale from 0 to 1, to which the product is organic, as opposed to inorganic.
Scale: [0..∞)

1.2 Text Attributes

Applications :
Description: The expected applications of the product.
Examples: adhesives, miniature display devices

Forces :
Description: The forces which are significant in the use of the product.
Examples: electrostatic, van der wals

Industries :
Description: The industries which may benefit from the product.
Examples: aeronautics, textiles

Materials :
Description: The materials used in the product.
Examples: carbon nanotubes, copper

2 How do we evaluate Nanotech?

2.1 Order of Attribute Importance

1. Nano-Dimensions (N) - What is it?
2. Macro-Dimensions (D) - What limitations does it have?
3. Activity Metric (A) - Does it actively *do* anything?
4. Assembly Method (M) - How is it made?
5. Assembly Procedure (P) - How well is it made?

2.2 Approximation Function

$$\frac{N}{D+1} + \frac{P}{M+1} + \frac{A}{A+1} \tag{1}$$

3 What are some applications of Nanotech?

Bio-Informatics Devices to aid inspection of biological organisms.

Cybernetics Devices to supplant or augment biological mechanisms, such as nerve replacement/reconstruction.

Fuel Cells Special materials and devices for use in hydrogen fuel cells and the like.

Hazardous Materials Cleanup Nano-machines which decompose or otherwise neutralize harmful chemical or nuclear agents.

Nano-materials Production of nano-materials such as diamond filament or carbon nanotubes, for use in high-strength composits.

4 How do we evaluate the risks involved in Nanotech?

4.1 Order of Attribute Importance

1. Bio-Integration Index (B) - How can it affect me?
2. Assembly Method (M) - How quickly can it go wrong (linear vs. exponential)?
3. Activity Metric (A) - How much does it do?
4. Assembly Procedure (P) - How much does it degrade per generation?
5. Organic Composition (O) - How much is it likely to infringe upon our resources?
6. Macro-Dimensions (D) - How much infrastructure does it require?

4.2 Approximation Function

$$\frac{A^M}{P+1} + \frac{O+B}{D+1} \tag{2}$$