Concepts in Artificial intelligence

Thought processing and Thought generation

Concepts and Notation

*Thought Particle* – a construct which does not contain start symbol and end symbol and it may be mapped to a stored thought particle. A thought particle will be associated with dimensional *particle vector* where is the number of particle dimensions.

*Simple Thought Particle* – a Thought Particle which cannot be subdivided further into smaller thought particles.

*Connection Particle* – an artificial construct connecting two thought particles which cannot be subdivided to more elementary particles. It is used to convey semantic nuances accounting for the context in which the current thought is used. Initially, assigned some default *particle vector* with dimensions. In the thought transformation phase the connection particle c can get modified vector accounting for some inferred secondary semantic differences.

*Thought* – a construct with a starting symbol and an ending symbol which can be evaluated against a stored thought by the semantic discriminator. A thought *t* will be associated with a path starting with start symbol and ending with end symbol. Thought will be represented by an array of *thought vectors* where each *thought vector* has dimensions. The array of thought vectors will be used to compute the *signature* of the thought .

*Simple Thought* can be presented by a path from starting symbol to a sequence of thought particles with an ending symbol appended. In other words a *Simple Thought* cannot be recursively partitioned into simple thoughts without further thought transformation which would involve the thought repository. Simple Thought is associated with dimensional thought vector. Each element of the thought vector contains a particle vector with dimensions. Every thought can be described by an array of simple thoughts.

*Thought Repository* – a place for storing processed and mapped thoughts

*Stored Thought* – a thought which has been processed and possibly been subjected to transformation

*Initial Basis* – processed thoughts and particles stored already in the thought repository at the time the input stream starts flowing.

*Thought Transformation* – a part of the thought processing which may take place. During *thought transformation* the processed thoughts may be rearranged, coalesced or split, where each of the newly obtained thoughts is mapped against the stored thoughts accordingly.

*Particle Discriminator* – an adaptive learning module which processes the input stream and creates thought particles by sequencing the input stream in appropriate way.

*Particle Transformer* – an adaptive learning module which re-sequences and transforms thought particles into new ones which can be mapped to stored particles or to reference particles.

*Thought Transformer* – an adaptive learning module which re-sequences and transforms thoughts into new ones which can be mapped to stored thoughts or to reference thoughts.

*Semantic Discriminator* – an adaptive learning module which evaluates the semantic distance between two thoughts.

*Thought Ranker* – assigns a dynamic score of each thought; this score is used by the thought transformer to resolve where to apply transformation

*Thought Executioner* – acts on a thought marked for execution

Thought Representation

We would like to have an abstract enough and memory efficient thought representation. We do not want to embed NLP constructs into the abstract thought representation.

– a thought particle is a piece of a thought represented by an dimensional vector where

A thought T is a construct of attached to each other thought particles represented by a path in which the vertices are the thought particles and the connections between them are given by the set of connection particles where . Note that the connectivity between the particles models more subtle semantic nuances of the whole thought when taken in context.

Thought Signature of thought t or particle p -

Let us consider an example:



*I am Dimitar. My wife is Mieko. My daughters are Hanna and Emily.*

Figure 1: Possible representation

-> “***I***”

-> “***am***”

-> “***Dimitar***”

-> “***.***”

-> “***My***”

-> “***wife***”

-> “***is***”

-> “***Mieko***”

-> “***.***”

-> “***My***”

-> “***daughters***”

-> “***are***”

-> “***Hanna***”

-> “***and***”

-> “***Emily***”

-> “***.***”

We will use the function to denote the textual representation of the particle . For instance = “***I***”

Each thought particle is represented by its magnitude and direction .

Semantic Value of a Thought

A thought is represented by its *thought path*. There is no intrinsic or absolute semantic value associated with a *thought path*. Instead, there is a *Thought Signature* which can be computed for a given thought at a given time. The thought signature is computed with the adaptive learning module *Thought Discriminator*. The thought signature is not static but dynamically evolves as more thoughts are stored in the repository and the thought discriminator internal state is modified in the process.

For a pair of thoughts we can obtain a semantic distance which similarly to the signature is not static but dynamically evolves as more thoughts are stored in the repository and the thought discriminator internal state is modified in the process.

Building Thought Path

Start with the default representation of all particles shown on Figure 1.

Let us assume that there are already processed and analyzed thoughts:

Figure 2: Stored thought

*I is a personal pronoun. Personal pronoun is a simple substitute of proper name of a person.*

The built digraph for the stored thought may look like:

One can see that , , ,

We are going to build and train semantic discriminator which will accept a thought and thought . This discriminator will produce the semantic distance between and .

Let us denote it with . We expect for a properly trained discriminator to produce small value when = and = as = “**.**”.

Coalescing of Thought Particles

Let = , =

Then =

Coalescing of Thoughts

Let = , = and =

Simple concatenation:

Then =

Splice operation:

=

Split operation:

=

=

If then we are going to refer to as .

Comparing Thoughts

Let be a thought represented by path and let be a thought represented by path .

Let has signature and has signature . Then and will be equivalent if and contain the same collection of thought vectors without regard of the order.

Updating Semantic Discriminator through training

Naïve approach

Let us have repository with stored thoughts , , , ,