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Immune Inspired Algorithm for Information Retrieval

Tsetsegkhand Namsrai

1st PhD school in Language and
Speech Technologies.

GRLMC, Rovira i Virgili University

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Tsetsegkhand Namsrai



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Objectives

- Huge amount of information on WWW makes difficult for users to find useful knowledge with regular searching engines. How can we improve the navigation in Internet ?
- There are many identical queries that express different information needs. Using the context can help disambiguate the query term and yield results that more closely reflect the intent of the user .
- In a complex IR, the information available to RS is the current query, the document collection to search from PLUS all the interaction of the user modifying his/her query history
- A context-sensitive application may need access to current context, but also to context memory in order to identify which retrieval context to use for retrieval.

Bio inspired computing algorithms



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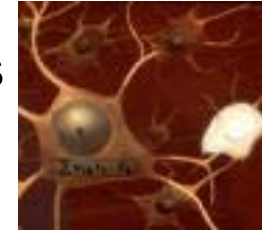


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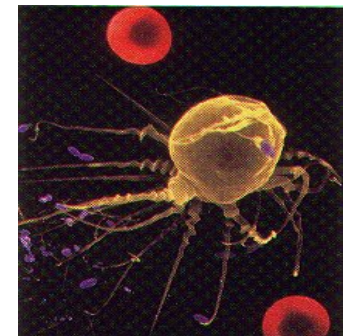
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- Pattern recognition and learning techniques based on how brains and nervous systems work (**NN**)
- Problem solving/ design/ optimisation techniques based on how natural evolution works (**GA**)
- Problem solving techniques based on how ant colonies operate.
- Massive parallel computation techniques based on how biological cells operate (**DNA**, **membrane computing**)



New computational approach : Artificial Immune system (**AIS**)





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Justification

■ The focus of our work is in suggesting application of properties of the immune memory for natural language processing with an effort to explain those features of the immune memory, which distinguish our approach from other existing methodologies.



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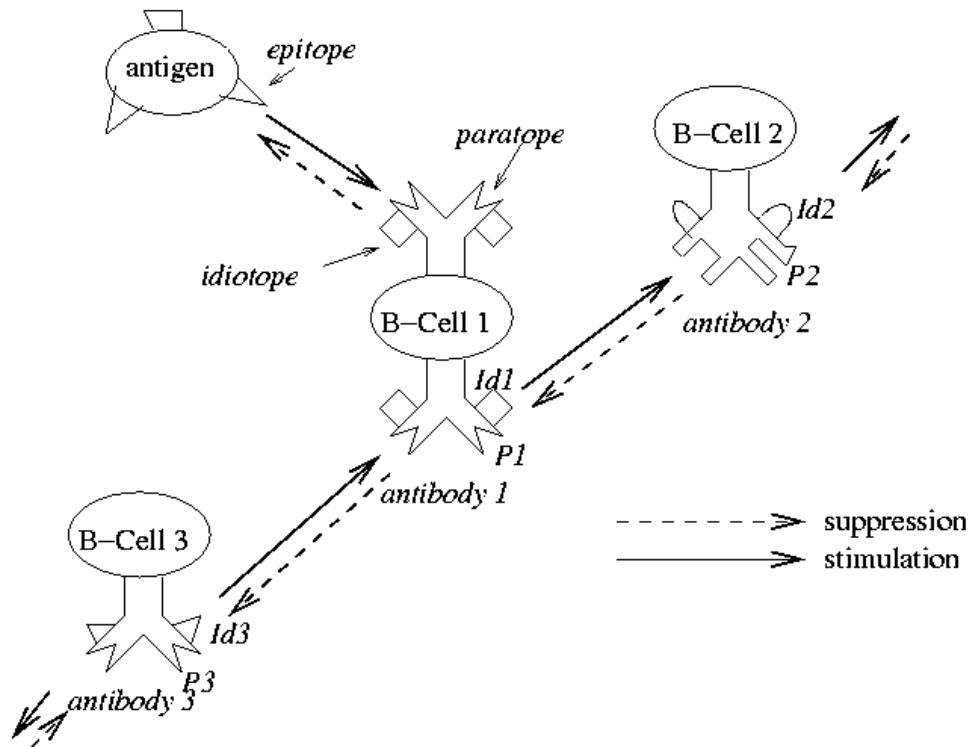


Methodology

- The natural Immune System is capable of maintaining memory of previous encounters, it is robust and interactive. Memory in the natural immune system is recognized as a key player in driving the immune response to counter virus re-infections.
- We want context-aware systems to be able to be adaptable and able to generalize and reduce large amount of data. Immune inspired methods can provide us with a more efficient algorithm for context history processing.



Theoretical Background



- Jerne's (1973) Theory: The Idiotypic Network of immune cells
- B-cells co-stimulate each other via portions of their receptor molecules
- A network of B-cells is thus formed and highly stimulated B-cells survive and less stimulated B-cells are removed from the system.



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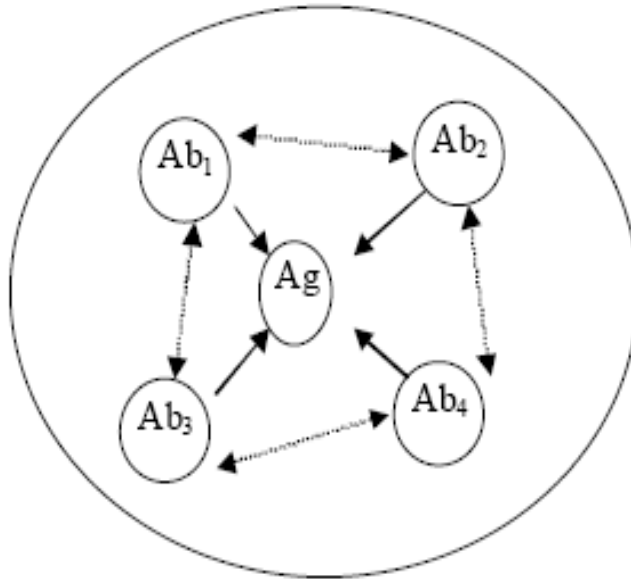
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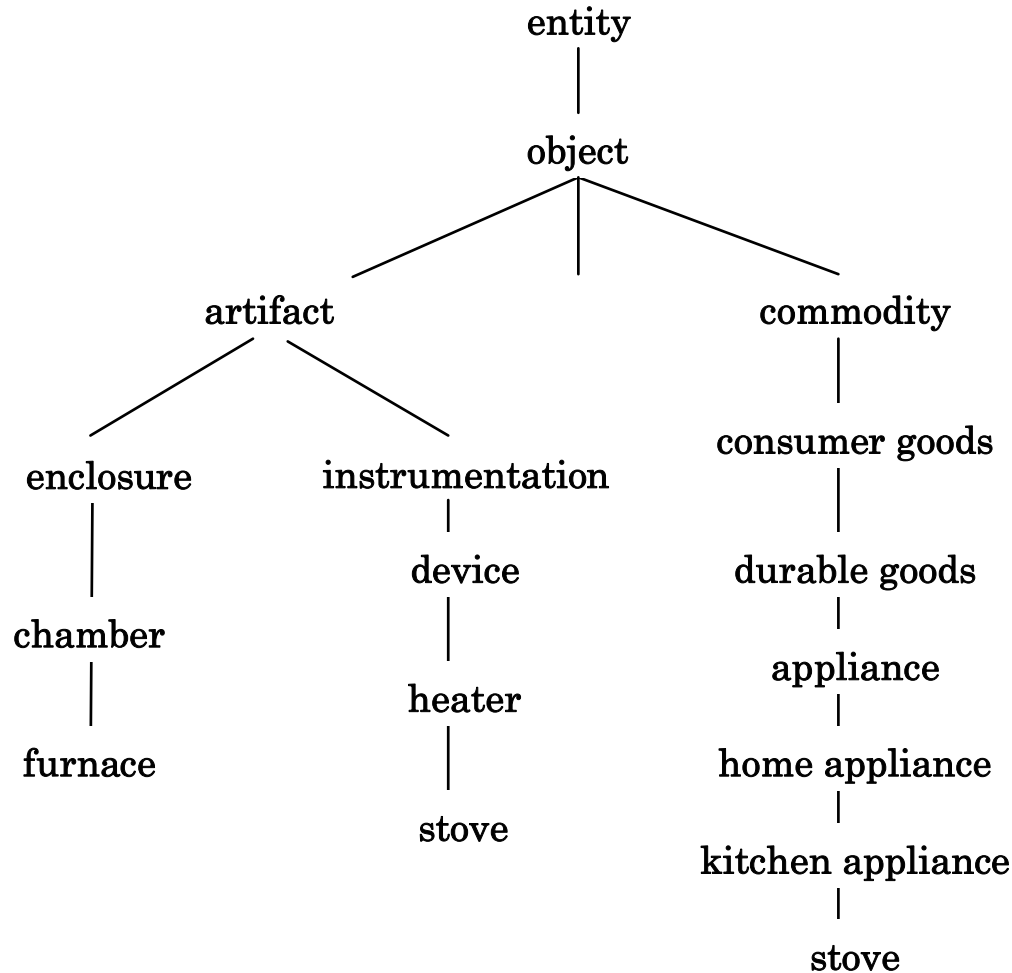
Meta-stable memory in Artificial Immune Network



- Input data represents as an Artificial Recognition Ball (ARB) and added to the network. An ARB represents a region of antigen space which is covered by a particular type of B-cell, excluding the need for repetition of individuals.
- If Euclidian distance between two ARBs is less than Network Affinity Threshold (NAT) value, they become neighbours. Neighbour-ARBs will have higher stimulation level, which allows them to survive longer.
- If input Ag is further away than NAT value from the nearest ARB, Ag is converted to ARB and added to the network.
- The more stimulated an ARB is, the more resources it can claim. When the resource level of an ARB falls below this lower limit it is removed from the network.

Mark Neal,
*Meta-stable Memory in an AI
network,*
ICARIS 2003, LNCS 2787

Ambiguity of a word in different synsets (*Is-a* taxonomy)



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Application Area of Our Algorithm

- Our proposal focuses on providing IR systems with a context memory algorithm, which collects, stores contextual information in it's memory and outputs contexts weights for current query.
- The immune inspired context memory can adapt to a wide variety of user behavior and may have an effect on the performance of the whole information retrieval system.

