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Computer Virus Biological Model

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Abstract

The term virus is dispersed to various domains of science and biological framework is one that can be used to map with the computer viruses. The artificial elements of life exists in computer virus and how it get handled in natural frame is a curious question in itself but in this paper we try give a biological mapping of computer viruses.

Keywords: Clonal Theory, Mutation.

Introduction

Computer viruses have self replicating behaviour. In the scenario of biological viruses same property make their growth possible. The factors like mutation that refers to the sudden change make their expansion more effective. In the natural immune system like in our body specific arrangement of specific cells is there that creates immunity factor. The activities of white blood cells are responsible for the resistance against diseases in our body that are caused by external harmful elements. Once there is attack on our body by external elements then the identification of self and nonself is very crucial factor and another important factor after this identification of nonself is the formation of specific element to defend against it and anyhow to stop virus growth in body. Further activities include vaccine design. The artificial immune system consist of computationally intelligent system that get evolved from vertebrate immune system and it includes the process of machine learning and other problem solving approaches.

There are many other factors that cause the similarity between the life cycle of biological viruses and computer viruses. This shows that there must exist a mapping but the question arises, of what kind mapping. The answer lies in the fact that if the various phases and activity are mapped then the factors of defending must be similar but the similarity in this respect is very specific because the main issue is that we cannot directly retrieve the solution set directly but we can try to follow the approaches of biological systems. The objective of our is rotating around the same procedure as given above and how to get the desired results from one domain to analyse other domain is not an easy task.

Elements of Computer Virus Life Cycle

Computer virus life cycle includes the various parameters that matches with the biological virus life cycle so it is said that computer virus sustain artificial life. Various parameters that defines life are as follows[1]:

1. Self production
2. Information storage of a self production
3. Mass energy conversion
4. Interaction with surroundings
5. Stability in concerned environment
6. Evolution
7. Growth
8. Resistance for survival

These all factors explains how the life flows, the same pattern get followed by the computer viruses, they have the capacity of self production by this property is their great strength for survival and expansion. Computer virus take certain support of computer environment and utilizes its resources we can say they interact with their surrounding environment.

Computer viruses use the various techniques like encryption and other to save themselves from classification and detection and thus they have a specific resistance for their survival. The techniques used in metamorphic and polymorphic viruses includes the typical growth and evolution pattern. The concept of learning is very important because it determines the behaviour for performing the task that creates an identification for particular class of viruses same thing happens with computer viruses as they learn from defender side for their growth and if we see from the side of antivirus designer the concept of learning in artificial intelligence is used to solve

many problems one problem out of them is the problem of computer viruses .Thus we can say that computer virus exhibits the artificial life.

The actual way used by biological viruses in their survival is almost same because both domain have to face same element of life during its life cycle thus with this approach retrieval becomes easy towards defending the problem of computer viruses .

Clonal Selection Approach

Various artificial immune system uses the approach of clonal selection that is a biological approach representing the flow of immunity generation. It includes the various factors that make it efficient that are:

1. Each lymphocyte occupy single receptor containing Unique specificity.
2. Cell activation involves receptor occupation.
3. Derived cells will contain specificity similar to parent cell.
4. Lymphocytes containing receptors for self molecules shall be removed in early phase.

Figure 2 explains the clonal selection of lymphocytes in different phases. These are the predictions used in this theory and this approach get widely used in artificial immune systems .For computer virus the same approach can be used and a clonal model in computer virus framework will be a amazing implementation of this approach.

The genetic algorithms and the neural network also follow the biological theme and widely used for detecting computer viruses. Various factors that are used in genetic algorithm are [3]:-

1. Mutation
2. Crossover
3. Fitness function

These factors are used in genetic algorithms to solve different type of problems and can also be used effectively in biological domain. Another approach includes the neural network methods that are inspired from the neurons in animals and these are mapped as shown below in computer domain.

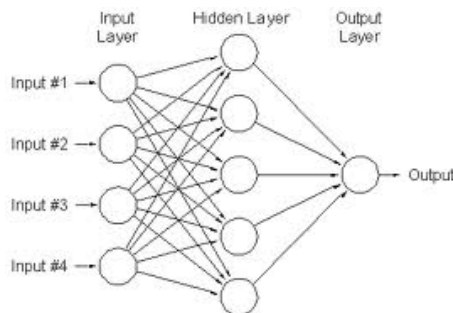


Fig1. Neural network

The problems related to pattern identification and classification are solved by these procedures very efficiently and frequently and these problems have to solve by solvers during various analysis so these approaches are very efficient .

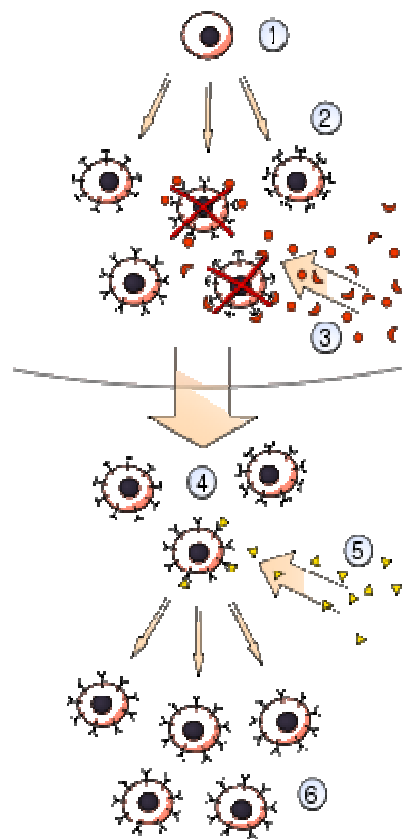


Fig2 : Clonal selection [2]

Clonal-Selection of Lymphocytes:

- 1)A hematopoietic stem cell undergoes differentiation and genetic rearrangement to produce
- 2) immature lymphocytes with many different antigen receptors. Those that bind to
- 3) antigens from the body's own tissues are destroyed, while the rest

mature into 4) inactive lymphocytes. Most of these will never encounter a matching 5) foreign antigen, but those that do are activated and produce 6) many clones of themselves

Another most challenging factor is to develop a method to simulate and then to implement all these approaches in a single module and then expand accordingly. The challenging issues are as follows:

1. Self and non self identification
2. Dealing with frequent nature changing viruses.

There are many other approaches that are present in this domain but we covered the main that are most relevant of the problem of computer viruses . Proper dealing with the defined problems and proper arrangement of approaches will lead to strong biological model in near future.

Conclusion

In this paper we discussed various approaches of biological domain and try to give a compatible view of these approaches with computer domain. I also discussed clonal selection procedure and its usage in computer virus domain .With this finally i discussed various problem that is needed to be resolved in near future .

References

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