

A study on digital ant technology in computer networks

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Abstract-- In computer science technology, we use networks in order transfer the data and to share other resources, so our main task is to protect network from malicious users, because they may introduce new type of threats in order to misuse the data. So, for that purpose we this digital ant technology in order identify the threats.

Keywords-- Digital ant, computer networks, antivirus.

I. INTRODUCTION

A computer network is a telecommunication network that is used exchange data between different computers. On the network these computers are called as nodes, so these nodes can include hosts such as servers, personal computers and networking hardware. And these nodes are connected on the network through wired or wireless media. One of the best computer networks is nothing but an internet [5] [7].

There are many properties in the computer networks, some properties like, it allows interpersonal communication and allow sharing of files, data etc and it also allows sharing of networks and computing resources. But one of the most important properties of the computer networks is nothing but the security. Because a computer network is used by computer hackers to inject computer virus and worms. So, that these viruses are effected to the devices that are connected in the network and prevent these devices from accessing the network [5][6][7].

So, by above scenario we can understand the importance of the security property, so, in order to remove the threats from devices which are connected to network, we introduce a software mechanism which is nothing but a antivirus software, it is the static application, means which is installed on the computer and scan the files for identifying the viruses and it takes so much amount of time in order to scan the files or folders. After scanning is completed, if it finds any files or folders are infected, it removes completely. As this is desktop based system, this process is Fine, but if we want find

the threats in the computer network, this won't be the best option. So, for this purpose we introduce a new technology called digital ant technology [5] [7].

"In nature, we know that ants defend against threats very successfully. They can ramp up their defense rapidly, and then resume routine behavior quickly after an intruder has been stopped. We were trying to achieve that same framework in a computer system," explained Professor of Computer Science Errin Fulp, an expert in security and computer networks [1] [6] [8] [9].

II. DIGITAL ANT

Digital ant, it is one of the latest trend in antivirus software; here ants are acts as agents to fight against harmful threats. Main aim of the Digital ant is find the viruses; malwares etc. digital ants have ability to find the technical details like cpu utilization etc [1] [3].

Working procedure of digital ants

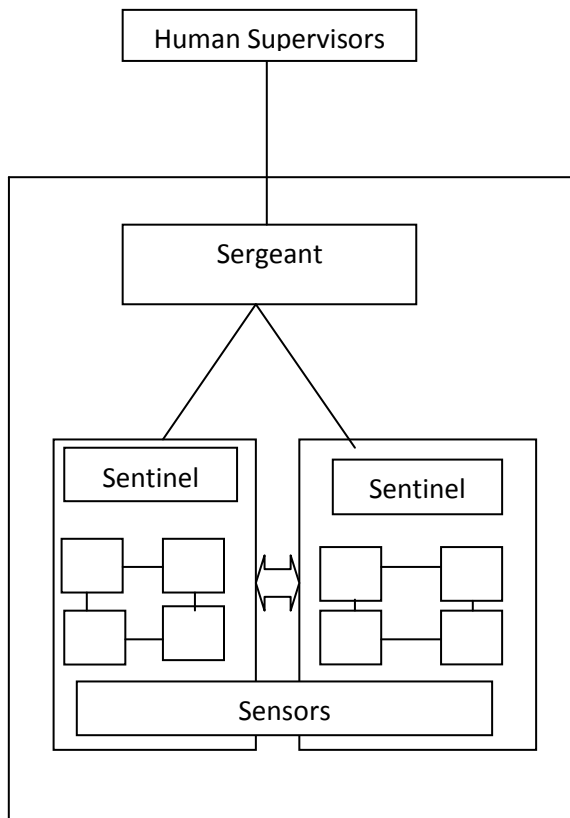
Initially the digital ants are injected into the network; here we should aware that digital ants are nothing but the software programs. When they are injected into the network, they do not follow any specified path, they traverse all around the network, in order find the viruses. Suppose a digital ant finds an unusual situation in the network, then as soon as it finds, it leaves a digital sense at that particular point. Then this digital sense which is nothing but a signal makes other ants to attract to come to that point. So, if other ants are come to same spot they also sense some unusual situation so, they also leave some particular digital sense. So, by this way all ants reach to that spot. As if more ants are appeared on same spot it draws the attention of the person who supervises all this process [1] [3].

Decision making in the ant architecture

In this Ant technology Decision making is done in Four stages, at each stage digital agents will present, based on their roles they perform their responsibilities. In first stage, Human supervisors will present and in second Stage digital Sergeant and in third stage digital Sentinel will be there and in fourth stage sensors will present [1] [3].

When a suspicious activity is identified by the digital ants, it reports about that activity to the digital Sentinel, here Sentinel is a program designed to watch over set of computers over the network. After receiving all the information from the digital ants, Sentinel sorts out the information which is received, and then if Sentinel feels that it is really a problem, then that information is passed to the digital sergeant, digital sergeant acts as a master program for all the Sentinel programs. So, once the information is passed from the digital Sentinel to the digital sergeant. Digital sergeant observes the situation alerts the human supervisors who can deal with the problem [1][3].

III. ANT ARCHITECTURE



Description

Ant architecture can be done in 4 stages.

Sensors

The sensors are lowest level software components which are moved freely from machine to machine within the community (a set of computer network hardware and software owned by a single organization). These are specialized agents which are detecting a single type of problem. All sensors come under the supervision of sentinel. They detect and report the problems to sentinels [1] [3].

Sentinel

Next higher level agent is sentinel. Sentinels manages next level of agents i.e. Sensors..These are responsible for protecting and configuring a single host or a collection of individual hosts. They Implements the policies, which are defined by sergeant [1][3].

Sergeant

Next higher level software component is sergeant. All the community comes under sergeant. They oversee security over their entire community as defined by the supervisor [1][3].

Supervisors

All the community is managed at the highest level by a human supervisor. He is responsible to make correct the problem which was intimated by the sergeant [1] [3].

IV. SAMPLE PROVEN THEORETICAL RESULTS IN DIFFERENT AREAS

Edge Extraction in Image Processing

As we already aware that digital ants plays Crucial role in the computer networks but it also extends its services to other area in computer science technology i.e., in the area of digital image processing. In digital image processing this digital ant technology is mainly used to extract edges for particular image based on their pixels [3].

In digital Image processing, Digital ant Technology mainly used to identify the edges. Edges play major role because in order to represent the border of an image or to separate the two objects in a single image, first we have to find the edges. From that edge the color or intensity change drastically to specified edge where the feature changes from one object to another. So, in this process, the edges will represent as set of pixels [3].

Procedure for edge extraction using ant technology

According to Zhuang, “Feature extraction is the important basis for image analysis and machine vision.”

A digital image is the environment that individual ants act upon to configure the image based on pixels connection information. Use of ants in image construction requires a perceptual graph that represent the connection of neighboring points, which is a weighted graph defined on the grid of pixels in the digital image. The end effect is that the ants reinforce the edge of object boundaries and extract the edge definition from the image. A value or weight is assigned to each pixel based on its neighbors who reside up, down, left, and right to a particular pixel within the image. In areas with similar gray scale values, non edge areas, the connection weight is low while areas with dis-similar gray scale values, edge areas, the connection weight is high. As the ants traverse the image during individual iterations these weights are used as the pheromone signal that act to attract individuals and reinforce the weight simulating the dispersal of pheromones that will act to attract more ants on the next iteration. The weight or connection to neighboring pixels reflects the intensity of connection between the neighboring points [3].

V. DIGITAL ANT TECHNOLOGY IN SOLVING TRAVELLING SALESMAN PROBLEM

Travelling salesman problem

In the previous section we have already seen the usage of the digital ants in the area of image processing. Now we are giving another usage of digital ants for finding the shortest path in TSP between source to destination in the area of networks [2][3].

Now we see what the TSP is, In TSP a travelling salesman has to travel through a group of cities, in such a way that the cost

should be minimized, for this purpose, we have to find the shortest path based on the distance between the cities [2][3].

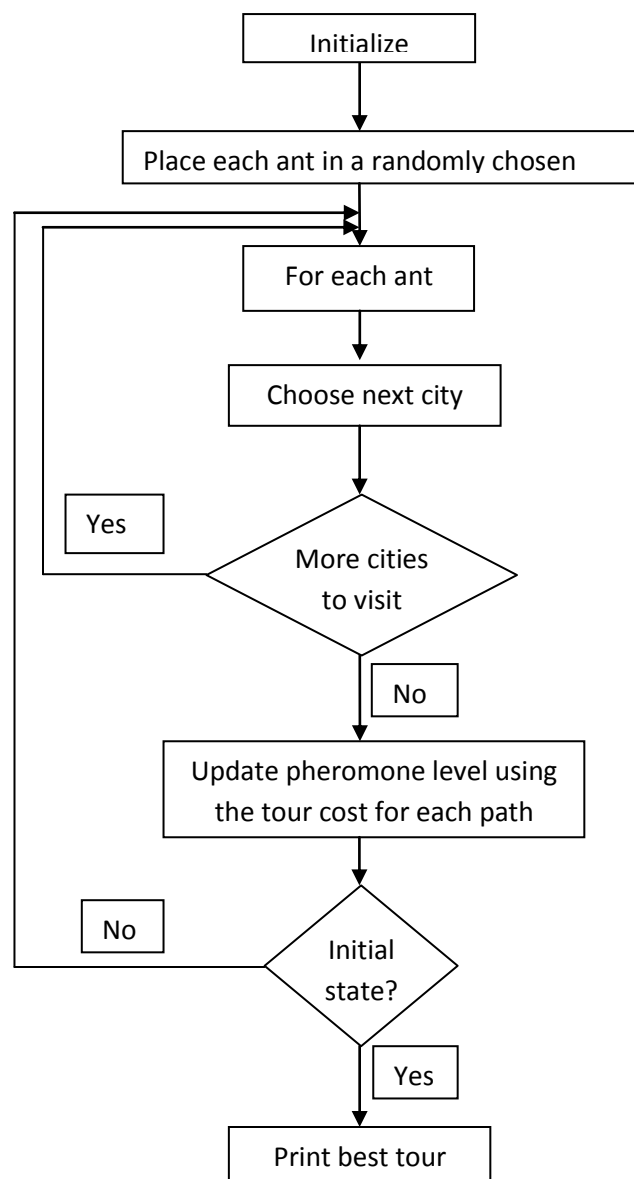
Now we discuss about the usage of digital ant technology for solving the TSP.

Behavior of the digital ant:

- The primary behaviors that are assumed for the digital ants are [3]:

 1. Preference for paths with high pheromone level.
 2. A higher rate of growth of the amount of pheromone on shorter paths.
 3. Trail mediated communication among ants.
 4. The ant is enhanced with memory, giving it the ability to reference cities already visited.
 5. The ability to calculate the distance to cities[3].

Flowchart



- [7] <http://news.wfu.edu/2011/05/27/digital-ants-protect-computer-networks/>
- [8] <http://www.pnl.gov/nationalsecurity/leadership/cybersecurity/feature.stm>
- [9] <http://csweb.cs.wfu.edu/~fulp/ewfPub.html>

Description

From the above flow chart, initially place each ant in at randomly chosen city. Then they calculate the distance, after calculating the distance they should move to the next city, if particular city is already visited, then it should go back. If ant want to visit more cities then same process will continue, after visiting each city they should update pheromone level at each path. Once the ant reaches the initial state, then we print the best path [2] [3] [4].

VI. CONCLUSION

Normally for identifying the threats in the desktop based applications, we use the antivirus application. Suppose if we want to identify the threats in a network we use this digital ant technology. The above sections describe the behavior of the digital ant and its working procedure. And we have also seen the sample proven theoretical results in different areas such as image processing and solving the travelling salesman problem. From the flowchart we can see the behavior of the travelling salesman problem for identifying the best path. So, in-order to understand the digital ant technology above information gives the brief idea.

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