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Exploring the Wi-Fi Connectivity in Intelligent Transportation Systems

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Abstract: Wireless communication technology plays a vital role in mobile and vehicular ad-hoc network. Wi-Fi applications retrieve content from remote servers via signals at remote servers can have slow traffic response times due to communication latency incurred during transmission of the potentially large query or signals. We study the Wi-Fi usage, processing and transmission latency, and use the dynamic programming framework to solve for the optimal processing policies that suggest the amount of processing to be done at radio frequency (RF). In this paper we want to represent the proposed architecture for the Wi-Fi with vehicular ad-hoc network and also prepare and handoff algorithm for the proposed architecture.

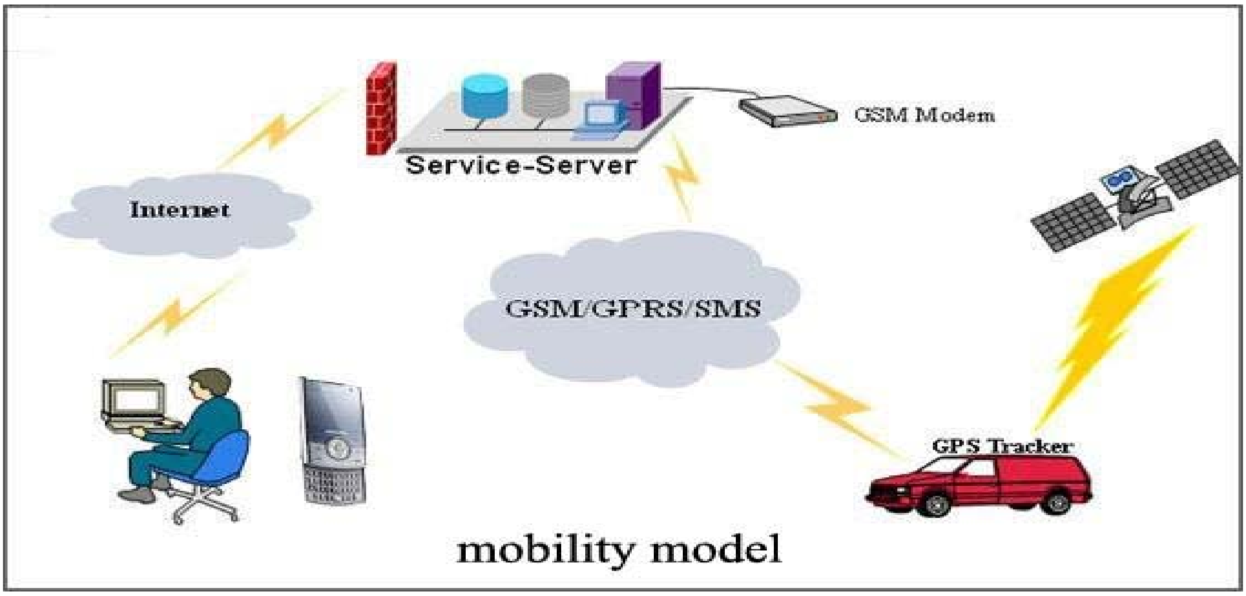
Keywords: Denial of Service (DoS), Wireless Ad Hoc Networks, Distributed Probing, Secure Routing Protocols, simulation.

I. INTRODUCTION

While there have been great advances made in the speed and ease of implementation of Wi-Fi networking and communications technology, the video monitoring systems are playing a major role in today's world, especially in the military, industrial and civilian security applications. Traditional video surveillance can generally achieve close distance monitoring, by using the PC as a monitoring unit connected to surveillance camera with coaxial cable. These video surveillance systems are broadly classified into analog and digital video surveillance systems.

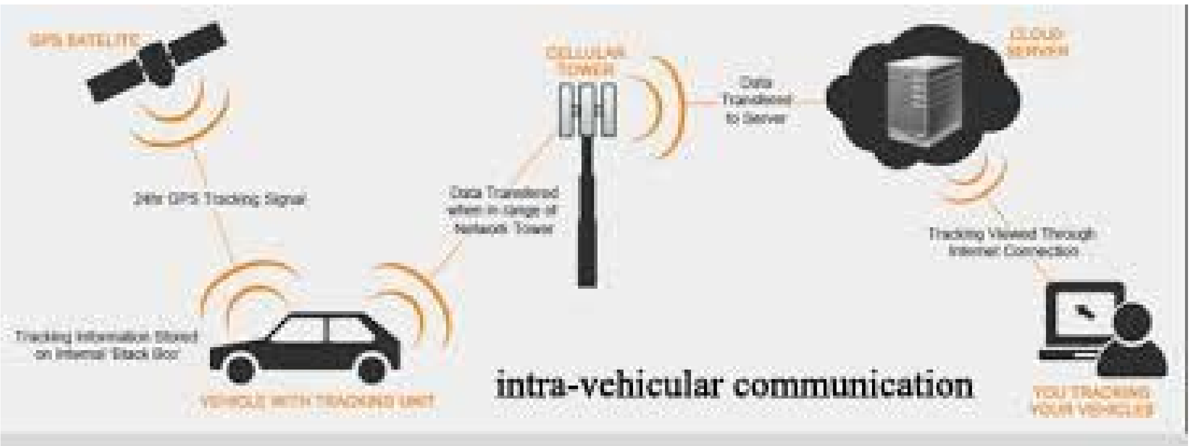
But today in this digital world, the video surveillance systems based on embedded technology are more advantageous compared to the traditional surveillance systems, as it provides high performance at low cost and good stability. Meanwhile, it possess some advantages, for example, enhanced design simplicity, compact construct, portable, low power consumption, long-distance transmission This paper puts forward a video surveillance system based on Wi-Fi.

Video stream captured purpose using a USB web camera and transferred through the 3G or 4G network under the control of the Wi-Fi, then, the monitor client will receive the data frames which are to demonstrate mobility the server is placed on path and capture an image. The video capture is the core part of the system. The camera capture video images transferred into a video stream format. GSM transceiver module is used for GPRS wireless network module. The system can be applied for monitor of anti-theft, dynamic transportation, on-road security, medical treatment, as well as in all kinds of video surveillance systems has the advantages of fewer and simplified modules, cost effective, enhanced intelligence, greater system stability and higher security. In Wi-Fi network, the mobility nodes are vehicles which are moving in a high speed of nearly 200 km/hr on a predefined road. The movement of nodes is dependent on the road structure, traffic and traffic regulation. Due to this high speed of the vehicles the usual mobile ad-hoc technology IEEE802.11 is not well suited for Wi-Fi. For this reason a suitable amendment is made on the existing standard 802.11 that becomes a new vehicular technology 802.11p. Another big challenge is creating the Wi-Fi network outside the city area. The real issue is to develop a model for the highway mobility outside the city. Therefore a new highway mobility model is developed with a new cluster concept that increases the efficiency of the data communication. In the new concept a simple highway system is taken for characterizing the Wi-Fi. The newly proposed system takes into consideration the two scenarios:

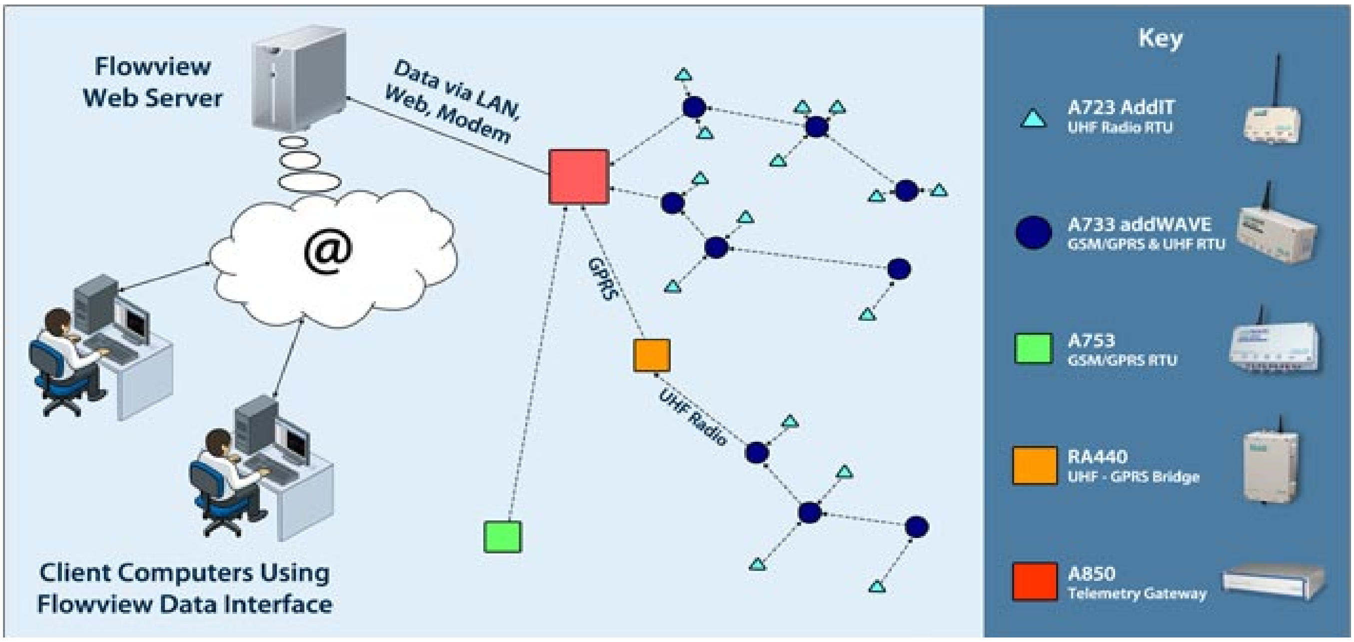


a) Through Wi-Fi Service to Discovery when a vehicle moves inside the city.

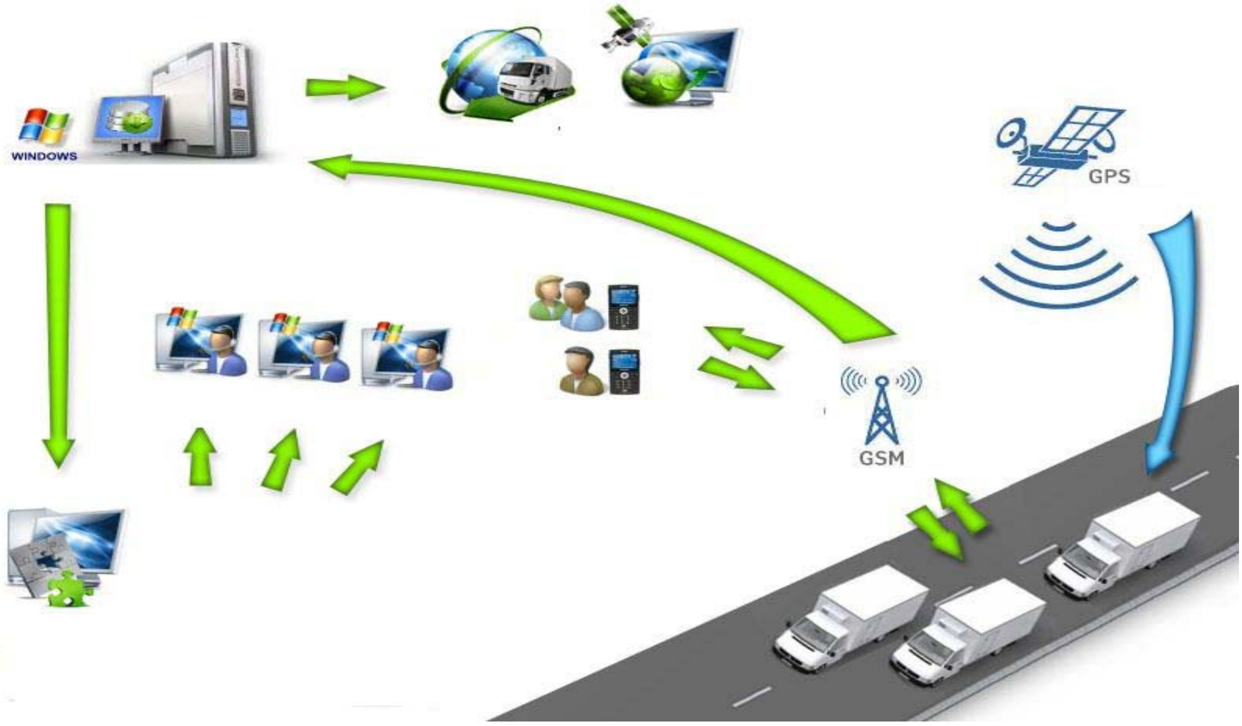
b) Through Wi-Fi Service to Discovery when a vehicle moves outside the city.



The intra-vehicular communication from vehicle to vehicle through the RSU's and inters-vehicular communication through the RSUs are shown in figure. In the non-urban area, limited road side units are available for data communication. For effective vehicular communication each vehicle acts as a router to exchange information. Each vehicle is equipped with a global positioning system (GPS). Broadcasting and routing algorithms use the information provided by the GPS and make effective communication. For the road safety, new applications are proposed for vehicular networks, i.e. car to car, car to bike and heavy vehicles communication, travel and tourism information distribution. These applications need reliable communication equipment with high data rates and also a stable connectivity between the transmitter and the receiver under high reliability condition.



The Wi-Fi Cluster creation process in the proposed model is different from the existing model. The size of the Wi-Fi cluster changes only during unavoidable situations like sudden increase in the number of vehicles moving in a particular road due to traffic changes. The Wi-Fi cluster remains in the same frequency, so the cluster areas are created as fixed ones. While creating a cluster, it should be ensured that the cluster head does not frequently cross the cluster boundary.

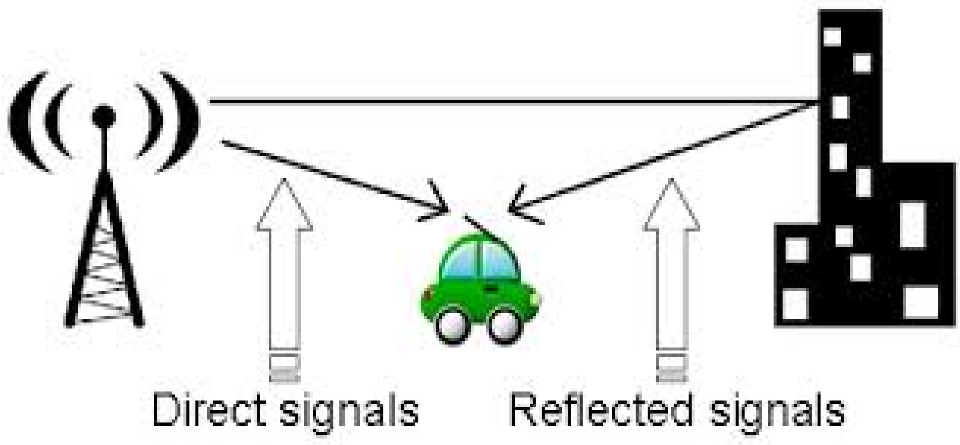


Cluster head election algorithm often elects a new cluster head. The Wi-Fi area has been split into a number of clusters by using the proposed cluster formation algorithm. Each cluster has a cluster head. All the cluster heads in the Wi-Fi are regularly updated if a new service centers in the network. In a Cluster environment, the Cluster head receives information from any node of that cluster and sends it to another cluster head. Cluster-based solutions provide less propagation delay and high delivery ratio. The earlier Wi-Fi models discussed only the communication between vehicles through the RSU. One of the most important issues is how to efficiently support mesh client handoff between different routers, it is very important to employ the call admission control (CAC) mechanism in the mesh router. So there are some challenges to handoff using mobile agent.

II. WORKING OF PROPOSED ARCHITECTURE

Cluster Based Wi-Fi

Often clusters are used for primarily computational purposes, rather than handling IO-oriented operations such as web service or databases. For instance, a cluster might support computational simulations of weather or vehicle crashes. The primary distinction within compute clusters is how tightly-coupled the individual nodes are. For instance, a single compute job may require frequent communication among nodes - this implies that the cluster shares a dedicated network, is densely located, and probably has homogenous nodes. The other extreme is where a compute job uses one or few nodes, and needs little or no inter-node communication. A simple highway system is used for the Wi-Fi. Each vehicle is using a global positioning system. To create Clusters dynamically in Wi-Fi the following steps:



III. WI-FI FAILOVER MANAGER

The failover manager consists of the list of dead process. The failover manager handles the situation when a process is dead. This failover manager periodically updates the node chooser with the list of dead process to prevent the node chooser from sending the subsequent requests to the dead process. When a process that is currently processing the requests assigned by the dispatcher interceptor is down, then the failover manager informs the dispatcher interceptor about the failure of the process. Now the dispatcher asks the node chooser for an active process by sending again the request and the process chooser responds the dispatcher with an active process.

Two Stage Composite Clustering Algorithm

Stage1: Divide the original dataset:

The dataset D is divided into k number of clusters C= {C_1, C_2, C_3………..C_k} using the threshold as cluster size. The one pass clustering is described as follows.

- Read a data object ‘p’ from the dataset and assign it to an empty cluster S.
- Create a cluster with the object ‘p’

- If no objects are left in the dataset then go to step 6, else read a new object p, find the cluster C1 in S that is sufficiently close to the object p.
- If dist (p, C_1)>r then create new cluster with the new data object.
- Else merge data object p into cluster C_1.
- Stop.

IV. CONCLUSION

Accordingly, this paper focuses on the software developers' work practices necessary to identify the list of actors whose actions should be monitored and to whom actions should be displayed. We call this set of actors the awareness network. In shifting the focus, it is possible to observe a myriad of such practices, how they are influenced by the work setting (organization, software architecture, etc), the problems that arise when this identification is problematic, and, finally, software developers' concern with the management of these networks.

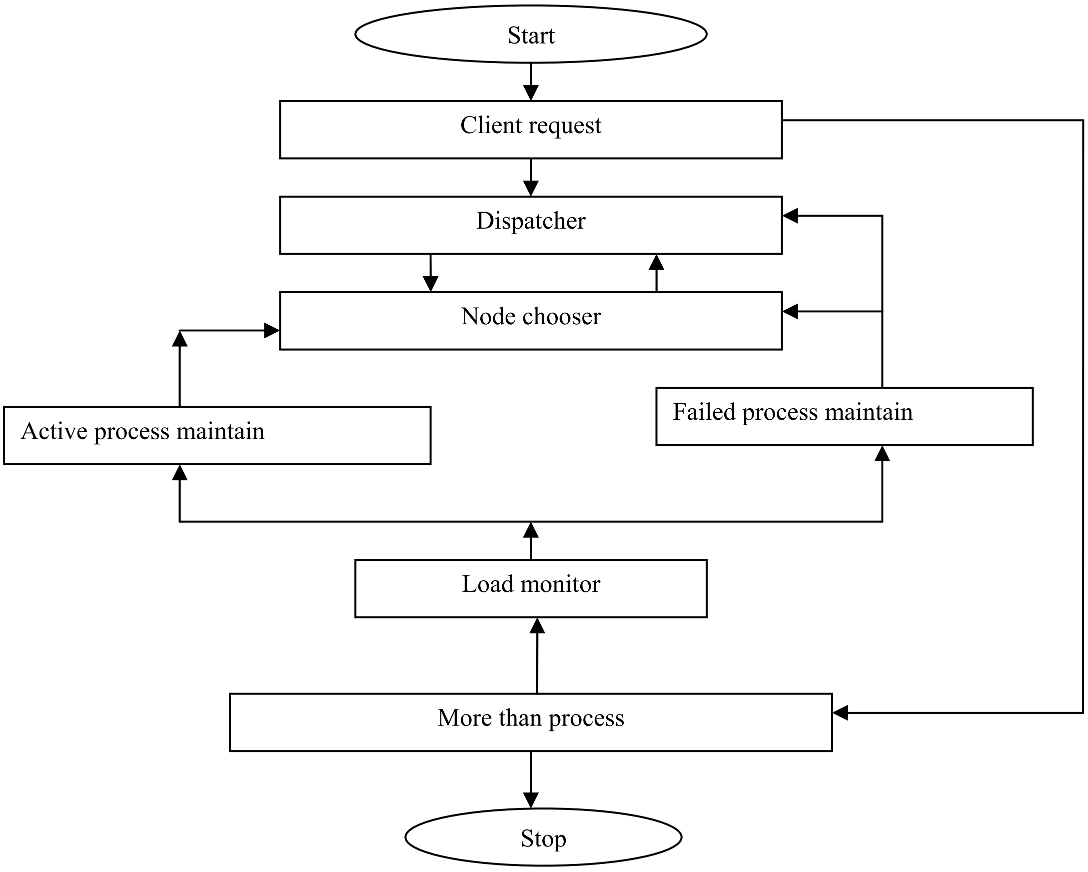
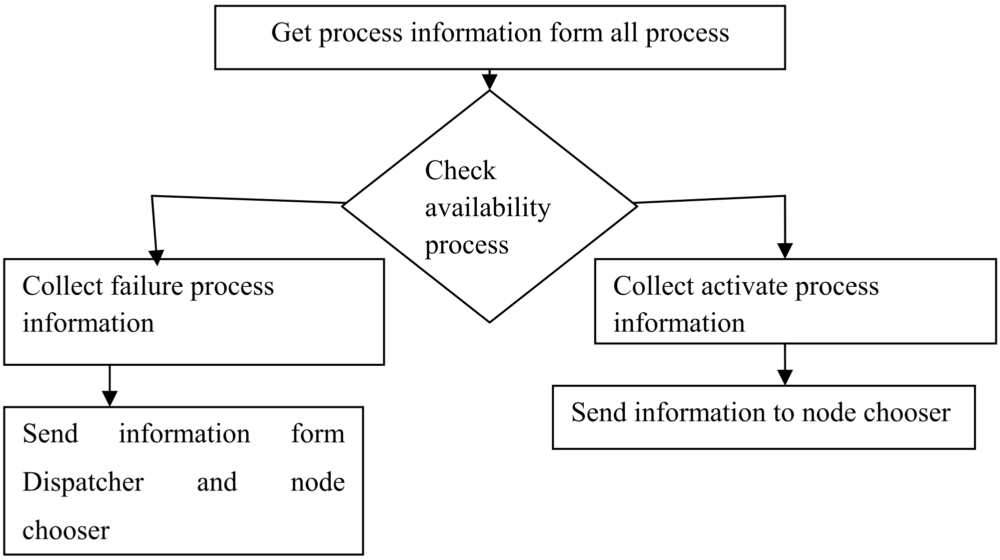


Figure: data flow in load balancer

Stage 2: Merge the clusters:



We regard every cluster obtained in stage 1 as an object, and merge them again with the improved DBSCAN. For K original clusters {C_1, C_2……..C_k} after merging with DBSCAN, there will be N_0 final clusters. Merging steps are described below:

- Regarding every cluster obtained in stage 1 as an object, we define their initial state as unprocessed and compute distance between arbitrary two clusters.
- Reading a cluster (original cluster).
- Turn to Step 2 to read the next cluster when the state of the cluster C (original cluster) is noise.
- If the state of the cluster C_i (original cluster) is unprocessed, then count its Eps neighborhood NEps (C_i). If N_{Eps} (C_i) < MinPts then we define the cluster C_i (original cluster) as noise and turn to Step 2 to read the next cluster. Otherwise, if N_{Eps} (C_i) ≥ Minpts, then we label the cluster C_i (original cluster) as core cluster, and create a new final cluster C'_j with the cluster C_i (original cluster).Add all clusters in N_{Eps} (C_i) (original cluster) into the new final cluster C'_j.
- Repeat step 2, continue to process the clusters (original cluster) in final cluster C'_j until no new cluster (original cluster) is added to the final cluster C'_j.
- Repeat step 1~step 5 until all the clusters (original cluster) have been merged into a certain final cluster or been labeled as noise.
- After reading all clusters (original cluster) orderly, merge the clusters, whose state is noise, into a final cluster.

V. WI-FI CHOOSING R, EPS AND MINPTS

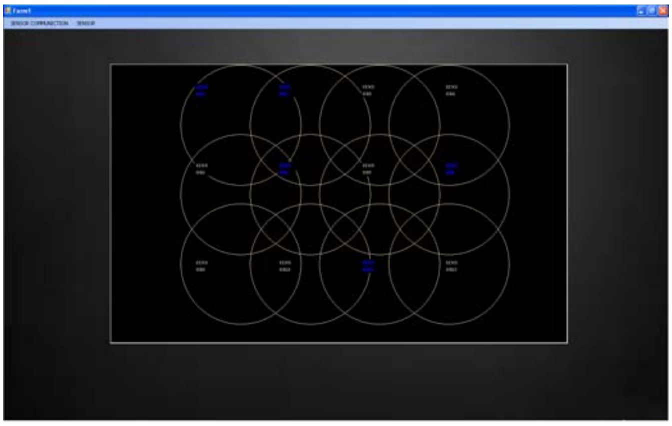
In stage 1 the Quality of clustering and time-cost efficiency of algorithm is influenced by the input parameter, threshold r. The Threshold size r is inversely proportional to the number of clusters. We describe a sampling approach to determine r so that it is greater than inter-cluster distance and less than intra-cluster distance. The technique used to determine threshold is described as follows.

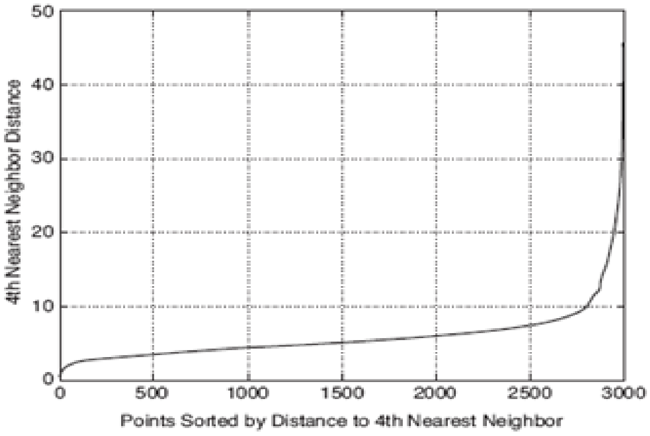
- Choosing randomly pair of objects in the dataset D.
- Computing the distances between each pair of objects.
- Computing the average distance EX and calculating standard deviation DX.

In the stage 2 we use technique to determine the Eps and Minpts of DBSCAN. The basic approach is to look at the behavior of the distance from a point to its k^{th} nearest neighbor, which we will call the k-dist. For points that belong to some cluster, the value of k-dist will be small if k is not larger than the cluster size. Note that there will be some variation, depending on the density of the cluster and the random distribution of points, but on average, the range of variation will not be huge if the cluster densities are not radically different. However, for points that are not in a cluster, such as noise points, the k-dist will be relatively large.

Therefore, if we compute the k-dist for all the data points for some k, sort them in increasing order, and then plot the sorted values, we expect to see a sharp change at the value of k-dist that corresponds to a suitable value of Eps. If we select this distance as the Eps parameter and take the value of k as the MinPts parameter, then points for which k-dist is less than Eps will be labeled as core points, while other points will be labeled as noise or border points.

Figure: k-dist graph





The k-dist graph for the data is given in Figure. The value of Eps that is determined in this way depends on k, but does not change dramatically as k changes. If the value of k is too small, then even a small number of closely spaced points that are noise or outliers will be incorrectly labeled as clusters. If the value of k is too large, then small clusters (of size less than k) are likely to be labeled as noise. The original DBSCAN algorithm used a value of k = 4, which appears to be a reasonable value for most two-dimensional data sets.

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