A Consensus Algorithmic Approach to identify multiple target nodes in Cloud Environment using Navigational Feedback

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Abstract: Identifying the featuring of past legacy system provides a scalable solution in artifacting reliable communication defining the qos at a higher rate. Likely the umbrella of computer networks deals with variety of service architecture. Among that cloud services stands in providing a betterment of services to attain more and more trustiness among multiple stakes of cloud. As we all know cloud can also determine well in providing the service virtually. When attain the services in virtual environment there may be lack of trust among nodes or for other stakes of cloud. Targeting an individual node may be very simpler to get communicated with other. But processing the service among heterogeneous node parallel might be complex issue in access control. Processing one or two node is easily achievable by flocking on the other side processing multiple nodes among different cluster is a serious challenge and flocking doesn't meet this challenge. In this paper we introduce a semi-flocking approach which is very Consensus and has the ability to solve mass target processing.

Key Terms: Flocking, Target Node, Semi Flocking, Navigation

I. Introduction

Cloud services are the current trending approach in IT for any entity. Cloud structures or applications are mainly driven and motivated by e-commerce that deals with many of the heterogeneous attributes. Among that security, reliability and trust is the main factors to aquisite QOS. Recent proofs justifies the tremendous growth in this area, its been huge positive impact on distributed applications in maintaining the potentiality.

Cloud services have notified its outcomes vigorously on SaaS, PaaS and IaaS applications respectively monitoring with respect to performance, delay, and guaranteed service for both physical and logical attributes. Incorporating and coordination between the server management regulates with huge complexity in finding the target node which can be a group or cluster communicator among heterogeneous nodes in a server. The dataset acquired by the server can be cumulative and fused to acquire a complete pictorial of that information in cloud environment and delivers the service among different stakes of cloud. Due to few limitations with respect to communication and energy, the centralized merging algorithms are not more effective. For this reason we need a distributed algorithm that limits the interaction with immediate nodes.

The major challenging part in self organizing node is coordination, while offering the service and control over in communicating, where it leads to a situation in rising for an elaborated solution for node identification and maximum coverage of target nodes among different servers.

Based on Reynolds rules a forbidden and eligible approach in determining the target node identification flocking algorithm was implemented on behaviours of birds when the follow the rule trajectory and it was satisfying conclusion for single boid [9]. Flocking is a system which is inspired from biological attitude that consoles with a cooperative coordination to achieve group objective and pop up their behaviour. Examples of fishes, insects and birds etc natured for this flocking approach. To attain the flocking behaviour each entity follow the Reynolds rules and their objective is to coordinate with their neighbouring agent [10]. The rule is adaptive in IT for survivallence systems (Adhoc networks) [9].

A scaled up or elaborated version of flocking [10] is introduced in our work. Flocking based approach is also briefed and discussed; it's been used as a standard to learn the betterment of semi-flocking scheme.

II. Flocking algorithm in mobile clouds

As mentioned earlier in the introduction cloud services completely rely on the services of its cloud stack which is also an application for different physical and logical computing aspects. Among that if we consider mobility as a service people makes use of handheld devices for the cloud operation. Coming to the server management hosting a service among node coordination to achieve integrity and interdependency is a main challenge in distributed forum likely on mobile nodes. Amazon EC2 mentioned this drawback in accessing multimedia, document editing and calendaring applications. The main highlight for all these flaws was lack of node coordination in the cloud environment which are really operative and suitable for centralized environment. Even the service of two nodes appear to be homogeneous the server delivering these services lacks in how many nodes are coordinating in provide the same service. To have a local intermediate coordination between the server and service offering nodes flocking algorithm is well suited for achieving local communicative objective. As flocking approach is driven by nature and successive enough in self organized networks and adaptive enough for distributed environment. The merits we found in flocking based approach on mobile sensor networks helped and motivated us to tackle the flaws that exist in cloud services with respect to different scenarios.

We can state few assumptions about server management while offering the service

1. The SMS consists of n number of nodes deployed on main request server which leads with a leading rendezvous node
2. Ability in communicating: each node can communicate with all its neighbouring node by message passing system through communication network
3. Threshold for communication: each node can coordinate with all the target nodes with in the distance S from its location.

Flocking scenario

It's a scenario where a collection of behavioural representation in a group of autonomous agents [12]. This kind of behaviour is initiated via intra interactions, a similar group objective and without the knowledge of overall information or global information. This process resembles the group behaviour of birds [9][20].
1) Flock Centring: Stay close to nearby flock-mates.
2) Collision Avoidance: Avoid collision with nearby flock mates.
3) Velocity Matching: Match velocity with nearby flock mates [10]

Earlier a theoretical frame work was proposed by Olfati-Saber [20] for the design and analysis of distributed flocking algorithms to achieve coordination in sensors [20]

$$u_i^{\alpha}=\sum_{j\in Ni} \phi_\alpha(||q_j - q_i||_\sigma)\, n_{ij}+\sum_{j\in Ni} a_{ij}(q)(p_j - p_i)$$
(1)

Her in (1) N_i presents neighbours of node *i*. Also the equation indicates the summation of gradient and consensus terms. The features of (1) is abstracted as defined below with consideration of $q_j - q_i$ that gives a norm value σ that gives vector routing and stated as equation (2)

$$||Z||_\sigma=\frac{1}{\varepsilon}[\sqrt{1+\boldsymbol{\varepsilon}||z||^2}-1]. \quad (2)$$

Finally $a_{ij}(q)$ in consensus representation of (1) results in spatial representation includes (1) and (2) gives (3)

$$a_{ij}(q)=\rho_h(||q_j - q_i||_\sigma/r_\alpha)\ [0,1] \quad (3)$$

The primary part and secondary part of u_i^γ which is navigation term and provides feedbacks for individual target tracking results equation (4) where c_1 and c_2 are relatively positive constants

$$u_i^\gamma=f_i^\gamma(q_i, p_i, q_t, p_t)= - c_1(q_i-q_t) - c_2(p_i- p_t).$$
(4)

The adaption of flocking algorithm is driven with respect to the knowledge of sensor management for coordination between sensors where in the sensor networks applicable for survive lance applications to identify the target and show its prominent behaviour. In our work we abstract the said idea for cloud services where in it lacks in coordination among nodes for various factors like trust, access control, performance, node behaviour and so on. Its major challenge in cloud in identifying the rendezvous target node and how better it coordinates with the other existing nodes within that cluster or group. In our previous paper Flocking based trust management for cloud we tried to identify the rate of trustiness among the stakes of cloud by considering rule of Reynolds and applying it on K-factor. The above equation (4) specifies the individual target tracking when there are N numbers of targets. Figure (1) represents individual target node tracking .The dark region represents target nodes and the remaining blue, green and red are nodes approaching towards target

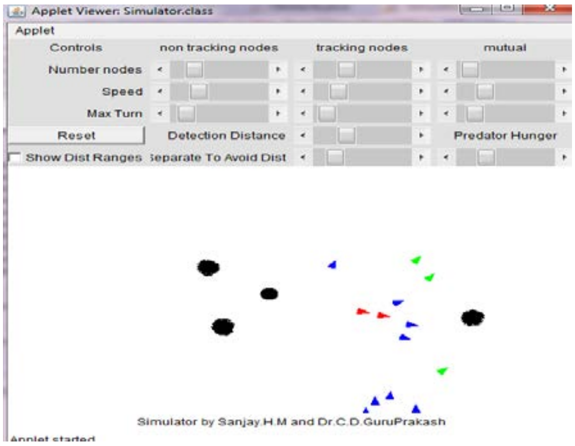

Fig.1 Individual Target node tacking

III. Semi flocking

The factors of applying the rules on each node to drive the result. The rules that we adopt probably be simple enough and treated as the input values on each node. The result concludes with a complex section and can be considered as semi flocking approach. In flocking [20] results of our earlier work the node applies a restricted input i.e., $u_i = f_i^g + f_i^d + f_i^\gamma$ [9] here the agents of two relates the Reynolds rules. The last on gives the propagation feedback. The vector proposal mentioned in flocking approach leads unconventional design in attracting the node to either of the target regulations passed on for decision making. This slight turn up of modification influences the attitude of nodes get turn up towards the target surrounded in cloud environment or else gives a room to look up for searching new point acting as a target node. The node which satisfies all the constraints of rules in achieving of tracking target node are completely dependent on r serious parameters: a) the amount of distance between the target node and node looking to track up target node. b) Amount of nodes which are targeting the target earlier. The nodes which are in to tracking applies equation no 1

$$u_i^\gamma = \sum_{j=1}^{m} \varphi(q_{tj} - q_i)\, \frac{c_{1j}(q_{tj}-q_i)+c_{2j}(p_{tj}-p_i)}{n_{tj}}.$$

$$u_{i,tj}^\gamma = \frac{c_{1j}(q_{tj}-q_i) + c_{2j}(p_{tj}-p_i).}{n_{tj}}$$

$$u_i^\gamma = c \times (q_{w},l - q_i) \qquad (5)$$

Here the node can be considered as i , the conditional part target can be assigned as j where initially the value of j consensus to zero to m , m signifies the number of points acts as a target node, c_{1j}, c_{2j} are optimal and results as positive constant values , where n_{tj} is considered to be value where number of nodes tracking the targets point tj , the line of vector that connects amount of nodes i to t_{ij} is $(q_{tj}-q_i)$, and $(p_{tj}-p_i)$ signifies the negative difference of node i and tj.

```
u_i^γ = 0;
for target j=0 to m do
   if ||q_tj − q_i||_σ ≤ θ_j then
      u_{i,tj}^γ = (c_1j(q_tj − q_i) + c_2j(p_tj − p_i)) / n_tj
      //where n_tj is the number of        already tracking target tj
      u_i^γ = u_i^γ + u_{i,t}^γ;
   end if
end for
if u_i^γ == 0 then   //          searching mode
   q_{w,l} = center of adjacent areas that has least visited times
   u_i^γ = c × (q_{w,l} − q_i)
   //toward the area that has longest time not being visited
end if
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Fig. A pseudo for node i projects a navigational control tracking

We consider the theory of Euclidean distance (ref) for the above figure where the part of distance from node i is lesser than the θj . At the earlier θj is assigned to a default condition where it relies on overall number of nodes and targets which are participating. This value is applicable and same for all the targets involving in the cloud environment. After few iteration the defaults values are switched over to its correctness based on amount of nodes that supports the target. In this process if the supporters are found at a higher rate the value of θj falls and vice versa. The contribution each rendevzous targets is calculated in terms of tj.

$$u_{i,tj}^\gamma = \frac{c_{1j}\left(q_{tj}-q_i\right) + c_{2j}\left(p_{tj}-p_i\right)}{n_{tj}}. \qquad (6)$$

The above said equation determines the inverse proportionate with respect to flock size surrounded to target point and nearby them. If the size of flock projects bigger enough, than results in smaller value of navigating vector.

In this approach of navigational part in turn with semi flocking scenario , if any either of the target doesn't exist close to node i that the node looks for an target identified node to detect targets entering the premises . Nodes which are not able to identify the target either of any scenarios are neglected and treated as ignored on for further tracking activity

IV. Factors considered for evaluation

Cloud server management in the context of target node identification has a two embedded objective. Primarily it should fairly demonstrate the target point covering in a robust method and secondary is it must be able to provide dynamic coverage as a whole. Based on the mentioned requirements we try to consider four factors: 1) Total Target Coverage (TTC) , Target Identification Time(TIT), Amount of undetected targets(AUT) , Here in equation *i* signifies a target, each t_i is a value represents a fraction with respect to time where target *i* is been completely covered by *k* nodes.

2. *Target Identification Time*: its fact identified until the target is been passed with respect time when it is covered by *k* nodes

A. Experimental phase

In this phase we tried to provide few inputs that are developed in Java Framework. We tried to implement the frame work for both flocking and Semi flocking Scenarios where in to prove Semi flocking achieves a selective challenge in identifying target Rendevezous point that can't be achieved by using flocking rules (ReynoldsRules).

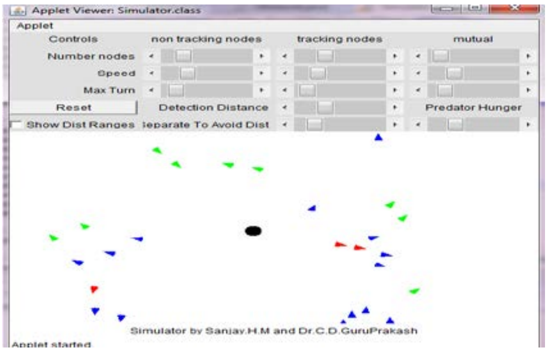

Fig.2 Random nodes tracking Targets

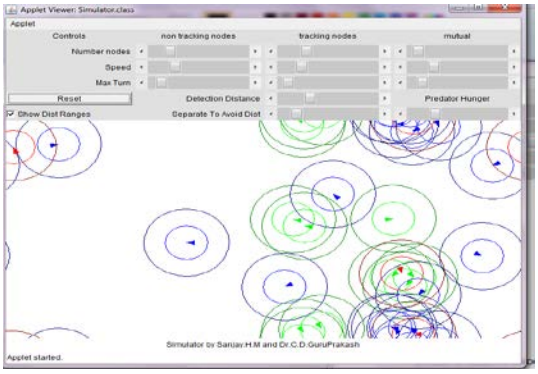

Fig.3 Track of Targets

Cumulative Coverage(CC). Among these factors we try to solve TTC

1. *Total Target Coverage:* is the amount of percentage of its lifetime where it is covered by *K* Nodes. By treating that *k* is the lowest factor of nodes required for targets coverage

$$TTC_i = \frac{\sum t_i}{lifetime_i} * 100 \qquad (7)$$

The above figure represents the amount of nodes which are tracking the target based on the relation of cohesion and separation of Reynold's rules. The activity described in the figure gives the comparison of single target identification and mass target identification. In this representation of experiment the system is fed with an random attitude of nodes where it contains maximum count of 25 nodes. For the number of targets 10 instances were generated as a process activity. The average consideration is drawn for overall instances that happens with respect to node tracking the target point

B. Simulation Result and Analysis

We considered the following parameters: target nodes=4, overall nodes=25,d=20, a=b=5, h=0.2 and time constant is 0.02s

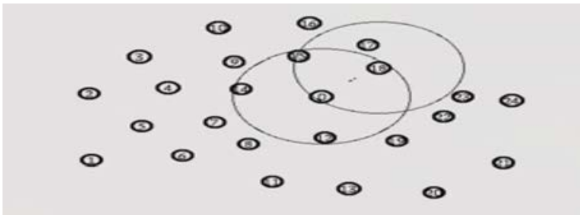

Fig.4 Minimum tracking of Target

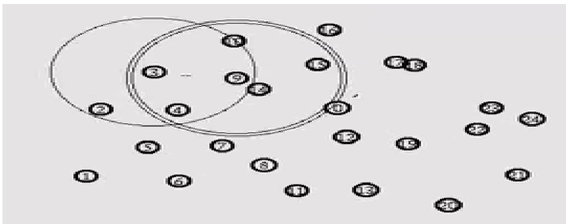

Fig.5 Increase of Tracking

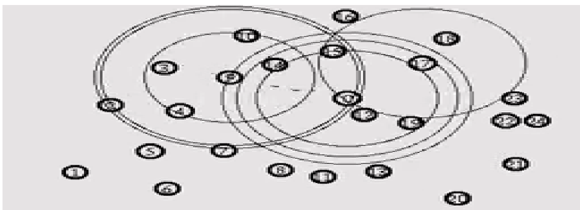

Fig.6 Target point tracked by Maximum nodes

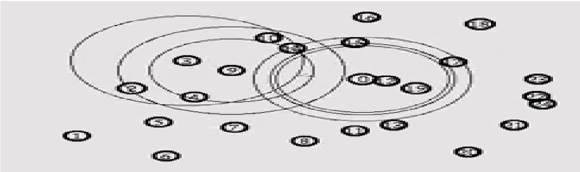

Fig.7 Target approaching regular areas

In the above figure we come across four scenarios where it uses the above said inputs. Firstly we consider the minimum track with minimal nodes which is achievable only for flocking scenarios, here there is no interaction among target nodes mutually observation made in fig (4). Next, setting node 0 as the target point and nodes which are already involved in tracking are ruled out and other area of nodes which is tracking are considered.

In figure (5) compared with earlier tracking node 0 associated with other node 9 and 4 sets navigation towards within its boundary alerting that node to be involved in the same set of navigation. In fig (6) maximum nodes have been associated with the said target nodes. In fig (7) is optimizing the nodes with regularity for increased tracking and mass target tracking. In this experiment it proves different scenarios of target node tracking in the cloud environment.

Based on the factors considered in the section IV are as follows

Total Target Coverage: The input provided for flocking and semi flock scenario represents a point which is considered as total target coverage (TTC) with maximum number of targets. For instance if targets are of count 2 it represents the value as $TTC_1+TTC_2/2$.

In the fig (8) below represents content as flocking and navigational as semi flocking the highest total target coverage through navigational feedback which results for semi flocking scenario which is efficient than flocking with respect to mass target coverage. As it creates small amount segment boundary area to get flocked as a result it forms minute flock around each target node. Whereas flocking approach is clear for individual or small amount of target node identification. Here the one target coverage is perfect compared with multiple. In navigational feedback content as the number of target nodes gets increases there will be decrease in flock size. As shown in the figure the content based for individual target identification decreases after few intervals where here TTC_1 is higher for 1^{st} interval but from TTC_2 to TTC_9 is decreased. In navigation scenario the points signifies the consistency of semi flock approach throughout all the iterations.

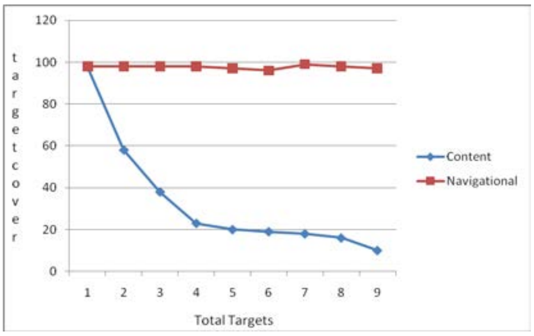

Fig.8. Total Target node coverage comparison

V. Conclusion

In this work we have introduced a navigational approach for multi-target tracking in cloud environment which results for a semi-flock behaviour. The approach of this algorithm integrates both content and navigational feedback system by tracking and result in Total

Target coverage between two algorithms and stating that navigation feedback is better than flocking based scenario for all the time intervals and exhibits a better performance in achieving the objective of multi target node tracking in cloud environment.

The future work can be with respect to minimizing the tracking of already detected target nodes to provide efficient time constraint.

VI. References

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