WAS Science Nature
WASSN

ISSN: 2766 - 7715
WAS PRESS

Article

Survey on Crowd Sourced E-Health Networks

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Received: 15.03.2018; **Accepted:** 20.04.2018; **Published:** 25.04.2018.

Abstract: By using the reliable data congestion which turns out to be very essential, particularly in enormous information timeline, in context of wide adaption of universal crowd sourced medical service's members. Since the crowd-sourced e-health organizations have discontinuous the availability of its remote medicinal services. the information clog investigation is a major issue. The information blockage examination may be acknowledged by axing the quantity of sent duplicates, however, at times, it may not claim the changing system conditions well. Adjusting parcel-sending conditions progressively through identifying continuous system condition can be the good way to comprehend this issue. In view of this thought in this paper, an upgraded steering calculation called Lessened Variable Neighbourhood Seek Based Shower and Hold Up (RSW) is suggested. The current system situations will be assessed and quantized as a continuous limit to adjusts the edge for information clog control. Reproduction demonstrates that the proposed calculation expands information parcel conveyance likelihood, and advance the overhead proportion significantly, that may be doing 10 times lower than that of standard calculation.

Keywords: Crowed; E-health; Networks; Buffer minimization

1. Introduction

E-health advancements are imagined enhancing the traditional medicinal service's framework. As it is to a great degree testing in the wording of physical assets to give successful medicinal treatment to an extensive maturing populace in the healing facilities, E-health utilized the current achievements in remote sensor advancements what's more, clever gadgets to screen elderly individuals' well-being remotely. As of late, crowd-sourcing step-by-step progresses toward becoming a smart answer for process unstructured enormous information [1]. Versatile crowd-sourcing exploits human insight to achieve the substance gathering and handling to accomplish the fundamental information requests [2]. In a crowd-sourced e Health arrange, the old individuals are normally conveyed or installed the compact sensors in order to record and reveal their physiological status. Whence information is gathered, it will be sent to the remote human services suppliers for continuous checking, that has possibilities for offering monstrous social insurance properties to the old individuals with no require to transporting them to the Healing centres. In any case, e Health arrangements require a colossal sum of information transmission among the patients and the human services suppliers. For information universality, a higher number of sensors may require being conveyed. Additionally, these sensors need high inspecting recurrence for information precision. For instance, mind sensors may produce almost a tera byte of information amid the solitary test. This immense measure of information is normally carried using Web. In a crowd-sourced e Health arrange, bunches of portable sensors are embraced to gather elderly individuals' physiological data. In an established system, it is generally less demanding to improve the system because of its static structure, however for a powerfully changing system structure, customary directing enhancement is by all accounts of constrained use to dodge blockage when transmitting the huge measure of information.

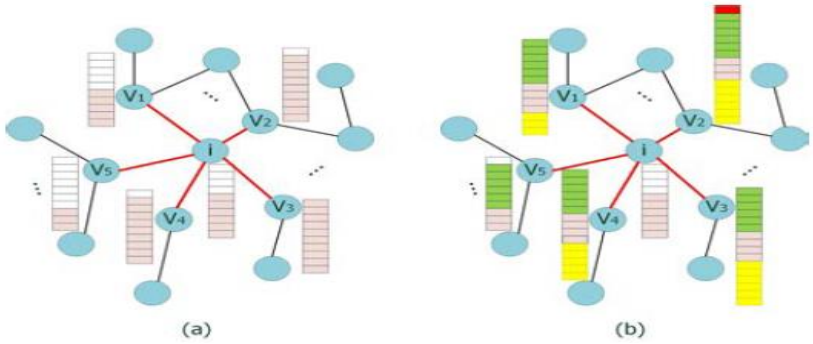


Figure 1. (a) Original buffer status; (b) Buffer status after transmission. [27]

(a) The purple and white cubes show free buffer in addition to busy buffer. There are some red lines, which show the observed communication links.

(b) Pink cubes, red cubes, green cubes and yellow cubes shows both original and received packets as well as dropped and generated packets The crowd sourced e Health arrange display has a few comparable postpone qualities with portable sensor arrange, for example, irregular availability, dynamic system topology, constrained support space and meagre thickness [3]. In any case, the customary information transmission calculations are flooding -based, e.g., Direct Transmission, Flooding, and Epidemic [4], [5]. Whenever utilized for huge information, these calculations may endure organizing blockage, prompting high parcel misfortune rate. Some enhanced calculations have been proposed to maintain a strategic distance from blockage, e.g., T. Spyropoulos et al. proposed Spray and Wait (SW) calculation in view of constrained flooding [6], in which every bundle is relegated with a fixed number of duplicates. The SW calculation first executes Shower arrange: a source hub transfers L duplicates of each bundle to various trunk hubs. Then, in the Wait organize; these trunk hubs will actualize Direct Transmission. The SW calculation can be viewed as the mix of Epidemic also, Direct Transmission. Be that as it may, Spray stage may create huge measure of duplicates, which still end up plainly overpowering to constrained support, particularly when enormous measure of information is transmitted. An illustrative cushion status is appeared in Fig. 1[27]. In the event the cradle of a hub is filled up or is insufficient, the hub is inaccessible to fill in as the bearer. Some dropping instruments are expected to drop or convey parcels to different hubs to discharge enough space for the recently produced parcels. In Fig. 1 (a), the support of encompassing hubs is practically filled up. Notwithstanding, in view of the possibility of the Spray organize, hub I will convey its supported parcels to encompassing hubs. As a result, hub I' neighbours need to drop their supported bundles, as appeared in Fig. 1 (b)[27], to make space forgot parcels. Additionally, these neighbour hubs can scarcely find cushion space for recently produced bundles. In like manner, we require a legitimate approach to evaluate neighbouring hubs' cradle status, progressively.

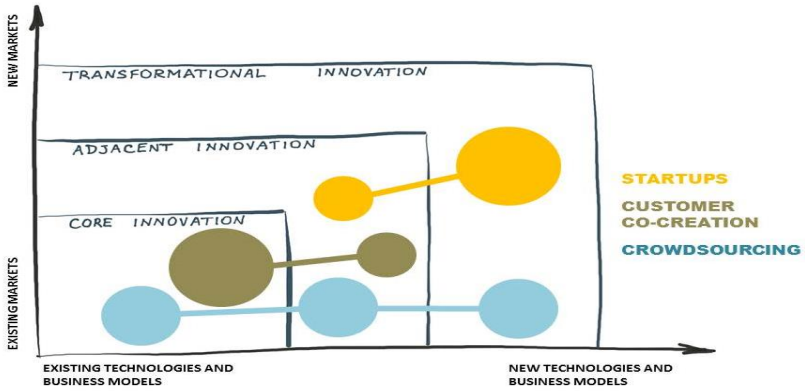
2. Related Work

An awesome worry about the monstrous volume of information for crowd sourced arranges in the scholarly community and industry has been indicated. A standout amongst the clearest concern accompanies how to process this information. In [8][10], we have proposed an information handling design for versatile Health arrange. On the transmission point of view, enormous explores are propelling from various perspectives [11], [12]. Be that as it may, the greater part of writing paid restricted thoughtfulness regarding the transmission component, which is a fundamental some portion of the issue. This survey shows more endeavors into streamlining the transmission component. For the first calculation, SW, 2 sending models of the Spray organize [6]. The first model is SSW (Source Spray furthermore, Wait), in which just a single duplicate of the bundle is transferred from source hub when it speaks with another hub until the point that the quantity of duplicates in the source hub abatements to one. Each met hub will just contain one duplicate of the bundle, what's

more, enter the Wait organize. In this model, dependability isn't ensured since there are just two bounces at most in the steering process. The other one is called BSW (Binary Spray and Wait), that when hub A (source hub or trunk hub) with additional than one duplicate of the bundle meets hub B without duplicates, hub A will convey half of its duplicates to hub B, and save other half duplicates to itself[20]. This procedure rehashes until the number of duplicates lessening to one. The last model is better as far as bundle conveyance likelihood and postponement as it includes more than one hub to help execute the Spray arrange. The calculation could be viewed as a leap forward around then, in any case, it additionally expands analysts' enthusiasm to upgrade it in different viewpoints. At exhibit, the advancement of SW can be partitioned into the accompanying classifications.

3. Spray Improvement

Spray stage can be optimization additionally be ordered into three angles as indicated by various rules. The first rule is the recorded meeting data [13],[15]. Through gathering the recorded data of neighboring hubs, the source hub will know which hubs are more appropriate for handing-off. Another rule is the public of hubs [16] [18], whose principle thought is ordering hubs into groups considering a few qualities. The third rule is natural self-adjustment [19],[21]. Under this rule, hubs will modify their own conduct when they distinguish ecological changes. To enhance conveyance proportion, the calculations above as a rule embrace flooding based techniques, which



strain the system assets, and increment deferral and vitality utilization.

Figure 1. Three strategic horizons [27]

Center Innovation: streamlining existing items and plans of action for existing clients. Continuous Innovation: growing to the "new to the organization" markets.

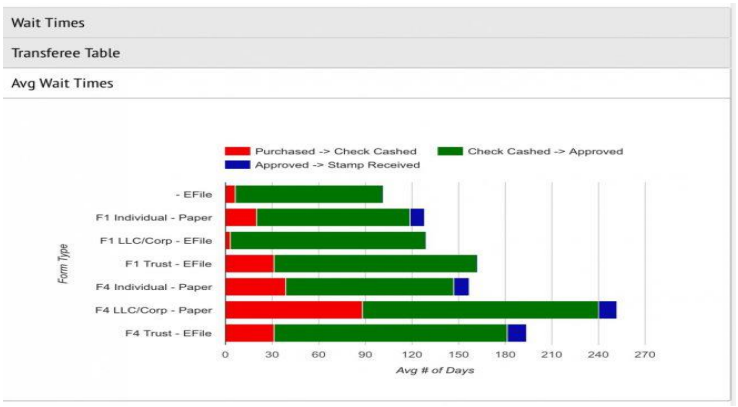
Transformational Innovation: making new items and plans of action to serve markets and client needs that may not yet exist. The significant advantage of the 3-skyline advancement system is that it demonstrates to associations generally accepted methods to structure, oversee and, above all, finance development programs while effectively overseeing dangers. Shockingly, as detailed, it is noiseless as for development devices that associations should utilize when moving toward various advancement skyline.

4. Wait Improvement

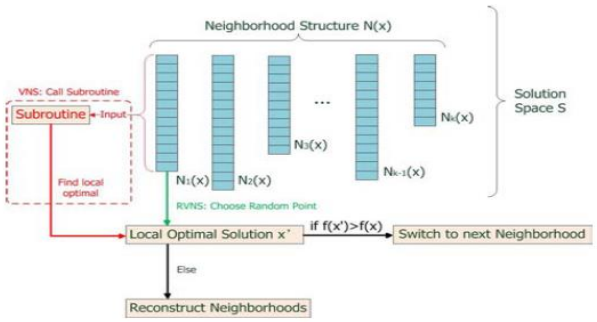
Spyropoulos et al. [22] enhanced the first SW by proposing an enhanced calculation Spray and Focus (SF). It gauges authentic meeting chance between hubs with a utility work, conveys bundle to hubs with a higher possibility in Wait organize. [23] proposed another plan, ORION. In ORION, hubs can identify their neighborhood through estimation of new contacts and foresee the best contact by an autoregressive moving normal. The above changes chiefly focus on decreasing the conveyance delay however paid restricted considerations to blockage issue.

5. Other Improvements

Kishore et al. [24] control replication by versatility assessment furthermore, cushion space identification. Zheng et al. [25] proposed a plan utilizing an ACK-system to expel the excess duplicates of parcels and a token sending innovation to enhance transmission capacity use. This plan is appropriate for an irregular associated portable system because of the freedom of pre-association. o this end, support status of hubs and system clog have been given careful consideration. Although SW predefines the number of duplicates, the system may experience the ill effects of blockage at the point when monstrous bundles are created. To address the issue, we acquaint RVNS with enhancing Spray arrange by updating the flooding process in view of ongoing system conditions. As the first form of RVNS, Variable Neighborhood Hunt (VNS), was proposed and generally explored these a long time [7]. The general idea of VNS is to isolate a major worldwide arrangement space into a few little variable neighborhoods through some predefined criteria regarding with an introduced worldwide ideal arrangement. These little neighborhoods comprise of an area structure. At that point, subroutines are called to find a local optimal solution for each neighborhood in local search. Once a neighborhood ideal arrangement is unrivaled than the worldwide ideal arrangement, the neighborhood ideal arrangement will supplant the worldwide ideal arrangement, and the entire neighborhood structure will be reproduced in view of the new worldwide ideal arrangement. This procedure will rehash to meet the ending conditions: neighborhood reproducing number or, then again maximal CPU time. A standout amongst the most critical issues of VNS is intricacy might be expanded because of some unpredictable subroutines. To tackle the issue, a simplified adaptation, evoked Variable Neighborhood Search (RVNS) is proposed. In RVNS, the nearby hunt will choose an irregular information from an area. The diminishing of computation many-sided quality gives the establishments of quick responses of eHealth frameworks. The contrast amongst VNS and RVNS has appeared in Fig. 2 [27]. Table 1 condenses the documentation utilized as a part of this paper [27].



(a)



(b)

Figure 3. (a)Wait Improvements [27], (b) nieghbors organization

6. Heuristic Optimization Algorithms

6.1. Network Model

This paper survey utilized versatile hubs to speak to the convenient sensors conveyed by or inserted in elderly individuals in eHealth network. We send these sensor hubs in a two-dimensional rectangular region. The system model can be dreamy as a chart GD (V, E), where V (VD vi; v2; v3;: ; vn) speaks to n moving sensor hubs. Every hub can take its own moving course and speed autonomously. The scope of speed is [min; Vmax][17]. Radio correspondence run dmax is the same for every one of the hubs. Two hubs can speak with each other. if their separation is shorter than the range. We utilize E D FVI; VIJD (vi; vj) < dmax; vi; vj 2 Vg to indicate the arrangement of existing correspondence joins. The extent of cushion space is same for each hub. Inside every hub, cushion space is partitioned by two: one for sending bundles, and another is utilized to store the record of encompassing hubs' cushion statuses, which is called cradle counter. The entire system demonstrate is appeared in Fig. 3[27]. Additionally, we likewise make the accompanying supposition: (1) For a subjective hub I, there is a cushion counter showing the support status of itself, indicated as Ci (I 2 [1; n]).

This cradle counter will be transmitted to different hubs when the correspondence. The estimation of Ci (I 2 [1; n]) implies the number of parcels put away in the sending cradle of hub I. For instance, Ci D 6 implies that hub I stores 6 parcels right now. The cradle measure is the same for all hubs. On the off chance that the support is full, we set Ci D Cimax. (2) In every hub, got cradle counters will be put away as indicated by the meeting or imparting arrangement. For illustration, if a hub I meets hub a, b and c progressively, the succession of cradle counter in hub I will be Ca, Cb and Cc, correspondingly.

(3) A support counter will be traded and put away as a counter record when two hubs are imparting.

TABLE 1. List of symbols.

Symbols	Description
S_i	Solution space of RVNS in node i
x	Current global optimal solution
max	Number of levels for stored buffer records
$N(x)$	Neighborhood structure based on x
$N_k(x)$	The k^{th} neighborhood in the neighborhood structure
k	The index of the k^{th} neighborhood in RVNS
k_{max}	The maximum number of neighborhoods in RVNS
t_{max}	The maximum number of neighborhood reconstruction in RVNS
V	Set of all the sensor nodes in the network
v_i	A specific sensor node in the network
E	Set of all the existing communication links in network
$d(v_i,v_j)$	Communication link between node i and node j
d_{max}	The maximum radio communication range
V_{min},V_{max}	The minimum and maximum speed of sensor nodes
C_i	A counter in node i with the number of stored packets
C_{imax}	The maximum value of counter records in node i
M_i	Buffer space of node i for storing the value of C_i
m	Maximum number of C_i that can be stored in a node
$M_i(h)$	The h^{th} record in the buffer space of node i
$M_i(opt)$	Optimal record reflecting the current network environment
$l(cur)$	A temporary level of C_i record stored in buffer space
$l(opt)$	The level C_i record selected as the global optimal solution
$l(max)$	The highest level of C_i record stored in the buffer space
T_i	Congestion threshold in node i
b_l	Lower bound of congestion threshold

A. Buffer Mechanism

To spare hubs' assets, no compelling reason to record the cradle counter for all hubs in the system, however just that of as of late meeting hubs.

Definition 1: In a self-assertive hub I, the support space utilized to store got cradle counter is meant as Mi. Specially, we utilize Mi(h) to get to the h^{th} counter record. For every hub, the space for support counter can store m records at most.

Definition 2: To for the most part portray the system status encompassing a hub, we present the idea of cushion status level. cushion status level is a level framework to demonstrate the degree of system clog, where the largest amount is meant as l(max). Each level demonstrating a specific organize status. Each counter record thus has a place with a comparing level. At that point limit of each level could be computed as takes after:

$$l(p)_{min} = (p-1) \times \frac{C_{imax}}{max} + 1 \qquad (1)$$

$$l(p)_{max} = p \times \frac{C_{imax}}{max} \qquad (2)$$

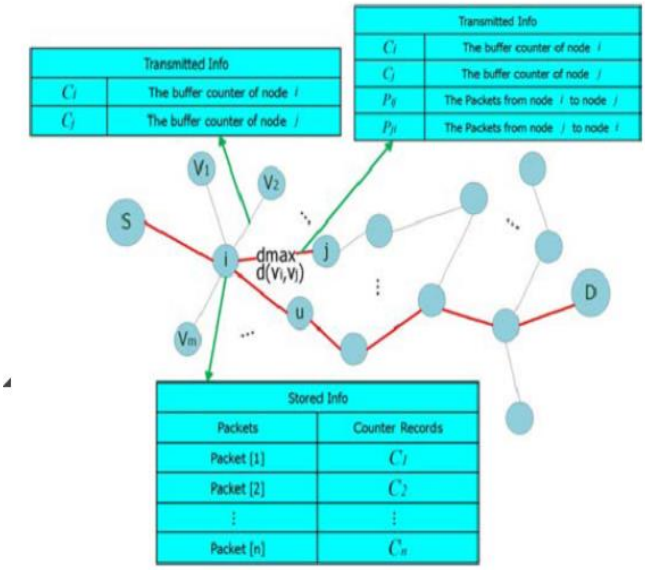


Figure 4. Architecture of the proposed model

Max is symbolized the number of levels. After the division, the network status can be derived by estimating the level that contains most buffer records. For example, if the upper level holds the most records, then the e-Health network is busy. Moreover, it is inactive if most records are in low levels.

After a few neighborhood recreating, RVNS will return an appropriate an incentive to portray current system condition, meant as Mi(opt). A bigger Mi(opt) implies a busier system, while a littler Mi(opt) demonstrates less clog. Then again, even though congested condition needs stringent limitations, it will likewise obstruct the recently produced bundles. Considering this idea, in this paper, we deny the blockage edge of hub I as Ti D Mi(opt). Whenever a hub I set up a correspondence interface with another hub j, hub I will consequently check Cj in view of Ti, [27].

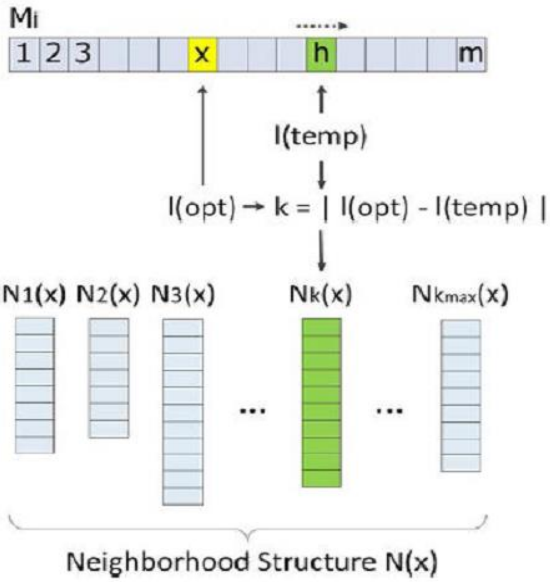


Figure 5. Neighborhood construction process

Also, won't forward any Spray-organize parcels to hub j. The pseudo-code of the RVNS-based bundle conveyance instrument is appeared in Algorithm 1, and Fig. 5 outlines the distinction between our proposed component and the first Spray arrange [27]. In Fig. 5(a), expecting that the parcel is conveyed from source hub to hub I, and the calculation is in the Spray arrange, hub I sets up the correspondence connects between the other six hubs. As indicated by the customary Spray arrange, every one of the six hubs get the duplicates of the bundle. On the off chance that hubs with the higher likelihood to forward bundles to the goal (e.g., hub j) just gets modest number of duplicates, the parcel is barely sent to its goal. Furthermore, a great deal of pointless sending happens in this procedure. In Fig. 5(b), because of the blockage limit, just those hubs whose cradle space are moderately sit without moving will get bundles. In addition, if the hub's cradle space is full, no parcel will be disposed of (e.g., hub 3).

Algorithm 1 Delivery Mechanism Based on RVNS

Input: m, max, M_i, C_{imax}, k_{max}, t_{max}, C_j
Output: a Boolean value of forwarding decision
Procedure: Function TransmissionDecision ();
BufferDetectInitialize();
//Initialize $M_i(h)$, $M_i(m)$ stands for the totally m memory spaces in node.;
while do
  //The iteration will terminate with the end of whole system.;
  $M_i(h)$ = BufferDetect ();
  //It is used when two nodes meet and exchange information, which includes exchanging their own counter records to each other.;
  $h++$;
  if $h == m$ **then**
    LevelDivide (max, Cimax);
    //Those m records will be divided into different levels.;
    x = SetInitialSolution ();
    //Construct neighborhood structure $N_k(x)$.;
    T_i = CallRVNS (x, k_{max}, t_{max});
    //Calculate a threshold, represented by T_i.;
    Transmission (T_i);
    //Through comparing T and meeting nodes' counter record, decide whether to deliver data packages from source node.;
  end
  else
    Transmission (T_i);
  end
  if $h > m$ **then**
    $m = h\%m$;
    //If the number of records exceed the maximum permitted, the earliest record will be replaced.;
  end
end

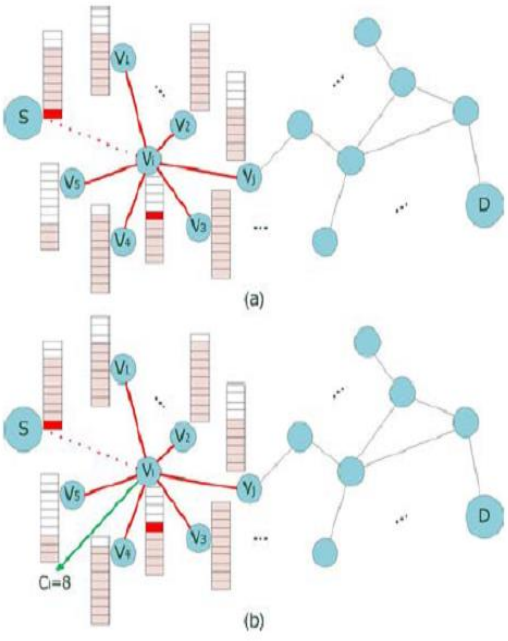


Figure 6. (a) Original Packet develivery mechanism , (b) improved packet devlivery mechanism

7. Spray Stage and Its Improvement

The principal procedure of RSW is displayed in the segments on the top [27]. As indicated by RSW, when organizing is sans relative, the blockage edge is normally a little esteem. Nonetheless, when the blockage edge is little yet arranged is scantily utilized, even though a considerable measure of cushion space is sitting without moving in hub j, hub I will not forward to hub j if Cj > Ti. To moderate the issue, we require a compelling reach. Comment 1: A compelling scope of clog edge ensures that system assets can be utilized efficiently [9]. A lower bound bl of blockage edge is presented. Pack- its will be conveyed by the customary SW when Ti is littler than bl; when Ti is bigger than bl, the blockage limit works. As needs be, founded on the powerful range, the clog limit

$$T_i = \begin{cases} C_{imax} & M_i(opt) \le b_l \\ M_i(opt) & M_i(opt) > b_l \end{cases} \quad (4)$$

In this paper, we define $b_l = C_{imax}/2$.

Algorithm 2 describes the pseudo-code in the Spray stage to realize data congestion control using a congestion threshold based on RVNS.

TABLE 2. Simulation configuration.

Scene Parameter	Network scale(m)	100*100
	Number of nodes	100,200,300,400,500, 600,700,800,900,1000
	Simulation time (s)	200,400,600,800, 1000,1200,1400, 1600,1800,2000
	Compared algorithms	Spray and Wait (SW), Spray and Focus (SF)
	Mobile model	Random walk [21]
	Number of counter records	50, 60, 70, 80
	Number of Neighborhood reconstruction	2
	Number of levels	4
Node Parameters	Mobile speed(m/s)	(0,4]
	Radio communication range (m)	3, 4, 5, 6, 7, 8, 9, 10
	Buffer space (K)	500,600,700,800, 900,1000,1100,1200, 1300, 1400, 1500
Packet Parameters	Size (K)	50
	Number of data packages	50, 100, 150, 200, 250, 300, 350, 400, 450, 500

can be gotten through the coming equation.

Reenactment condition is worked with CCC. In the earth, development of hubs is utilized to reenact development of elderly individuals in an eHealth arrange. The crude information created from sensors is browsed the Arrhythmia Data Set in UCI Machine Learning Depository [26]. The span of reproduction locale is 100m*100, which speaks to the movement zone of elderly individuals. In the reproduction locale, we increment the number of versatile hubs (convenient sensors) from 100 to 1000. Every hub can move freely. The scope of radio correspondence is changed from 3m to 10m (whole number). Space of the cradle is set as [500K, 1500K]. The most extreme limit of the cushion space for counter records is altered from 50 to 80, which implies that the quantity of put away records is in the scope of [50, 80]. There are four cushion status levels, where counter records can be sited, and they step careful neighborhood reproduction twice [20]. Also, speed of the hubs differs from about 0 to 4 m/s. When crude information is created, it goes to an exemplification work which returns parcels with size of 50KB. Amid reproduction, the number of produced parcels is different in between [50, 500], what's more, the time of the reproduction is set as [200s, 2000s]. The RSW calculation will be contrasted and SW and SF. The reproduction condition is set in Table 2 [27]. In

this paper, we measured the execution of proposed the calculation of the parts of conveyance likelihood, overhead [27].

8. **Conclusion**

This paper survey the proposed a RVNS-based Spray and Hold up calculation to tackle the information clog issue in crowd sourced health systems, where RVNS is received to examine the encompassing system situations of a hub and restores a dynamic clog limit to confine pointless sending. The recreation comes about demonstrate that RSW may enhance the system execution when organize assets are restricted. In some outrageous cases, the overhead proportion of RSW can be ten times lower than that of SW with a high conveyance likelihood. Albeit a few enhancements may improve the execution further, RSW gives a novel thought to alleviate information clog in crowd sourced e-Health systems.

Supplementary Materials: All materials are included in this article.

Author Contributions: All authors contribute equally in this work.

Funding: No external funding has been received to complete this work.

Conflicts of Interest: The authors declare no conflict of interest.

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