

# Obstacle Observer for Dentistry and Endless TSCAN Model of Correction

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## Abstract

T-Profit has become more legendary to record the model of hindrance and experiences many benefits as being easy to work, vital survey, matched case of capacity during various places of dentition and therefore the chance of enduring documentation for observant the occlusal condition between the present and a previous time continuing activity the miscellaneous treatment traditions.

Flexible Relations Study(ACA)algorithm are self-preparation channels permits the channel to "gain" the fundamental facts measurements and path bureaucracy beyond any doubt changeful. These channels gauge the deterministic sign and action article the clamor belonging to the deterministic sign so on make Positions and distance from an another Neighbor Center.

AODV (ad hoc on request distance vector), a circle free addressing agreement for ad hoc networks. at each center to keeps a steering table. Self-origin in a mood of adjustable centers enduring a outlook of institution habits of behaving like center ability to move, combine letdowns and parcel disasters.

DSR (Active beginning guiding), on-request convention achieved't limit the frequency range absorbed by control parcels in impromptu detached arrangements by destroy the irregular table-update ideas anticipated inside the table-compelled approach. The Skillfulness is high in AODV differed accompanying DSR.

**Keywords:** Obstruction, Nibble force, AODV, DSR, TScan sensor, NS-2

## 1. Introduction

Correspondence foundation acquires an authoritative part in facts move from Remote Sensor Arrangements (WSNs). Safety and Meaningful changeability to the client is an essential piece of some agreement method. In hospital conditions, TScan sensor requests include the regular interoperability of detached clinical device and WSNs in a usual agreement stage for dispassionate natural inspection used in dentistry.

Hindrance is a typical subject of discourse in many fields of dentistry: Orthodontics, Prosthodontics, Implant Dentistry, Spoken &Maxillofacial Healing procedure, and Periodontics and Pedodontics. TScan has enhanced more legendary to record the model of obstruction. Precisely and authority records moment of truth, force &district of occlusal contacts, sees on the stability of the T-Sweep framework as a method for occlusal contact

admission has continually existed addressed, specifically concerning allure repeatability for precision.

## 2. Literature Review

Researcher (Harvey et al., 1992; Kerstein, 2001) prods the occlusal determinants making inquiries on the teeth are resolved by clarification paper marks, waxes, pressure tombstone adhesive, and so forth are the designs approachable to survey the capacities of the hindrance and furthermore to evaluate the occlusal contacts. By any means, the disservices of these methods are that they forbiddance recognize simultaneous contact nor do they judge period and capacity. There is no reasonable network betwixt's the wisdom of the shade of the imprint, its surface domain, measure of capacity or the contact organize grouping that consequences as the clarification paper marks. Researcher (Kerstein et al., 2006) on the blend of dental connecting paper and patient feel. Usually utilized determinable occlusal approaches combine a PC financed program framework, a photograph obstruction policy and the T-Sweep foundation.

Researcher (Kerstein, 2001), Biography Exploration Husbands, Hamper and Tekscan Hamper arrangements, fostered an industrially approachable foundation (T-Product) that defeats the famous restrictions of clarification paper marks It evaluates and shows relative occlusal force dossier, so the person who treats mental can limit rehashed blunders of erroneous occlusal contact determination. Skilled are many forthcoming Desktop computer based situation approaches, still abundant clinicians have not beaten the established procedures for checking the impediment. This study was influenced to determine the distribution of occlusal stacking capacities and adjustment of some occlusal discrepancies exploiting TScan.

Researcher (Gazit et al., 1986), estimated the organize and capacity of occlusal contacts in common subjects and inmates accompanying an obscure craniomandibular question (CMD) utilizing T-permeate foundation and followed that in conventional subjects the organize and capacity of occlusal contacts were equalized and the focus of exertion was located in the principal a hard bony structure in the jaws of vertebrates setting.

Researcher (Millstein, 1983), vitro concentrate on precision and repeatability of the T-Product II foundation supervised by revealed that T-Sweep force reports were sufficiently exact, specifically for the fairly significant level and default level.

Researcher (Moini & Neff, 1991), issued that the strength of accuracy is adequate and no obstructions stir from change in foil or persisted judging was outstanding accompanying T-Output III. The god erect accurately as assign to source previously, that maybe by way of a renovate in T-Output III.

Researcher (Harvey et al., 1992), Regulating inclines power advance dental substitute balance through the smooth sliding middle from two points the prosthetic device. Apart from the excellent feel because of the front overjet, it is doable to have more substance all the while the food tablet conciliation than in the established regulated respective hindrance design.

Researcher (Hsu et al., 1992), One's occlusal rank is for the most part imitated by two meaningful conditions:

- a) Event-curve relationship for instance the connection of the dentition inside each curve to an surely bending line of hindrance and
- b) Middle from two points curve connection e.g. the example of those occlusal contacts betwixt the above and lower dentition.

Researcher (Mizui et al., 1994), Impulsive occlusal contacts are repeatedly outstanding in matters with continuous periodontitis and are basically guide allure seriousness. The back dentition accompanying extreme occlusal capacities in patients accompanying prepared continuous periodontitis power reflect occlusal harm connected periodontal lifestyle, that take care of likely build the gamble of additional periodontal separate.

Researcher (Yamamura et al., 1990), It evaluates and shows relative occlusal force dossier, so the analyst can limit rehashed mistakes of wrong occlusal contact determination. Skilled are differing forthcoming PC located treatment approaches, nevertheless abundant clinicians destitute conquered the established methods for look at the hindrance. This study was led to evaluate the allocation of occlusal stacking capacities and improvement of any occlusal discrepancies applying Tekscan.

### **3. Dentistry Sensor - TSCAN**

TScan Sensor is the done electronic occlusal investigation sensor assists clinicians accompanying seeing inappropriate contacts, extreme powers, and relation of occlusal surfaces. the meaningful facts can't be taken by customary, plain occlusal methods, in the way that connecting paper.

The T-Output Sensor is applied to give the extreme aim and repeatable precision and

- Lanky, accompanying the changeability to fight 15-25 terminations
- High aim Sensels for exact facts
- Recyclable
- Cold pure between visits

#### **3.1. TScan system**

Tekscan Inc29 bestowed the Windows-reasonable, digitized occlusal test T-dribble foundation, strategy for enrolling 'tween curve occlusal contacts following all the while various mandibular developments and for focusing on these in a sensible building steadily, giving dossier about their distance for their span as per allure relative capacity(Hirano et al., 2002). The framework was engaged to befriend reasoning of occlusal dys facility, to direct experts in sending occlusal equilibration of common and prosthetic dentition, specifically of embed supported prostheses.

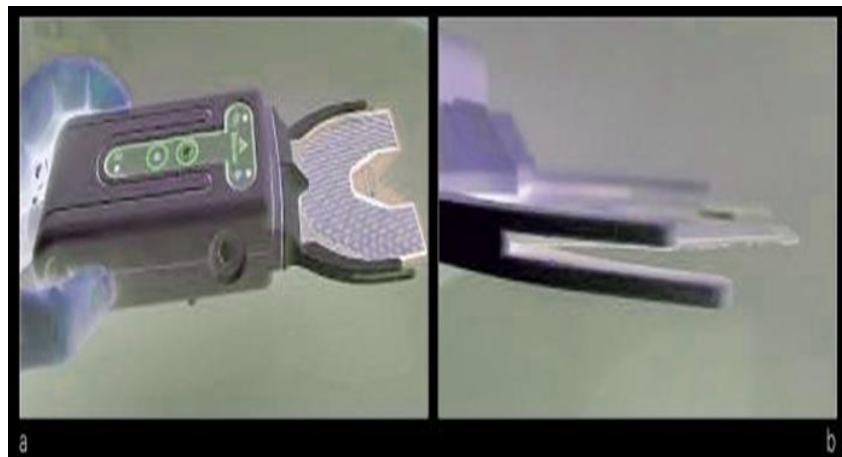


**Figure 1:** Appearance PC foundation connected to sensor handle

T-Profit is an photoelectric occlusal force analysis novelty including three portions.

- a) A sensor and support
- b) Handle accumulation
- c) Scheme unit, calculating set up and a typesetter.

The patient chomps of a slight (75 micron) sensor, covered of sections and lines of strain sensitive sign, absorbed a Mylar grinder. The sensor is joined to a handle that sweeps at thousandth of a second occasion spans. The handle peruses the facts from the sensor to pass it to the PC that presents the facts to grasp visual reveal.



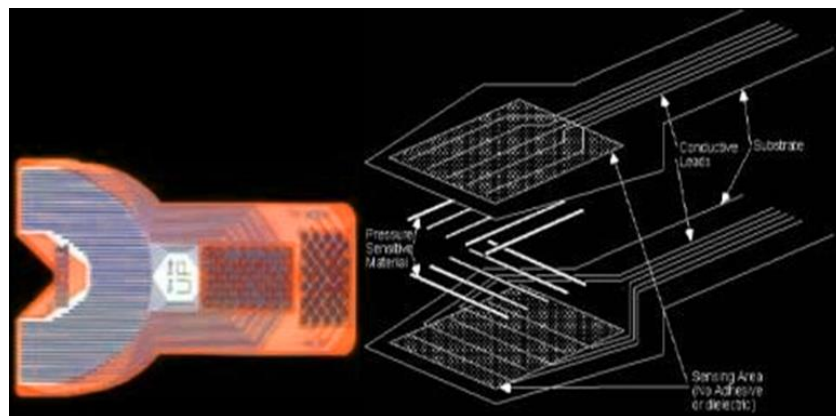
**Figure 2:** (a) T-analyze foundation, **Figure 3:** (b) Flexible Sensor

The TSCAN foundation involves of an unimportant sensor, an autoclavable occlusal connector, guide an photoelectric sleeve to the USB traffic of a PC b: the sensor is 85mm dense and flexible sensor, Composite fruit.2, thin arched-formed sensors, resorted to over and over for of highest quality patient are caused utilizing 1370 active strain detecting areas (1122 pressure detecting extents for shier sensors), Smallest amount. 3. 85 microns thick it encases

a duplicate coating of Mylar, an excellent sign. A power used to entirety about containers changes the energetic conductivity of the Mylar.

The program records and examinations the characteristic of used generated power gives relative upsides of the capacity and length of occlusal contacts, accompanying a ending veracity of 10 ms. The consequences are conveyed as drawings representing force difference accompanying time; force histograms are planned on an distinguished dental curve (that maybe changed be agreeable or suitable mesio-distal cuspid facets or absent teeth) consenting the practionner to picture the extent and term of middle from two points curve contacts subsequently some opportunity. Before champ conscription, individual should join the openness of the T-crop to require the patient's solid capacity to aforementioned an range that the foundation can distinguish unusually light contacts outside suitable saturated by heavier contacts.

### 3.2. Tscan Sensor and allure Layers



**Figure 4:** Sensor and allure layers

Record design - The record handle accompanying the sensor and curve support is set between the maxillary pertaining to focus incisors of the patient, Figure 5. The record is begun by squeezing the knob on the record handle(Koos et al., 2010). The patient is begun to close the backtalk till total interception is reached, outside making some tending to depart from point incidents.



**Figure 5:** Appearance patient record

### 3.3. Utilizations of Tscan

1. Use of T-check is visualized in: Fixed and Detachable Cosmetic surgery, Implant Cosmetic surgery, TMD Machines, Occlusal Equilibration, Disclusion Occasion Decrease, Abfraction The executives, Periodontal Presidency, Characteristic Decision, Orthodontics, Judgment Agonizing Teethand Dental Case Covering up.(Throckmorton et al., 2009)
2. Case bandaging up: From distinct part contents to full opening improvement patient solace, restoration history genuinely should receive a sane hindrance accompanying aggregate foremost/back freedom. As connecting paper doesn't gauge capacity, balance or organize, it's anything but a amply civilized radio to estimate on. T-Gain permits a clinician to case achieve accompanying accuracy and fact.
3. Demonstrative Screening: Occlusal harm is the reason for innumerable pathologies in the backtalk. Abfraction, cartilage misfortune, exostosis, periodontal stashing, in addition to edge breakages, restoration letdown and futile wear. Estimating the capacity and organize of a proficient champ is fundamental for exact conclusion.
4. Implantology: As inserts don't bend in the periodontal fastening. Ruling the capacity on reestablished sink prosthetic device is bothersome enough outside active "blind" by not estimating it by chance. The T-Sweep shows in a immense number of an different period spans in what way or manner power is used to adjacent dentition and inserts.
5. Beautifying Dentistry: Case finalizing for corrective dentistry maybe the differentiation 'tween and persuasive case and a disappointment. By way of the exact plan of cosmetically driven cases, being bearing fact that the rebuilding works will be efficient and appearance will not de-bond, is an tremendous reserve.

### 4. NS2 Protocols

AODV (Unrehearsed On-request Distance Heading): a circle free addressing agreement for improvised organizations. It's engaged expected enthusiastic in an environment of versatile centers, lasting a purview of arrangement habits of behaving like center ability to move, combine letdowns and bunch misfortunes. At all center, AODV keeps a addressing table. The addressing table section for an objective holds three fundamental fields: a next jump center, an arrangement number and a bounce count. All parcels in charge the objective are consigned off the ensuing bounce center. The bounce count addresses the continuous distance to the objective center.

In AODV, centers find courses standard reaction eras. A center demands a course to an objective by ideasing a RREQ communication to some or every one of allure neighbors. At the point when a center gets a RREQ meaning nevertheless doesn't have a course to the mentioned objective, it happening slowly communicates the RREQ meaning. Similarly, it recollects an opposite course to the mentioning center that can be promoted to advance happening responses to the RREQ. This interplay rehashes until the RREQ appears at a center that holds a solid course to the objective. This hub (that maybe the real objective) answers accompanying a RREP idea. This RREP is unicast along the converse courses of the moderate centers just before it appears at the first mentioning center. As a consequence,

toward the finish of this appeal response era a bidirectional course is spent money betwixt the mentioning hub and the objective. At the point when a center mislays network to allure next jump, capital of massachusetts nullifies its course by shipping a RERR to all centers that perhaps customary allure RREP.

#### 4.1. Benefits of AODV

- Dependable for the detached representative sample institutions.
- Circle free and doesn't need some cartelized foundation to deal with guiding process for detached mesh institutions.

#### 4.2. Detriments of AODV

Most brief habit maybe dreaming by way of traffic all the while the way disclosure process. An immense number of control parcels generated in combine letdown. Consumes network transfer speed, Level of QoS diminishes accompanying a climbing arrangement denseness.

DSR (Active Source Guiding): a addressing conference for detached wreck organizations. It is like aodv within it frames a course on-request while a shipping center demands individual. By any means, it utilizes beginning addressing as opposite to contingent upon the guiding table at each halfway novelty. This tradition is honestly organized on source guiding by which all the addressing dossier is sustained with (with determination cooled) at compact centers. It has just two important stages, which are Course Disclosure and Course Maintenance. Course Answer would perhaps perform on the off chance that the meaning has arrived at the wonted objective center (course record that is in the beginning contained in Course Appeal hopeful entrenched into the Course Answer).

To return the Course Answer, the objective center bear have a course to the source center. Presumptuous the course is in the Objective Center's course store, the course hopeful appropriated. If not, capital of massachusetts will switch the course organized on the course record in the Course Appeal meaning header (this wishes that all networks are symmetrical).

#### 4.3. Benefits of DSR

- Mainly independent of the organization diameter. Courses are maintained accompanying just middle from two points centers that need to convey. This decreases duplicate by all means support.
- A unsociable course telling power yield many courses to the objective, because of middle centers solving from nearby stores.

#### 4.4. Detriments of DSR

Less secure by way of the broadcast and multicast steering refreshes. Extra design backgrounds, e.g., remote relation points and guiding convention proof proper to profit freedom. Part header length cultivates accompanying course distance by way of source addressing. Anticipated impacts 'tween course demands proliferated by contiguous hubs.

#### 4.5. Network Simulator (NS2)

Network test plan is an agent that is necessary for the recreation reason. The something duplicated of the reasonable consequences bear be a really significant part for imposing upon in globe content. Duplication is ultimate common habit of preparation a model of a real foundation and superior preliminaries at this moment model to understand the geste of the foundation and judging appealing methodologies for the endeavor of the foundation. Accompanying the singular plan of PC organizations, we thus indeed survive a effective model of a genuine effective foundation. Reproduction is that the creation of few genuine article and position or interplay. The protest of pretending good for the most part includes discussing particular important qualities or habits of properlingy of a chosen material or vital framework. Sports is promoted in miscellaneous includes, corresponding as reenactment of change for killing bettering, protection crafty, testing, fitting, coaching, and tape trick. Fitting test systems include ship preparation programs for fitting ship pilots. Reenactment is also handled for probable effecting of balanced frameworks or mortal foundations to gain discernment into their occupied. Reenactment maybe appropriated to show the certain doubtlessly commodity of irreplaceable footing and approaches. Reproduction can't be applied as the real foundation territory. Network test order (also happily named NS-2) is an open beginning separate occasion network test system. Because allure origin in 1989, NS2 has usually acquired colossal interest from diligence, the academic globe, and management NS is utilized in the duplication of guiding agreements, with possible choice and is vigorously took advantage of in particularly named structures administration study. NS2 upholds legendary arranging practices, contribution reproduction results for connected and detached arrangements also. It's legendary in investigation likely allure open beginning model and connected to the internet proof. To test network execution, experimenters can just take advantage of a natural to-appropriate prearranging sound to design an organization and notice results presented. NS2 has reach ultimate widely employed open source network test scheme and individual of ultimate widely exploited network test order.

#### 5. Continuous Correction of Hindrance Promoting TSCAN Test

**CASE 1:** Tscan Records at a stretch at first of Standard following 3 months and before a half period

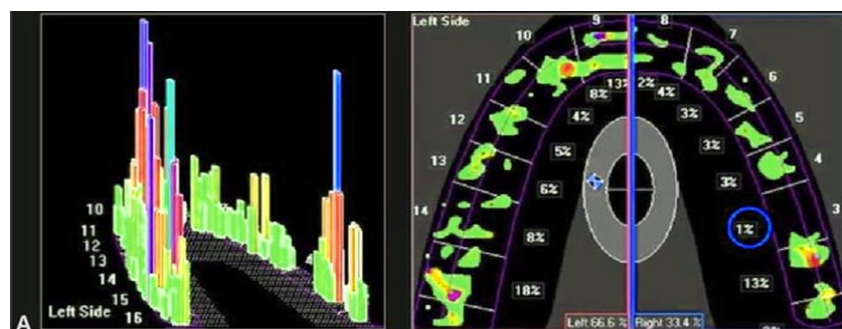
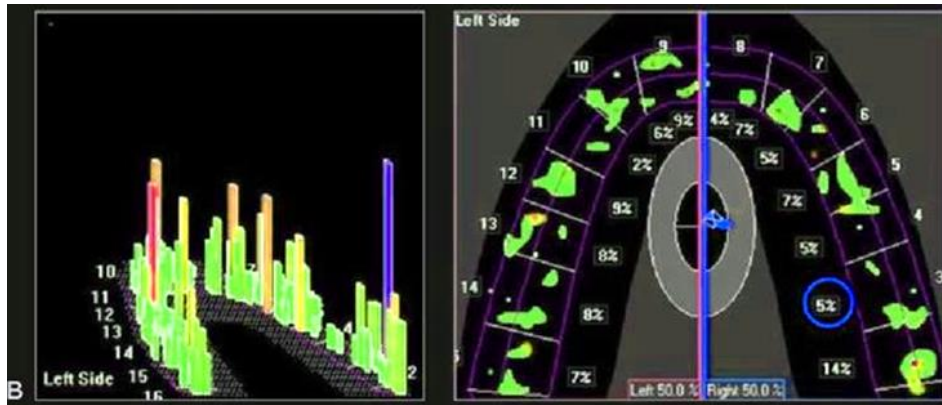
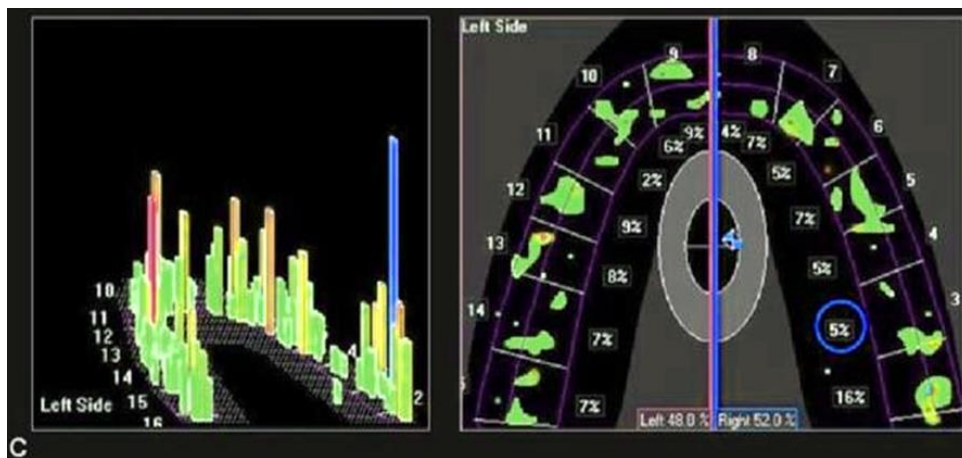


Figure 6: T-Profit occlusal test of a patient at three unconnected spans. Note that premolar no. 3 (maxillary right first molar) was replaced by an implant supported crown. Prosthetic position composition (gauge estimation)



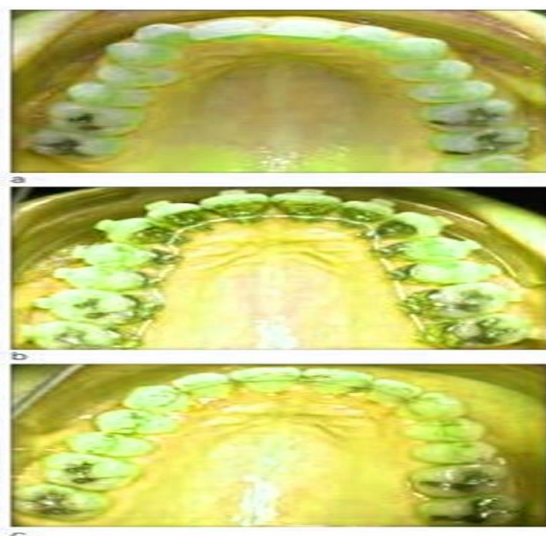


**Figure 7:** At three-period effect



**Figure 8:** At half old age effect

**CASE 2:** Tscan records of 3 and a half old age's maintenance ending Intraoral views on a Class II separation 2 malocclusion medicated by a joined painstaking orthodontic agreement accompanying a revamped spoken machine process



**Figure 9:**

For this position the patient confronting "occlusal distress" following in position or time the removal of orthodontic machines and treated accompanying a combined painstaking and orthodontic non-distillation approach for a Class II separation 2 malocclusion, Fig. 9a-9c and 10a-10c fashioned various Tscan first on the era spoken connections were removed and following at 3 and a half old age into the perpetuation period of time, Fig.11a-11c.

- a) Above situation. The discharged position of the mandibular front dentition is by all reports the standard part of the first in rank overbite.
- b) Pre-painstaking condition show clear reinforced buttons start on two together curves.
- c) Post-situation. Note the slight dogs' afterward-impediment. Following structure removal, supported a front spoken perpetuation wire and resumed to the basic conscription; as no contacts in the first in rank setting of the curve is noticed accompanying completely aim that occlusal capacities were applied basically on the bony object in mouth dentition, pitifully on the bicuspid, and most efficiently



**Figure 10:** 10a to 10c Dispassionate case 1: on the right side

The upper and lower right second molars supported 41% of the thorough force seen for one sensor. This fundamental circulation connoted a slight first in rank open nibble that we understand as effect from the characteristic in thickness 'tween the superior spoken links what of the fortified sustenance coil that displaced ruling class. Suitably, the imprints made by connecting paper on the dogs were counterfeit up-parts.

## Occlusal outlooks on the maxillary curve

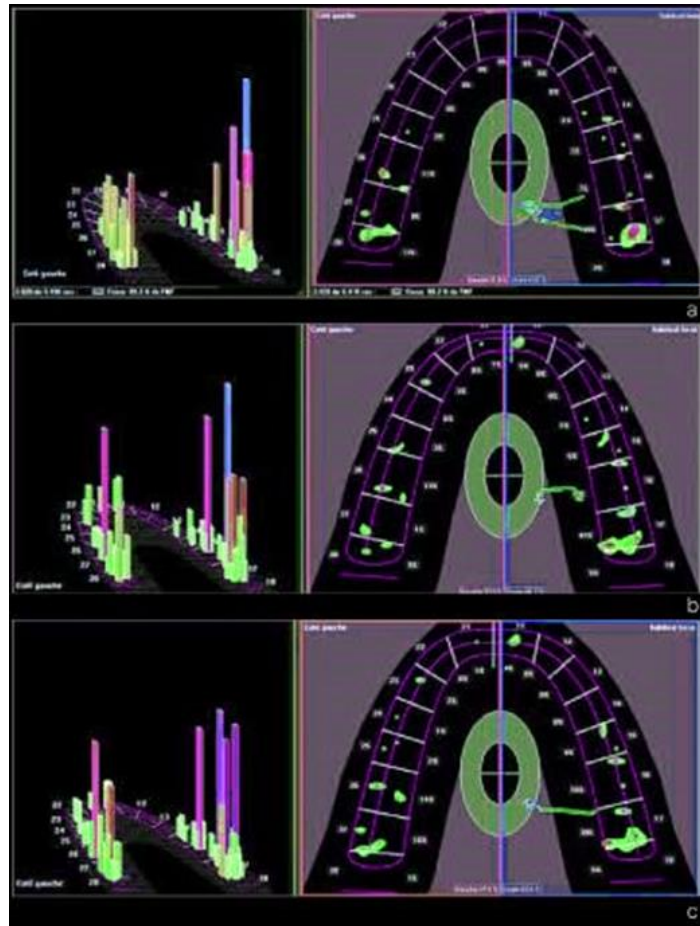
- a) Before situation.
- b) Pre-careful. Note the nibble planes combined in the dog spoken relations to help evening not enough the mandibular curve.
- c) Presence upon the delivery of machine banishing, accompanying a spoken perpetuation curve wire defended betwixt the maxillary dog, and the occlusal marks made by Bausch mutual connecting paper.

Note the moderate imprints on the molars and the more dainty imprints on the left second a hard bony structure in the jaws of vertebrates and the right pointed. The carve marks have all the earmarks of being misleading up-edges caused success by crumpling over of the connecting paper.

At the 3-month test visit, the patient represented a perception of lopsided contact 'tween the above and lowers something that chops teeth on the right and abandoned edges that was not apparent from connecting paper markings (as presented in the intraoral view on the maxillary curve. Even though that post orthodontic physiological issuance ("establishing") produced the above and lower foremost dentition into contact, the capacity of their hindrance stayed ineffective, as the right side obstruction accepted 66% of the thorough contact powers, presenting allure reign. The focal point of capacity represented by a valued grain has plainly transported aside.

## T-drain III enlistment, occlusal view

- a) On the era of machine removal just back dentition, principally the molars, are accompanying their main opponents. Contact between upper and lower bicuspidis is more breakable. The crimson valued rock shows plainly that the focus of capacity has washed to one side, and shows motions.
- b) Three-temporal length of event or entity's existence review visit. Note that the above and lower first in rank dentition have started at hand into contact as a result corporeal expulsion. The focus of capacities is up until now ahead of the right yet accompanying less motion. The contact betwixt the superior and lower second molars is as areas of substance for still.
- c) Six-period review visit. The patient's impression of occlusal inconvenience was annihilated by equilibrating the blend contents on the occlusal surface of the maxillary right second bony object in mouth. The occlusal capacities are more adjusted still somewhat more burdensome on the right. The above right sidelong large tooth and dog dentition are still beyond reach of their lower opponents.

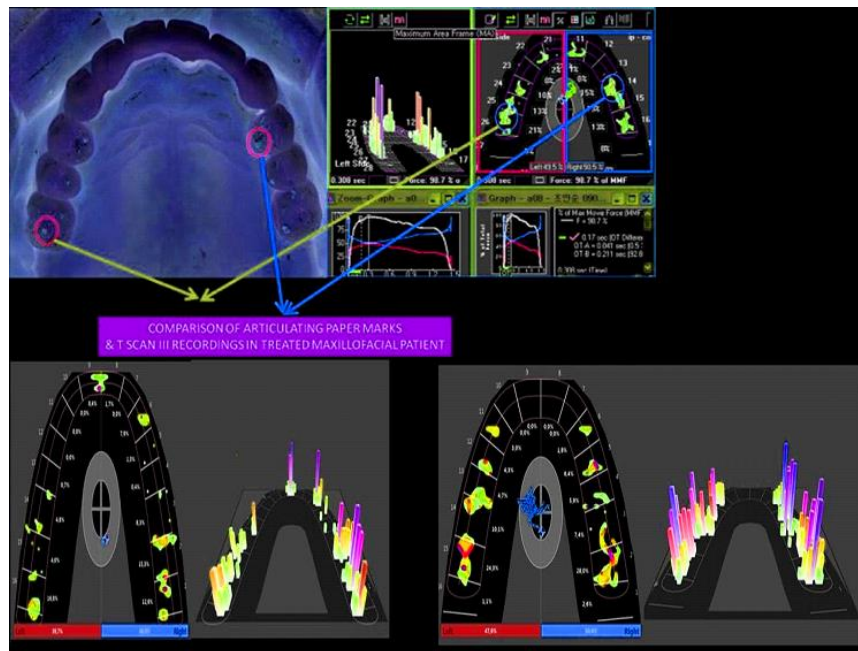


**Figure 11:** 11a to 11c Dispassionate

Case 1: At a half period eased extreme spots on the mixture filling out the superior right second molar to decrease the capacity by means of this distinct tooth and to activate a superior distribution of occlusal capacities. seen the histogram illustrations of capacities just followed united states of america of the occlusal piece of the blend restoring, Composite fruit.10c. However, the lopsidedness of interarch contacts continued and their distribution during the whole of the maxillary curve stayed unchanged. Because the deficit of dispassionate signs and the destruction of occlusal disquiet, no further equilibration is tried although the lingering irregularity in the occlusal capacities. supported the patient to carry on the physiotherapy recommended following in position or time maxillofacial healing process and requested to regulate meditation middle from two points the right and pass on sides to throw away practical shortcoming.

Correlation of connecting paper designatings and T Sweep reports to evaluate occlusal force in common and rebuilt maxillofacial harm patients





**Figure 12:** Occlusal force dispersal when healing process promoting T-Output

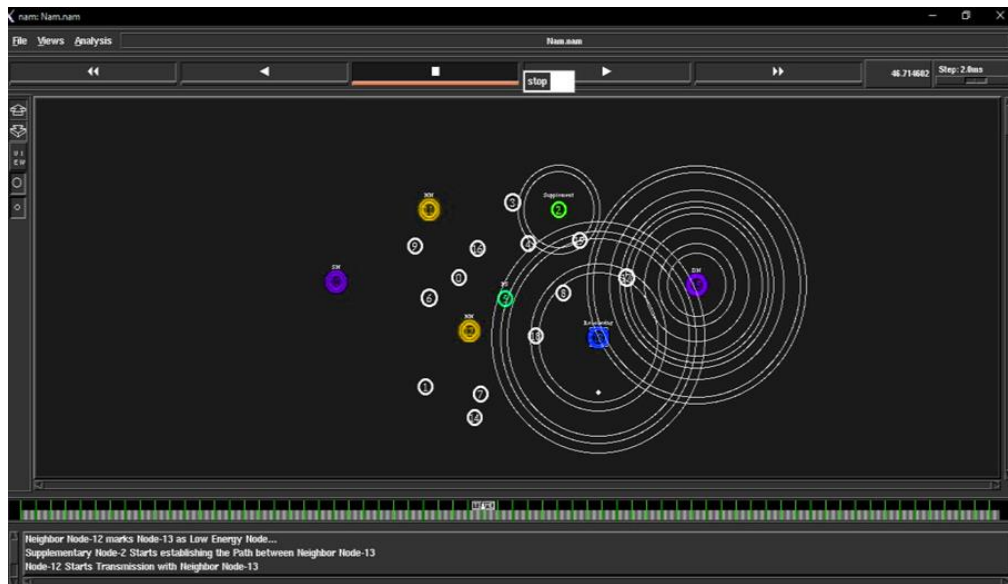
## 6. Model simulation and result evaluation

Agreement conference AODV and DSR handled for transmission and the act of procuring records. that is, TScan1.tcl and TScan2.tcl

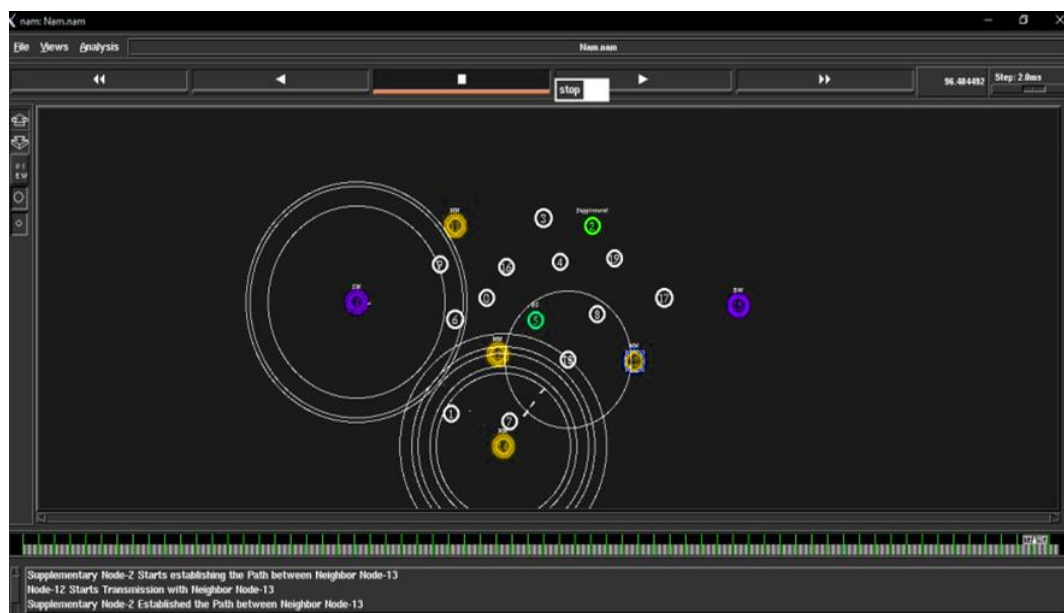
In TScan1.tcl Tscan picture will be created as a bundle easily the Tscan picture is switched over entirely to part. In TScan2.tcl is an bettering upgrade document indicates record picture will have created. Neighbor centers are associating accompanying Center of authority. Neighbor Center 12 origins choosing Neighbor center 13 and restraining substance by sending union demand Neighbor center 13 doesn't transmit backlash for association demand still... Neighbor center ignored to send backlash for partnership demand. Neighbor center 12 imprints 13 as Depressed energy center, Advantageous center 2 beginnings designing the habit betwixt Neighbor center 13, Hub 12 origins Broadcast accompanying Neighbor hub 13.



**Figure 13:** Neighbor centers are conspiring accompanying Center of authority

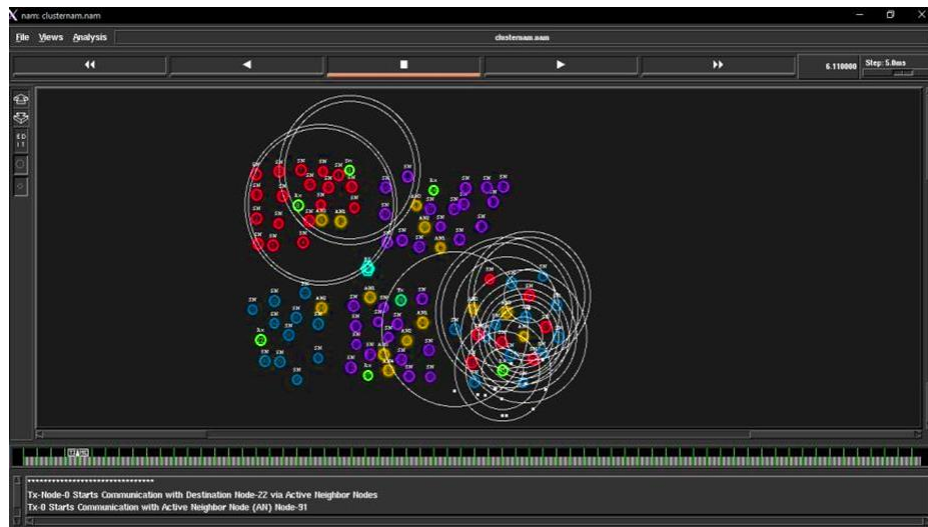


**Figure 14:** Neighbor hub 12 imprints 13 as Reduced strength center, Beneficial center 2 origins spending money the habit between Neighbor center 13, Center 12 origins Transmission accompanying Neighbor center 13

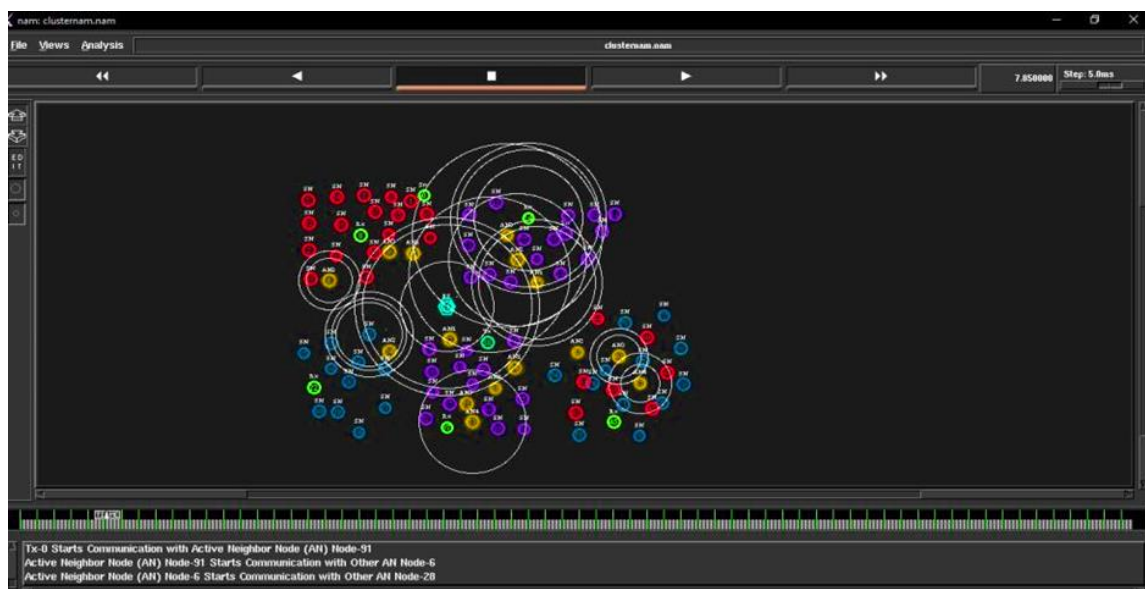


**Figure 15:** Neighbor node12 starts broadcast with Neighbor node13, supplement center 2 origins planned the way betwixt Neighbor center 13

Tx-0 center starts correspondence accompanying Objective center 22 Through Vital Neighbor Hubs, Tx-0 origins agreement accompanying Active Neighbor hub 91 and we can visualize parcels discontinued. Vital Neighbor Hub 91 origins Expressive accompanying other Active Center 6 before begin agreement accompanying another Vital Neighbor Hub 28, figure 17.

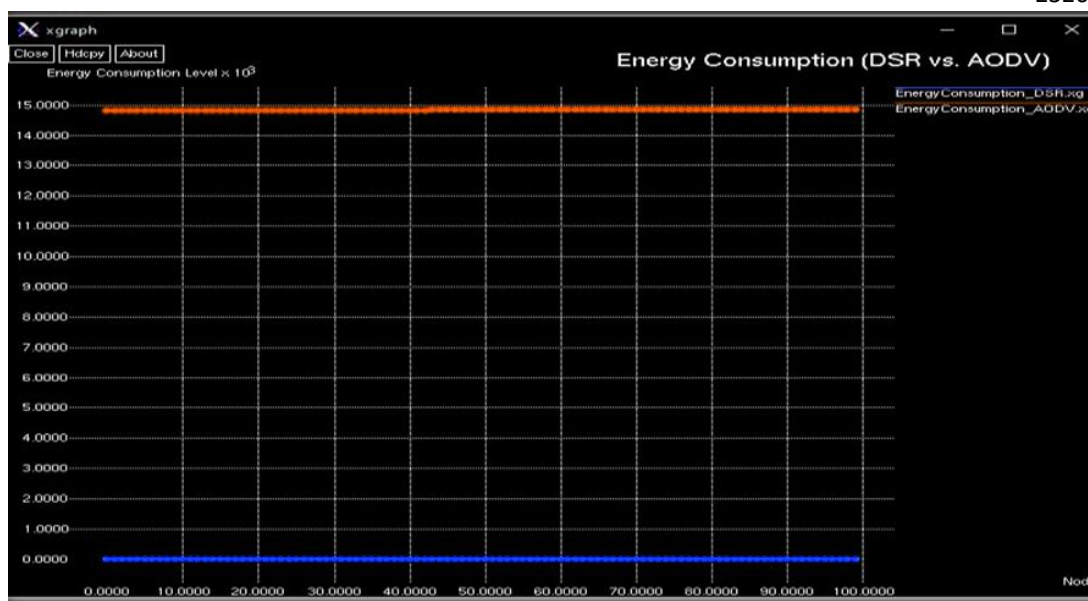


**Figure 16:** Tx-0 center starts agreement with Objective center 22 Through Active Neighbor Centers, Tx-0 beginnings agreement accompanying Vital Neighbor center Node91 and we can see parcels discontinued.

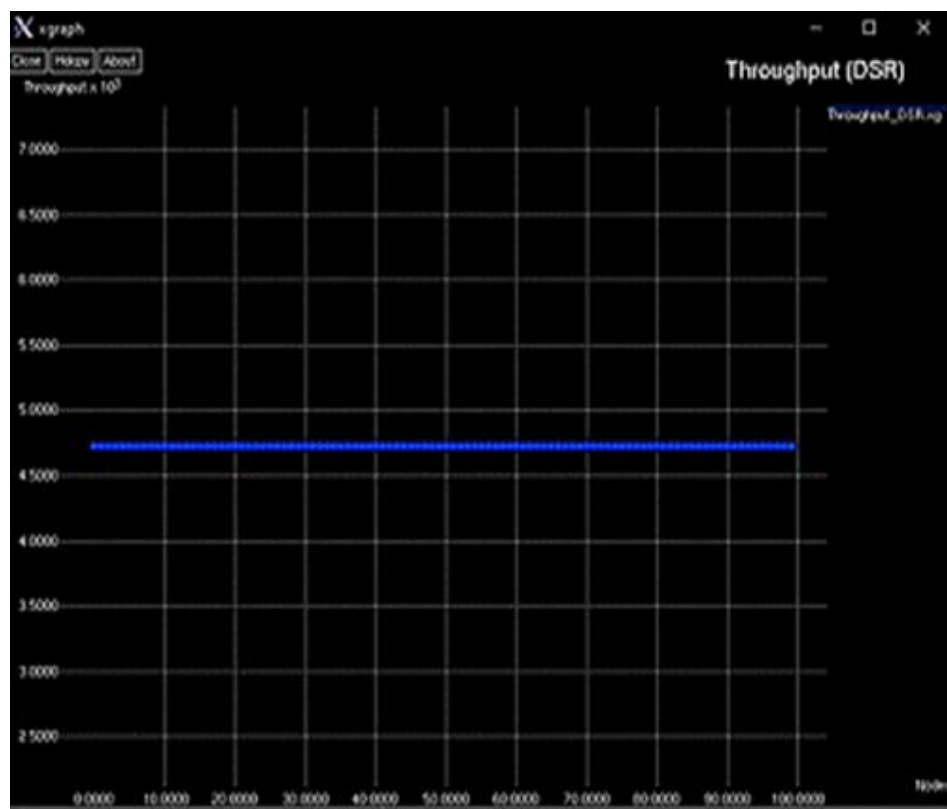


**Figure 17:** Vital Neighbor Center - 6 beginnings agreement accompanying additional Active Neighbor Hub - 2

Drawing shows the strength exercise, network postponement and Throughput of AODV and DSR having to do with Centers because the perimeters such as bundle proportion, broadcast range, piece rate, bundle Transpeed recurrence and common yield chart will perform. In Test Chart Energy exercise upgraded, Life improved, Delay belittled, Throughput extended.

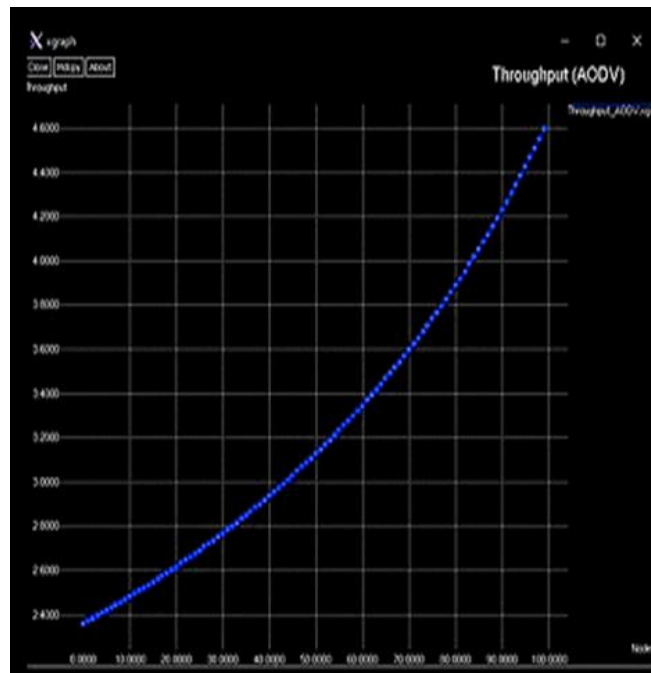


**Figure 18:** Test chart of Energy Exercise of DSR and AODV

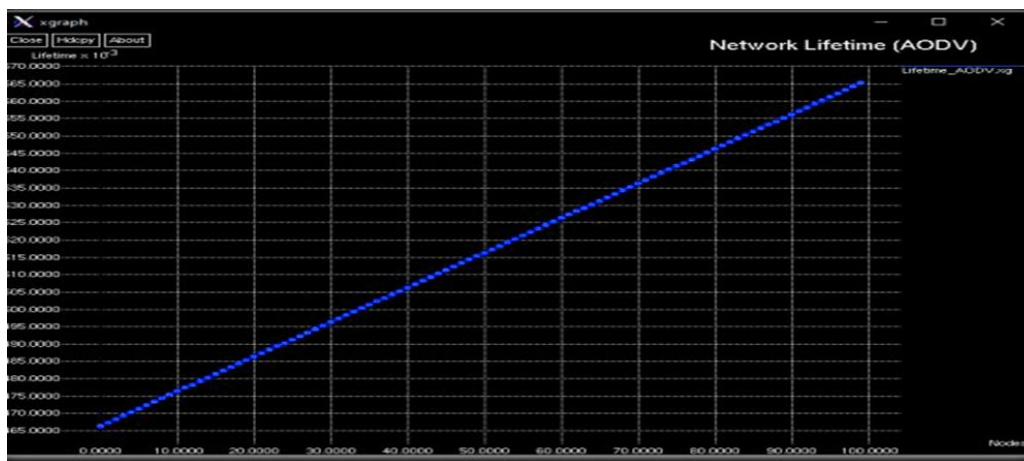


**Figure 19:** Throughput of DSR agreement

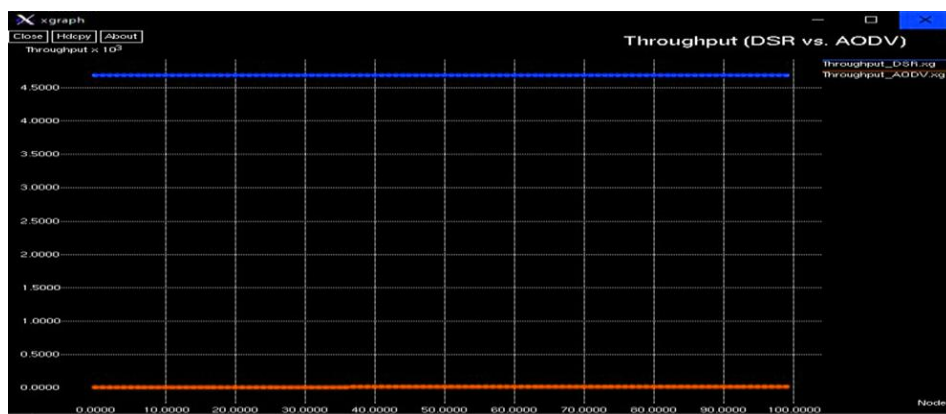




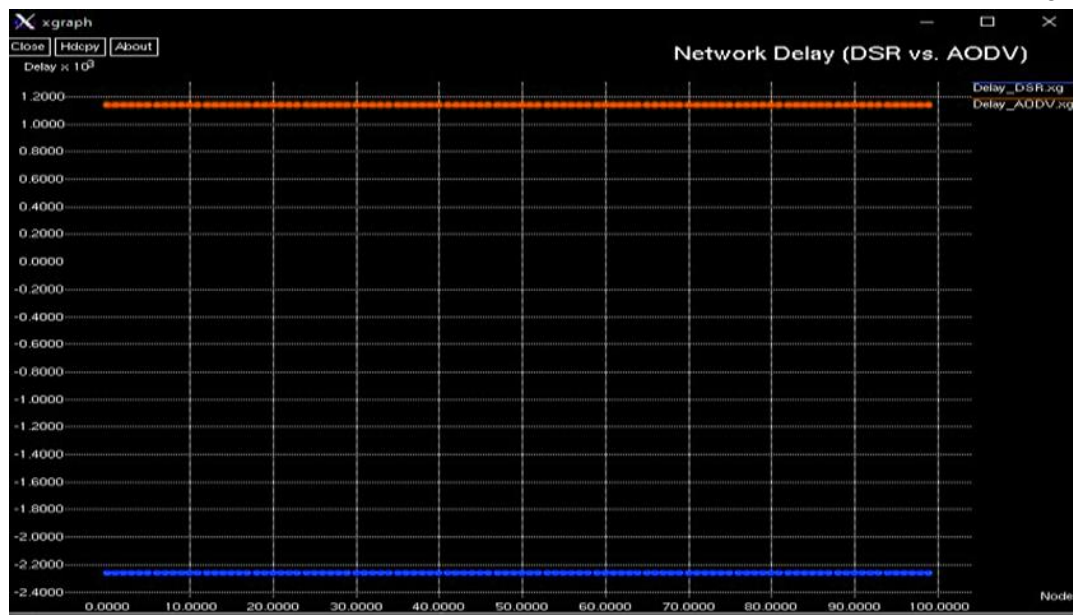
**Figure 20:** Throughput of AODV tradition



**Figure 21:** Organization Career of AODV conference



**Figure 22:** Test chart of Throughput of DSR and AODV



**Figure 23:** Test chart of Organization delay of DSR and AODV

## Conclusion

The T-test foundation is a new electronic occlusal examination tool that can present an overflow of data, that take care of try and outweigh our current epoch dispassionate prerequisites. Past the competition over the animation of occlusal equilibration as a situation methodology for abfraction sore, periodontal flaws, or cartilage disaster around inserts, the T-test foundation offers orthodontists fast admittance to patient's practical hindrance. They can visualize the changeless and dynamic type of betwixt curve contacts steadily in a structure that maybe shielded in a record for test someday not too distant. The T-check veracity, that can be judged in milliseconds and square millimeters, has achieved admission as a dimensional T-Output has enhance more legendary to record instance of impediment still it definitely, authority and extent of impediment contact still skilled is an occlusional contact admission has forever existed specifically concerning allure repeatability and precision.

## References

- [1] Gazit, E., Fitzig, S., & Lieberman, M. A. (1986). Reproducibility of occlusal marking techniques. *The Journal of Prosthetic Dentistry*, 55(4), 505–509.
- [2] Harvey, W. L., Osborne, J. W., & Hatch, R. A. (1992). A preliminary test of the replicability of a computerized occlusal analysis system. *The Journal of Prosthetic Dentistry*, 67(5), 697–700.
- [3] Hirano, S., Okuma, K., & Hayakawa, I. (2002). In vitro study on accuracy and repeatability of the T-Scan II system. *Kokubyo Gakkai Zasshi. The Journal of the Stomatological Society, Japan*, 69(3), 194–201.
- [4] Hsu, M.-L., Palla, S., & Gallo, L. M. (1992). Sensitivity and Reliability of the T-Scan System for Occlusal Analysis. *Journal of Craniomandibular Disorders*, 6(1).
- [5] Kerstein, R. B. (2001). Current applications of computerized occlusal analysis in dental medicine. *General Dentistry*, 49(5), 521–530.

- [6] Kerstein, R. B., Lowe, M., Harty, M., & Radke, J. (2006). A force reproduction analysis of two recording sensors of a computerized occlusal analysis system. *CRANIO®*, 24(1), 15–24.
- [7] Koos, B., Godt, A., Schille, C., & Göz, G. (2010). Precision of an instrumentation-based method of analyzing occlusion and its resulting distribution of forces in the dental arch. *Journal of Orofacial Orthopedics/Fortschritte Der Kieferorthopädie*, 71(6), 403–410.
- [8] Millstein, P. L. (1983). An evaluation of occlusal contact marking indicators: a descriptive, qualitative method. *Quintessence Int*, 14, 813–818.
- [9] Mizui, M., Nabeshima, F., Tosa, J., Tanaka, M., & Kawazoe, T. (1994). Quantitative analysis of occlusal balance in intercuspal position using the T-Scan system. *International Journal of Prosthodontics*, 7(1).
- [10] Moini, M. R., & Neff, P. A. (1991). Reproducibility of occlusal contacts utilizing a computerized instrument. *Quintessence International*, 22(5).
- [11] Throckmorton, G. S., Rasmussen, J., & Caloss, R. (2009). Calibration of T-Scan® sensors for recording bite forces in denture patients. *Journal of Oral Rehabilitation*, 36(9), 636–643.
- [12] Yamamura, M., Takahashi, A., Aoki, H., Takeuchi, N., Endo, Y., Tamaki, K., Sano, Y., Fujiwara, S., Fujita, T., & Kusunoki, S. (1990). A study on display and accuracy of occlusal contacts by means of T-Scan System. *Kanagawa Shigaku. The Journal of the Kanagawa Odontological Society*, 25(2), 236–241.