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Aim & Scope

AIM

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SCOPE

International Journal of Innovative Technology and Exploring Engineering (IJITEE) covers all topics of all engineering branches. Some of them are Computer Science & Engineering, Information Technology, Electronics & Communication, Electrical and Electronics, Electronics and Telecommunication, Civil Engineering, Mechanical Engineering, Textile Engineering and all interdisciplinary streams of Engineering Sciences. The main topic includes but not limited to:

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Contents

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An Experimental Investigation of Sustainable Concrete by using Paper Pulp and Crusher Dust

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ABSTRACT

The objective of the research carried out in this paper highlights the critical sustainability parameter of reusability of waste materials in the construction sector of India. This paper followed firstly the intense literature survey to identify the waste materials for the replacement in the concrete mix, hereafter Paper Pulp (P.P) and Crusher Dust (C.D) indicates the similar nature like cement and sand respectively. Secondly, an assumed proportion of replacement of P.P by 2.5%, 5%,7.5%,10%, and 12.5% by cement, and 10%, 20%, and 30% replacement of C.D by sand is adopted in M20 mix design by volume method. Thirdly, the casting of 48 sample cubes size of 150 mm × 150 mm × 150 mm is performed for Average Compressive Strength test, and casting of 48 cylindrical cubes of 150 mm in diameter and 300 mm long for Split Tensile Strength. Fourthly, the results are carried out for 7th day testing along with 28th day testing for both tests along with slump variation of different samples. It is observed after the experimental analysis that the elite results compared to normal M20 mix are exhibited when the replacement variation of P.P is 5% along with 10% variation of C.D for both Average Compressive Strength and Split Tensile test. In addition to it, the highest slump is obtained for replacement variation of 12.5% P.P and 10%C.D.

Key Words - Concrete, Crusher Dust (C.D), Paper Pulp (P.P), Reusability.

I. INTRODUCTION

Countries which are in evolving phase such as India, where various industrial development projects and rapid urbanization are increasing swiftly to improve the quality of life, the major problem noticed is pollution due to waste [1] [2]. This takes place because of the expansion of domestic and industrial pollution. Since solid waste disposal has become a major problem in metropolitan areas of India [3]. Out of several wastes from different industries, the paper pulp industry produces considerable amounts of wastewater from various types of pulp and in addition, the manufacturing of paper generates heavy dust during the conversion process. Currently, the disposal solution in India is majorly land filling the earth, although paper sludge is a non-corrosive material [4]. Due to limited landfill space availability and strict regulations, many researchers are trying to develop reasonable, economical, and environmentally friendly [5]. Therefore, civil engineers have been challenged to see this potential to use this waste as a constituent in different building materials like sand, bricks, cement, etc. The use of this waste in construction will firstly provide a solution for waste problems and secondly, it will develop a new sustainable resource to materials in different construction projects [6].

The use of paper pulp and crusher dust established reasonable replacement of cement and fine aggregate in concrete mixes. [7] [8]. A study is needed to determine the contribution of paper sludge and crusher dust in the concrete industry. Although there is great concern about the strength and durability of concrete produced by replacement materials. This requires experimental investigation along with a

literature study to verify that the concrete is durable and possess similar or better physical properties like ordinary concrete [9].

II. MATERIALS USED

The materials used in this experimental research are cement, sand (F.A), paper pulp, crusher dust, coarse aggregate (C.A), and water. Firstly, Ordinary Portland cement of brand ―Ultratech‖, Grade 43 confirmed from IS:8112-2013 is adopted. [10] Secondly, the sand of zone II confirmed from IS:383-1970 is used and acquired from local dealer [11]. Thirdly, paper pulp, and crusher dust are also collected from a local distributor. Fourthly, the coarse aggregate of size 20mm is preferred and conforming from IS 383, and the test data materials after experiments are shown below in Table 1.

Table 1 Experimental test data of materials

Specific Gravity	Water absorption	Free (surface) moisture
C.A : 2.84	C.A : 0.55%	C.A : Nil
F.A : 2.64	F.A : 2.71%	F.A : Nil

A. Paper pulp

The acceptance of paper pulp in concrete industries has become an legal use of ordinary concrete pozzolan [12] [13]. The main reason for making use of paper waste is because it provides environmentally friendly facilities [14] [15]. The chemical analysis supported by the XRF (Energy Dispersive X-ray Fluorescence Spectrometer) scan data shows the absorption sheet contains the SI (60%) and Ca (14%) shown in Table 1, and the results of the analysis and storage are represented in Table 2 and Table 3 [16] [17]. Various investigations have confirmed that its Fibrous environment offers high storage quality, while paper-dried waste absorbs water for 24 hours and remains machine-free to achieve consistency [18] [19].

Table 2 Elemental Analysis of Paper Pulp [16][20]

Elements	Paper Pulp (%)
O	15.83
Ca	14.94
Si	60.57
Al	2.06
Mg	3.59
S	1.07
Ti	0.15
K	0.16
Fe	0.92
Na	0.22
Cu	0.05
P	0.03
Cl	0.41

Table 3 Proximate Analysis of Paper Pulp [16][20]

WT (gm)	Moist (%)	Ash (%)	Volatile Material (%)	Free Carbon (%)	GVC Kcal/Kg
420	5.84	40.6	44.7	8.9	2372

Table 4 Ultimate Analysis of Paper Pulp [16] [20]

WT (gm)	C (%)	H (%)	N (%)	S (%)	O (%)
420	22.7	2.5	0.3	0.4	23.6

B. Crusher Dust

Stone dust is a selective material that can be effectively used in construction as a replacement for natural sand [9]. This is a waste of composite crop availability. Stone dust is better suited for its economical nature and character than conventional sand for medium-sized concrete. The replacement of aggregate with stone dust can be compassed by 40% approximately, and this results in acceleration of compressive strength of concrete by 22% roughly [7]. This study examines the use of stone dust as a good mixing of concrete instead of a good mix of natural materials and improves pozzolan reaction, less compact compaction, and concrete strength [21].

III. METHODOLOGY

The research followed in this paper is based on the experimental analysis for obtaining sustainable concrete by incorporating waste materials in the mix. Therefore, to achieve this, paper pulp and crusher dust are considered a waste material, and it replaces cement and sand respectively. The comparison investigation is carried to examine the average compressive strength, split tensile strength, and slump values of newly investigated concrete with normal M20 concrete of grade. The first step followed in the research is testing of materials used in the preparation of concrete mix and the achieved values are shown in Table 5. The second step involves defining the percentage replacement of paper pulp and crusher dust by cement and sand respectively by deeply exploring peer-reviewed published research. Hereafter the assumed replacement of waste materials (P.P and C.D) are shown in the first column of Table 6 with sample name.

Table 5 IS code testing of materials for concrete mix

Sl. No	Test on Cement	IS Code	Value
1	Specific gravity	IS 2720 (part III) 1980	3.15
2	Fineness test	IS:4031(part I) - 1996	2.52%
3	Soundness test	IS:4031(part III) - 1996	6 mm
4	Standard consistency test	IS:4031(part IV) - 1996	31%
5	Initial setting time	IS:4031(part V) - 1996	28 min
6	final setting time	IS:4031(part V) - 1996	522 min

Table 6 Weight of materials for 1m^3 of concrete

Sample Name	Paper Pulp (P.P %) + Crusher dust (C.D %)	Cement (kg)	F.A (kg)	C.A (kg)	P.P (Kg)	C.D (Kg)	Water (Kg)	Slump (mm)
S-1	0% + 0%	394.320	620.750	1236.920	0.000	0.000	197.160	87.00
S-2	2.5% + 10%	345.030	620.750	1236.920	9.858	39.432	197.160	84.00
S-3	2.5% + 20%	305.598	620.750	1236.920	9.858	78.864	197.160	83.00
S-4	2.5% + 30%	266.166	620.750	1236.920	9.858	118.296	197.160	81.00
S-5	5% + 10%	335.172	620.750	1236.920	19.716	39.432	197.160	79.00
S-6	5% + 20%	295.740	620.750	1236.920	19.716	78.864	197.160	78.00
S-7	5% + 30%	256.308	620.750	1236.920	19.716	118.296	197.160	76.00
S-8	7.5% + 10%	325.314	620.750	1236.920	29.574	39.432	197.160	75.00
S-9	7.5% + 20%	285.882	620.750	1236.920	29.574	78.864	197.160	74.50
S-10	7.5% + 30%	246.450	620.750	1236.920	29.574	118.296	197.160	73.00
S-11	10% + 10%	394.320	620.750	1236.920	39.432	39.432	197.160	71.00
S-12	10% + 20%	276.024	620.750	1236.920	39.432	78.864	197.160	70.00
S-13	10% + 30%	236.592	620.750	1236.920	39.432	118.296	197.160	69.00
S-14	12.5% + 10%	305.598	620.750	1236.920	49.290	39.432	197.160	66.00
S-15	12.5% + 20%	266.166	620.750	1236.920	49.290	78.864	197.160	64.00
S-16	12.5% + 30%	226.734	620.750	1236.920	49.290	118.296	197.160	63.00

A. Design Mix for M20 grade of concrete

Procedure for concrete mix design calculation as per IS 10262-2009 based on strength, durability, workability, and economy [22] [23]. To produce concrete of required strength and properties, selection of ingredients and their quantity is to be found which is called concrete mix design. Proper mix design helps in clarifying the problem arises in concrete while placing or curing etc. As per IS456:2000, different grades of concrete are classified into M5, M7.5, M10, M15, etc.,whereas M stands for Mix, and the subscript of M stands for characteristic compressive strength (fck) of the concrete in N/mm^2 [24].

The average compressive strength is measured with cube specimens of dimension 150 mm × 150 mm × 150 mm cube in direct compression and the split tensile strength of concrete is measured with the help of cylindrical specimen cubes of 150 mm in diameter and 300 mm long [25] [23]. The design mix for M20 concrete used in this paper is 1:1.57:3.13, and details are shown in Table 7. The weight of different materials used in the mix design of 1m^3 M20 grade of concrete using paper pulp and crusher dust are shown in Table 7.

Table 7 Mix Design for M20 grade of 1m^3 concrete

Mix Design Calculation	Quantity
a) Volume of concrete =	1 m^3
b) Volume of entrapped air in wet concrete =	0.01 m^3
c) Volume of cement = [Mass of cement] / {[Specific Gravity of Cement] x 1000}	0.125 m^3
d) Volume of water = [Mass of water] / {[Specific Gravity of water] x 1000}	0.197 m^3
e) Volume of all in aggregate = [(a-b) - (c+d)]	0.668m^3
Mass of coarse aggregate = e × Volume of coarse aggregate × Specific gravity of coarse aggregate × 1000	1236.92 Kg
Mass of fine aggregate = e × volume of fine aggregate × Specific gravity of fine aggregate × 1000	620.75 Kg
DESIGN MIX (C : F.A : C.A) = (1 : 1.57 : 3.13)	

IV. RESULTS AND DISCUSSION

A. Slump Test

The standards IS: 1199 -1959 method is adopted in which the required apparatus are slump cone, non-porous base plate, measuring scale, and temping rod [26]. The shape of the mold is a frustum of a cone, and a specific dimension is, height 300 mm, bottom diameter 200 mm, and top diameter 100mm [26]. Further, the dimension of the tamping rod of steel is 16 mm diameter and 600 mm long [26]. The slump values of samples show non-linear declination as the paper pulp is increasing from 2.5% to 12.5%. The highest slump is recorded for S-1 (normal mix) and the lowest is recorded for S-16, the numeric values, and the trend of samples is shown in Figure1.

B. Average Compressive Strength

Samples (S-1…S-16) as per IS: 516-1959 are casted considering mix design as 1:1.57:3.13 [25]. Total of 48 samples are cast of cube size 150 mm × 150 mm × 150 mm including normal mix and newly formed samples as shown in Table 8. As seen after Compression Testing Machine (CTM), the samples S-2…S-8 shows average compressive strength higher than S-1 (normal mix), and the highest strength is recorded for the S-5 sample.

Afterward, the strength of samples S-9…S-16 starts decreasing when compared to S-1 (normal mix), and the lowest strength is recorded for the S-16 sample. The detailed results of all the samples are shown in Table 8, and the trend chart is shown in Figure 2 below.

C. Split Tensile Strength

Samples (S-1…S-16) as per IS: 5816-1999 are cast considering mix design as 1:1.57:3.13 [23]. A total of 48 samples are cast of cylindrical size 150 mm in diameter and 300 mm in length, including normal mix and newly formed samples as shown in Table 9. The results seen from the compression testing machine suggests that samples S-2…S-8 shows split tensile strength higher than S-1 (normal mix), and the highest strength is recorded for S-5 sample. Afterward, the strength of samples S-9…S- 16 starts decreasing when compared to S-1 (normal mix), and the lowest strength is recorded for the S- 16 sample. The detailed results of all the samples are shown in Table 9, and the trend chart is shown in Figure 3.

Table 8 Average compressive strength at 7th and 28th day

Sample Name	P.P (%) + C.D (%)	Avg. Comp Strength at 7th (N/mm^2)	Avg. Comp Strength at 28th (N/mm^2)
S-1	0% + 0%	17.56	27.01
S-2	2.5% + 10%	18.63	28.66
S-3	2.5% + 20%	18.89	29.06
S-4	2.5% + 30%	18.98	29.65
S-5	5% + 10%	19.84	31.00
S-6	5% + 20%	18.20	28.43
S-7	5% + 30%	17.78	27.79
S-8	7.5% + 10%	17.37	27.14
S-9	7.5% + 20%	17.33	26.85
S-10	7.5% + 30%	16.81	26.04
S-11	10% + 10%	13.85	21.46
S-12	10% + 20%	13.28	20.57
S-13	10% + 30%	12.72	19.70
S-14	12.5% + 10%	11.98	18.82
S-15	12.5% + 20%	10.90	17.13
S-16	12.5% + 30%	10.20	16.02

Table 9 Split Tensile Strength at 7th and 28th day

Sample Name	P.P (%) + C.D (%)	Split tensile Strength at 28th (N/mm^2)	Split tensile Strength at 28th(N/mm^2)
S-1	0% + 0%	1.95	3.00
S-2	2.5% + 10%	2.07	3.18
S-3	2.5% + 20%	2.10	3.23
S-4	2.5% + 30%	2.14	3.29
S-5	5% + 10%	2.22	3.44
S-6	5% + 20%	2.04	3.16
S-7	5% + 30%	2.00	3.09
S-8	7.5% + 10%	1.95	3.02
S-9	7.5% + 20%	1.93	2.98
S-10	7.5% + 30%	1.87	2.89
S-11	10% + 10%	1.45	2.29
S-12	10% + 20%	1.45	2.29
S-13	10% + 30%	1.39	2.19
S-14	12.5% + 10%	1.33	2.09
S-15	12.5% + 20%	1.21	1.90
S-16	12.5% + 30%	1.13	1.78

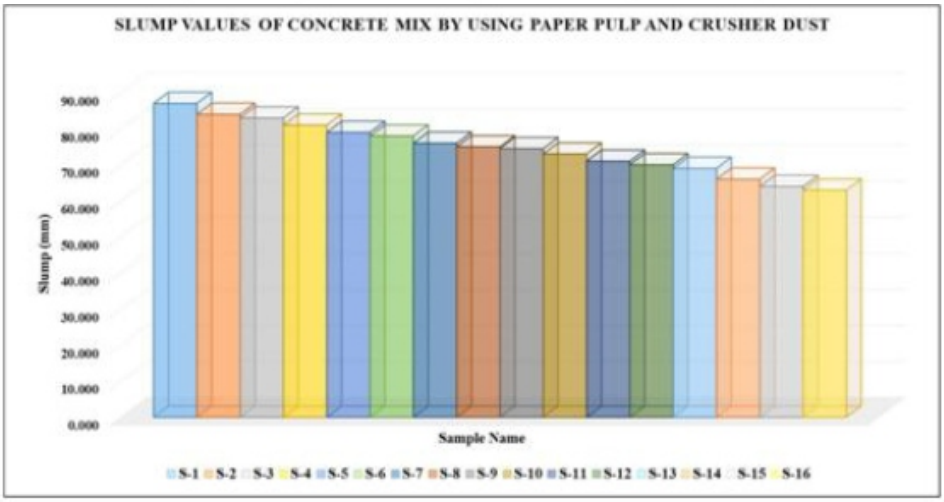

Figure 1 Trend chart of slump values for M_{20} concrete

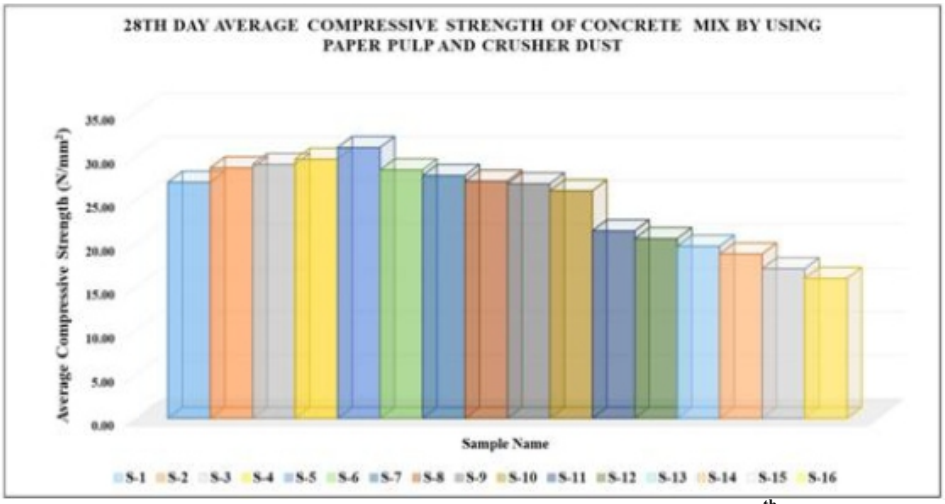

Figure 2 Trend chart of Average compressive strength at 28th day of M_{20} concrete

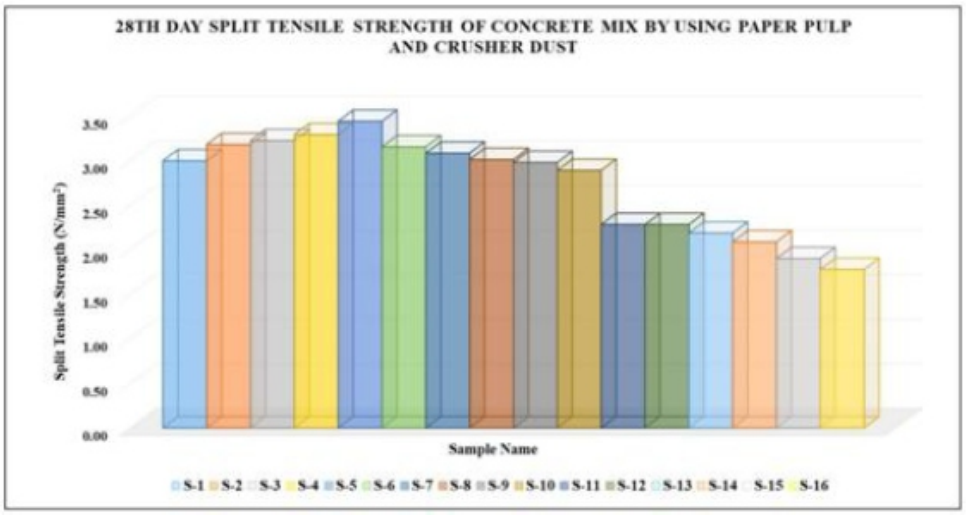

Figure 3 Trend chart of split tensile strength at 28th day of M20 concrete

V. CONCLUSION

The sustainable concrete obtained after adding paper pulp and crusher dust in the mix design of M20 concrete shows tremendous results in terms of strength and workability. As noticed, the results of average compressive strength and split tensile strength of samples (S-1…S-16) varies according to the percentage of paper pulp and crusher dust.

The workability of normal mix sample S-1 is observed 87mm, and afterward, the slump value keeps decreasing with a slight difference. The lowest slump observed is 63mm for sample S-16.

The average compressive strength when compared to normal mix sample S-1(P.P-0% and C.D-0%,27.01 N/mm2) is enhanced by almost 14% in sample S-5 (P.P -5% and C.D -10%, 31 N/mm2), and a reduction of 40% is observed in sample S-16 (P.P -12.5% and C.D -30%, 16.02 N/mm2). The trend observed in Figure 2 and Table 8 states that the average compressive strength of samples (S- 2…S-5) is greater than the normal mix sample (S-1) and afterward the samples (S-6…S-16) show a negative trend. Hence the optimum percentage of P.P and C.D to obtain sustainable concrete by using waste materials (P.P and C.D) is for sample S-5. It is advised after the experimental investigation that the promotion of such a concrete mix must be enhanced.

Similar observations like average compressive strength are seen for split tensile strength, and the results shown in Table 9 verifies it. When compared to normal mix sample S-1 (P.P-0% and C.D-0%, 3.00 N/mm2), the results of split tensile strength is enhanced by almost 14% in sample S-5 (P.P -5% and C.D -10%, 3.44 N/mm2), and a reduction of 40% is observed in sample S-16 (P.P - 12.5% and C.D -30%, 1.78%). The trend observed in Figure 3 and Table 9 states that the average compressive strength of samples (S-2…S-5) is greater than the normal mix sample (S-1) and afterward the samples (S-6…S-16) shows a negative trend. Hence the optimum percentage ofP.P and C.D to obtain sustainable concrete by using waste materials (P.P and C.D) is for sample S-5.

REFERENCES

1. TERI, ,, Material Consumption Patterns in India,— Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, New Delhi,2016.
2. R. SRINIVASAN, ,,EXPERIMENTAL INVESTIGATION IN DEVELOPINGLOW COST CONCRETE FROM PAPER INDUSTRY WASTE,— Universitatea Tehnică, 2010.
3. K. S. Teja, ,,HYPO SLUDGE AS A PARTIAL REPLACEMENT OF CEMENT IN CONCRETE,— IJCIET, Bd. 8, Nr. 4, pp. 1645-1651,2017.
4. C. Martínez, ,,Recovering wastes fromthe paper industry: Development of ceramic materials,— ELSEVIER, 2011.
5. S. Ahirwar, ,,Effective use of Paper Sludge (Hypo Sludge) in Concrete,— IJEDR, Bd. 6, Nr. 2,2018.
6. R. binti, ,,CONCRETE MIX WITH WASTEPAPER,— ICBEDC,2008.
7. D. A. Pofale, ,,Effective Utilization of Crusher Dust in Concrete UsingPortland Pozzolana Cement,— IJSRP, Bd. 3, Nr. 8, 2013.
8. Y.-m. Chun, ,,DURABLE CONCRETE THROUGH USE OF PULP AND PAPER MILL RESIDUALS,— Third International Conference, Hamelin et al (eds),2005.
9. M. Tamilselvi, ,,Effects of partialreplacement of cement with hypo sludge in concrete,— ICONSET, 2018.
10. B. o. I. Standards, ,,ORDINARY PORTLAND CEMENT, 43 GRADE — SPECIFICATION,— New Delhi,2013.
11. B. o. I. Standards, ,,COARSE AND FINE AGGREGATES FROM NATURAL SOURCES FOR CONCRETE,— New Delhi, 1970.
12. E. Gemellia, ,,Evaluation of Paper Industry Wastes in Construction Material Applications,— Materials Research, Bd. 4, Nr. 4, pp. 297-304,2001.
13. A. s. khan, ,,Structural Performance of Concrete by Partial Replacement of Cement with Hypo Sludge (paper waste),— IJETE, Bd. 1, Nr. 7, 2014.
14. S. Ahmad, ,,Study of Concrete InvolvingUse of Waste Paper Sludge Ash as Partial Replacement of Cement,— IOSRJEN, Bd. 3, Nr. 11, pp. 06-15,2013.
15. M. Alam, ,,AN EXPERIMENTAL STUDY ON USE OF HYPO SLUDGE IN CEMENT CONCRETE,— IJPCE, Bd. 2, Nr. 1,2015.
16. S. A. Balwaik, ,,Utilization of Waste Paper Pulp by Partial Replacement of Cement in Concrete,— IJERA, Bd. 1, Nr. 2, pp.300-309.
17. R. S. Gallardo, ,,STRUCTURAL PERFORMANCE OF CONCRETE WITH PAPER SLUDGE AS FINE AGGREGATES PARTIAL REPLACEMENT ENHANCED WITH ADMIXTURES,— ResearchGate, 2016.
18. A. B.Patil, ,,AN EXPERIMENTAL STUDY ON CONCRETE WITH PARTIAL REPLACEMENT OF CEMENT BY USING HYPO-SLUDGE,— IJARSE, Bd. 6, Nr. 3, 2017.
19. L. R. Singh, ,,Application of Paper Waste in Cement Concrete,— IJERA, Bd. 5, Nr. 4, pp. 95-98,2015.
20. V. Mymrin, ,,PAPER PRODUCTION SLUDGE APPLICATION FOR PRODUCING OF NEW CONSTRUCTION MATERIALS,— ResearchGate,2009.
21. A. U. Elinwa, ,,Ash from timber waste as cement replacement material,— ELSEVIER, pp. 219-222, 2001.
22. B. O. I. Standards, ,,Concrete Mix Proportioning — Guidelines,— NewDelhi, 2019.
23. B. o. I. Standards, ,, Method of Test Splitting Tensile Strength of Concrete,— New Delhi, 1999.
24. B. o. I. Standards, ,, Plain and Reinforced Concrete - Code of Practice,— NewDelhi, 2000.
25. B. o. I. Standards, ,,Method of Tests for Strength of Concrete,— New Delhi,1959.
26. B. o. I. Standards, Methods of sampling and analysis of concrete,— New Delhi,1959.
27. P. S. LOONTUROT, ASSESSMENT OF LATERIZED QUARRY DUST AND CRUSHED BRICKS AS ALTERNATIVE CONCRETE MAKING MATERIALS, JKUAT, Kenya,2018.
28. N. K. LOON, WASTE PAPER SLUDGE AS A FINE AGGREGATE REPLACEMENT IN CONCRETE, 2008.
29. M. R. Sharma, ,,CEMENT INDUSTRY TREND REPORT,— TERI, New Delhi,2017.
30. S. Roth, ,,THE PULP AND PAPER OVERVIEW,— Climate Strategies,2016.
31. D. J.D.Bapat, ,,HISTORY OF CEMENT AND CONCRETE IN INDIA – A PARADIGM SHIFT,— ResearchGate,2015.
32. A. S. Gill, ,,Study of Utilisation of Hypo Sludge in High Performance Concrete,— IJETT, Bd. 15, Nr. 6,2014.
33. P. R, ,,Experimental Study on Partial Replacement of Cement by Hyposludge in Concrete,— IJISET, Bd. 4, Nr. 3,2017.
34. M. A. Fauzi, ,,The effect of recycled aggregate concrete incorporating waste paper sludge ash as partial replacement of cement,— ICASET, 2015.
35. J. V. Solanki, ,,Study of Modulus of Elasticity of Concrete with Partial Replacement of Cement by Hypo Sludge Waste from Paper Industry,— GLOBAL RESEARCH ANALYSIS, Bd. 2, Nr. 1,2013.

36. *A. R. M. Ridzuan, ,,Strength Assessment of Controlled Low Strength Materials (CLSM) Utilizing Recycled Concrete Aggregate and Waste Paper Sludge Ash,— CHUSER,2011.*
37. *A. M. Nazar, ,,Study on the Utilization of Paper Mill Sludge as Partial Cement Replacement in Concrete,— MATEC Web of Conferences, 2014.*
38. *A.K.Priya, ,,Experimental Investigation on Developing Low Cost Concrete by Partial Replacement of Waste Sludge,— IJCRGG, Bd. 9, Nr. 1, pp. 240-247,2016.*
39. *J. D. Decard, ,,THE IMPACTRESPONSE OF RECYCLED PAPER WASTE CONCRETE,— ICE,2017.*
40. *Z. Jiang, ,,Self-Shrinkage Behaviors ofWaste Paper Fiber Reinforced Cement Paste considering Its Self-Curing Effect at Early- Ages,— International Journal of Polymer Science, 2016.*
41. *O. M. Okeyinka, ,,Assessment of the Suitability of Paper Waste as an Engineering Material,— Engineering, Technology & Applied Science Research , Bd. 4, Nr. 6, pp. 724-727.*
42. *B. S. Mohammed, ,,Assessing the properties of freshly mixed concrete containing paper- mill residuals and class F fly ash,— Journal of Civil Engineering and Construction Technology, Bd. 2, pp. 17-26,2011.*
43. *V. Hospodarova, ,,Investigation ofWaste Paper Cellulosic Fibers Utilization into Cement Based Building Materials,— MDPI, 2018.*
44. *T. R. Naik, ,,Paper Industry FibrousResiduals in Concrete and CLSM,—2005.*
45. *N. Chandrakar, ,,Utilization of Waste Paper Pulp in Construction,— IJERD, Bd. 14, Nr. 9, pp. 61-67, 2018.*
46. *B. S. Mohammeda, ,,Mix proportioning of concrete containing paper mill residuals using response surface methodology,— ELSEVIER, pp. 63-68, 2012.*
47. *B. S. Mohammed, ,,Mechanical and durability properties of concretes containing paper-mill residuals and fly ash,— ELSEVIER, pp. 717-725, 2010.*
48. *T. R. Naik, ,,Use of pulp and paper mill residual solids in production ofcellucrete,— Sciencedirect, pp. 1229-1234,2004.*
49. *B. o. I. Standards, ,,IS 4031-1 (1996):Methods of physical tests for hydraulic cement, Part 1: Determination of fineness by dry sieving,— New Delhi, 1996.*
50. *B. o. I. Standards, ,,Methods of physicaltests for hydraulic cement, Part 4: Determination of consistency of standard cement paste,— New Delhi,1998.*
51. *B. o. I. Standards, ,,Methods of physical tests for hydraulic cement,*
Part 3: Determination of soundness,— New Delhi,1998.
52. *B. o. I. Standards, ,,Methods of physical tests for hydraulic cement, Part 5: Determination of initial and final setting times,— New Delhi, 1998.*
53. *B. o. I. Standards, Methods of test for soils, Part 3: Determination of specific gravity, Section 2: Fine, medium and coarse grained soils,— New Delhi,1980.*

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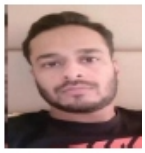

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Contrast Enhancement Technique using Discrete Wavelet Transform with Just Noticeable Difference Model for 3D Stereoscopic Degraded Video

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ABSTRACT

The Video Technologies for Medical, cultural, and social activities prefer 3D visual data rendering and processing. So 3D videos are captured by any capturing devices, like the digital cameras are not acceptable all the time due to the lack of capturing devices or indecent illumination or due to poor weather surroundings like Low light, rain, fog, mist, etc. reduces the contrast, thus the videos get degraded. 3D video contrast enhancement technique is an essential process for upgrading the quality and information content in the videos. The proposed work employs a discrete wavelet transform based enhancement technique with Jut noticeable difference model to improve the video frames and it is simple and computationally inexpensive. The application of DWT results in the Low and High-frequency sub-bands. The low-frequency components that contain the greatest amount of the information are improved using weighted threshold histogram equalization(WTHE) with the JND model algorithm while the high-frequency sub-bands are distortions and highly affected by noise. The Gaussian high pass filter is applied to each high-frequency sub-bands to remove the noise. Besides, enhancement gain control and luminance preservation are used to acquire the enhanced output video. At the end check the quality of the degraded video frame, the presented work is implemented in MATLAB 2018a and evaluated using objective parameters. Experimental results show that the proposed method can generate better and agreeable results than 2D videos.

Keywords: WTHE, Just Noticeable difference model, discrete wavelet transform, Contrast enhancement, GHPF.

I. INTRODUCTION

With the developing business sector in 3D imaging items, the 3D video has become a functioning zone of exploration as of late. The 3D video is the way to give more reasonable and vivid perceptual encounters than the current 2D partner. There are numerous uses of 3D Videos, for example, 3D TV, which is viewed as the principal drive of the current TV upheaval. The stereoscopic display is the momentum standard innovation for 3D TV, while the auto-stereoscopic presentation is all the more encouraging arrangement that requires more examination attempts to determine the related specialized challenges. The accomplishment of the 3D video industry depends on the specialized development of 3D video innovation, including its portrayal, catching, improvement, pressure, transmission, and delivery. 3D video upgrade is a provoking issue to be comprehended in video innovation. The significant period of stereoscopic 3D (S3D) will furnish onlookers with characteristic sensation and ideal submersion to binocular and monocular profundity sign.

Nonetheless, there is a recognizable diminish in the appeal of S3D methods over the most recent couple of years. Because of the unpredictability of a substance and unfortunate impact that may deliver by a perceptual perspective. S3D specialized difficulties in the field of video processing connected to quality examination, improvement, and compression. [1-2]

The main strategy of differentiation improvement is Histogram adjustment to balance the dark levels to upgrading contrast in numerous applications like clinical picture preparing, discourse acknowledgment, object tracking, and so forth Histogram equalization based procedures can't keep up average brightness level; it might deliver in either under immersion or over immersion in obscurity district or exceptionally splendid locale separately. To keep away from these issues some serious histogram leveling like bi-histogram equalization (BHE), partially overlapped sub histogram adjustment, and dualistic sub-picture HE strategies have been proposed by utilizing disintegration of two sub histograms of 2D video frames. In some paper proposed a neighborhood Histogram balance technique is known as Adaptive Histogram equalization. Here a video outline is isolated into little squares; close to HE is applied to each sub-square. Toward the end, the improved squares are consolidated utilizing the interpolation method. The adjusted HE technique depends on the singular-value decomposition of the LL sub-band of the discrete wavelet transform (DWT). Regardless of the improved contrast of theframe, this strategy will, in general, contort picture subtleties in low-and high-intensity regions [3-4]. To accomplish this objective, we present a proficient contrast upgrade technique for corrupted videos utilizing discrete wavelet transform based on improvement with the JND model. All the more explicitly, the proposed contrast upgrade calculation initially plays out the DWT to break down the info video outline into a bunch of band-restricted parts, called HH, HL, LH, and LL subgroups. Since the LL sub-band has the enlightenment data, JND values are determined. Based On the threshold values, the weighted threshold histogram equalization enhancement technique is applied. The high recurrence segments LH, HL, and HH parts are exceptionally influenced by noise, to eliminate the noise and upgrades the edge region Gaussian high pass filter is applied. After the JND based Enhancement upgrade strategy and noise decrease in the transformed area, play out the inverse discrete wavelet transform to recreate the improved videos.

II. PROPOSED VIDEO ENHANCEMENT APPROACH

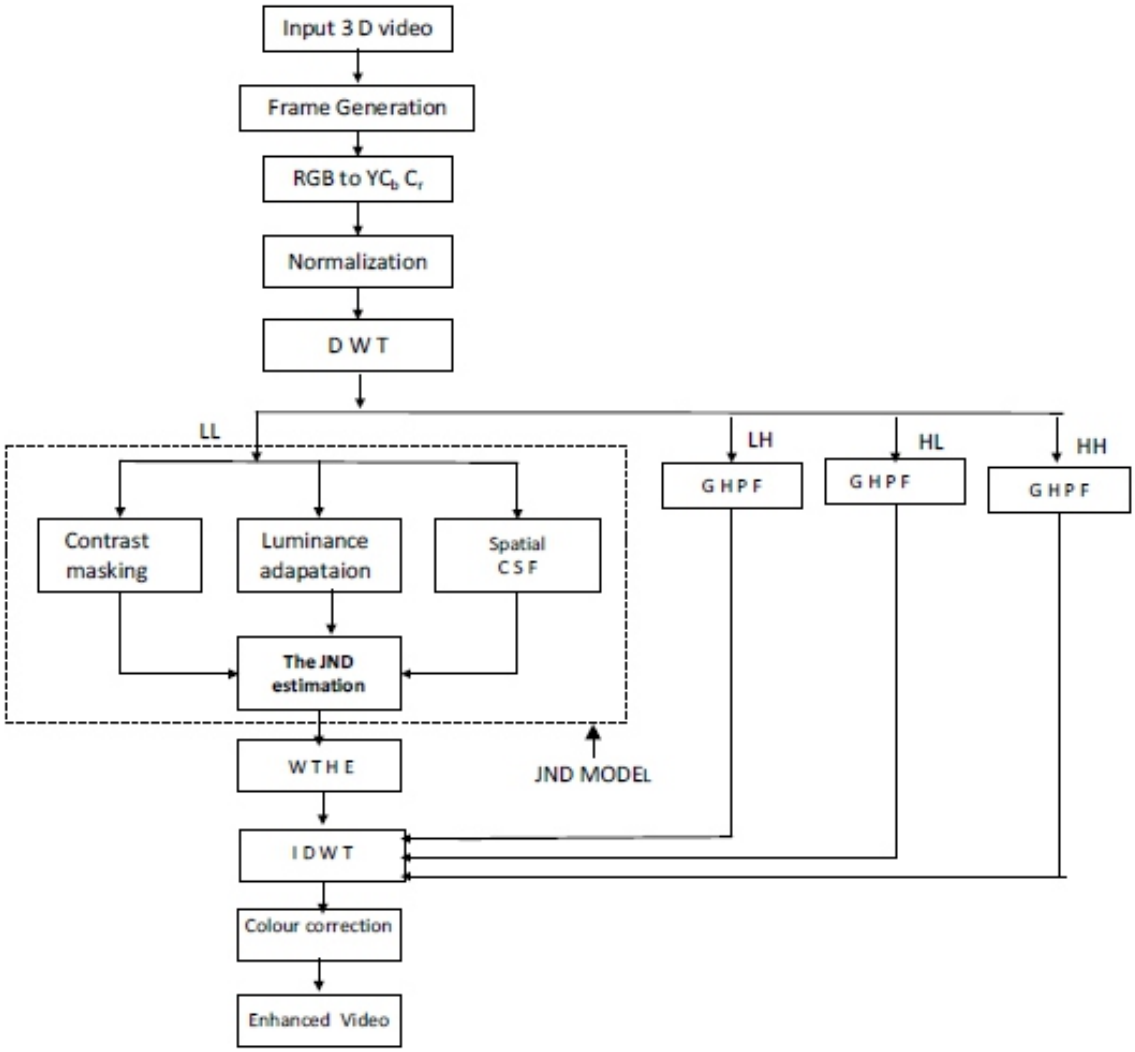

Figure 1: Proposed block diagram

1.1 Conversion of RGB to Y Cb Cr:

The Real-time videos are put away in color space since it relies upon affectability of shading location cells in the human visual framework. In advanced image processing,the Y CbCrcolor space is regularly used to utilize lower resolution capacities of the human visual framework for shading regarding luminance. Thusly, RGB to YC_bC_r transformation is regularly applied in image and video processing [5]

$$Y = 0.299 \times R + 0.589 \times G + 0.114 \times B \qquad (1)$$

1.2 Normalization

The dynamic scope of illuminationY isvery narrow, which doesn't use the dynamic scope ofdisplay tools. To utilize the dynamic reach totally, we utilized standardization dependent on an extending capacity as follows:

$$Y' = \frac{Y - Y_{min}}{Y_{max} - Y_{min}} \times 255 \qquad (2)$$

Here the maximum illumination components are Y_{max} and the minimum illumination component are Y_{min}.

2.3 Discrete Wavelet Transform

DWT is a straightforward and effective cycle for the development of wavelets. Wavelets are fundamentally the waves which are restricted in both time and recurrence area. DWT investigates the signal andvideo frames into continuously better octave groups. Break down the signal at various frequencies with various goals. The proposed calculation utilizes Haar wavelet because of its straightforward and effectiveness in improving boundaries of differentiation for recordings. This strategy is simpler to execute and comprehend as wavelets are developed in the recurrence area [5]. DWT is considered as a filter bank that contains two filters, for example, low-pass and high-pass channels, and decays the information outline into four sub-groups including LL, LH, HL, and HH. Since videos are two-dimensional signals, wavelet decomposition in the horizontal level and vertical levels, separately, and afterward, down-sampling is performed on the yields of filters so each filter yield is 50% of the first size input. The working of DWT is as appeared in the figure. 2. In the first level of decomposition, four sub-bands LL, LH, HL, and HH represent the approximation details, vertical detail, horizontal detail, and diagonal details respectively [6-7].

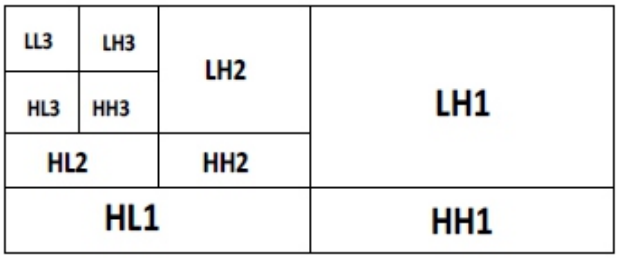

Figure 2. Three-level two-dimensional discrete wavelet transform

2.4The overall Just Noticeable Difference Model

In image and video processing technology, the Just noticeable difference model dependent on the human visual framework is generally utilized, which gives an essential visual perception model that relies upon the visual constraints and the qualities of the picture. The proposed JND model is a blend of three perspectives such as luminance adaption, Contrast sensitivity function, and contrast masking [8].

2.4.1The JND Estimation

$$JNDt(\lambda, \theta, i, j) = SF(\lambda, \theta, i, j)L(\lambda, \theta, i, j)T(\lambda, \theta, i, j) \quad (3)$$

The three elements of $SF(\lambda, \theta, i, j)$, $L(\lambda, \theta, i, j)$ and $T(\lambda, \theta, i, j)$ represents the spatial contrast sensitivity function (CSF), luminance adaption masking, and contrast masking respectively and i and j are spatial coordinates [9].

2.4.2Contrast sensitivity function

The most essential visual hypothesis model is Contrast affectability work. The substance of video outlines has no part in this model though it relies upon the eye to notice the video point of view. In the spatial recurrence space, the natural eye has band-pass highlights.

Mathematically this model is represented as the correlative of the essential distortion limit that each Discrete Wavelet Transform coefficient can deal with. The base limit can be figured utilizing the accompanying condition [10].

$$SF(\lambda, \theta, i, j) = \begin{pmatrix} \sqrt{2}, if\ \theta = HH; \\ 1, \quad otherwise \end{pmatrix} \frac{1}{H(t)(\lambda, \theta)} \quad (4)$$

Where $H(t)(\lambda,\theta)$ represents CSF and $\frac{1}{H(t)(\lambda,\theta)}$ is the just perceptual weighting depending on the frequency of the spatial coordinates and represents minimally noticeable sensitivity. Wavelet decomposition level is λ and wavelet co-efficient direction is θ. H(f) is a widely adopted model for the C0ntrast sensitivity function and is given by the equation

$$H(t) = 2.6(0.0192 + 0.0114t)e^{[-(0.0114)^{1.1}]} \quad (5)$$

2.4.3. Masking of luminance

Properties of the natural eye, for example, less affectability to the hazier area of the video frame over the lighter district and the location of a more brilliant locale of comparable power of commotion and obliviousness of more obscure district mutilations are clarified by luminance covering impact. It relies just upon the nearby highlights of the video frame, which is utilized to compute the impact of bending recognition under the condition of fixed pixel esteem as the foundation.

In a caught video frame natural eyes are less touchy to extraordinary brighter or darker areas, and based on this numerous models are utilized. In a DWT based model, we utilized the low-recurrence bit of the video casing to represent the nearby splendor. It is to propose another model [11], which is inferred in the sub-band for a given level, thinking about the degree of the estimate of remaking and neighborhood splendor appraisal. It can be shown below

$$L(\lambda,\theta,i,j) = 1 + L'(\lambda,\theta,i,j) \quad (6)$$

$$L'(\lambda,\theta,i,j) = \begin{cases} 1 - x(\lambda,LL,i,j), & if\ x(\lambda,LL,i,j) < 0.5, \\ x(\lambda,LL,i,j), & otherwise \end{cases} \quad (7)$$

Where $x(\lambda,LL,i,j)$ is the wavelet coefficient value of the discrete wavelet transform at the level λ, (i, j) position of the sub-band LL. The local brightness factor will be the maximum if the video frame area is very high light or very dark.

2.4.4. Masking of contrast

In the edge locales, the natural eye has less resilience to contortion and generally insensitive in the surface areas. This procedure is identified with the level of appearance of one signal within the sight of another signal. That is the permeability of the principle segment in the casing will change with the presence of different parts. The difference covering impact is most grounded when the direction, positions, and spatial frequencies of the two segments are equivalent. Similar clamor or examples put in a to a great extent finished locales, is hard to track down looked at an even region. That implies the casing surface can veil or conceal another bit of the example. The veiling of difference impact can be composed as [12].

$$T(\lambda,\theta,i,j) = T_{self}(\lambda,\theta,i,j)T_{neig}(\lambda,\theta,i,j) \quad (8)$$

Here $T_{self}(\lambda,\theta,i,j)$ represents the self –masking adjustment factor of contrast at the location (λ,θ,i,j). $T_{neig}(\lambda,\theta,i,j)$describes the neighborhood adiustment factor of contrast at the location(λ,θ,i,j).The model for $T_{self}(\lambda,\theta,i,j)$ is given by [13-14].

$$T_{self}(\lambda,\theta,i,j) = max\left\{1, \left(\frac{|v(\lambda,\theta,i,j)|}{SF(\lambda,\theta)L(\lambda,\theta,i,j)}\right)^{\emptyset}\right\} \quad (9)$$

Where $v(\lambda, \theta, i, j)$ represents the discrete wavelet transform coefficient in position (λ, θ, i, j). In the LL sub- band Ø= 0, The model for $T_{neig}(\lambda, \theta, i, j)$ can be written as

$$T_{neig}(\lambda, \theta, i, j) = max\left\{1, \sum_{k \in neighbors\ of\ (\lambda,\theta,i,j)} \frac{\left|\frac{v_k}{SF(\lambda,\theta)L(\lambda,\theta,i,j)}\right|^{\delta}}{N_{i,j}}\right\} \quad (10)$$

Where the area is made out of neighborhood coefficients in a similar sub-band inside the window focused at the area (i, j), $N_{i,j}$ is the number of coefficients of the area, v_k is the estimation of every local coefficient, and δ is consistent and controls the level of every neighborhood coefficient.

2.5 Histogram equalization

The customary histogram equalization strategy is portrayed as shows: By taking avideo frame,F (i, j) in Low-frequency components (LL), with a sum number of picture elements and a dark level range of black to white that is [0, K-1]. The probability density function (PDF) of the video frame can be written as

$$P(K) = \frac{n_k}{N} \quad \text{where } k = 0,1 \ldots., k-1 (11)$$

N = Sum of all pixels in the frame F(i, j)

n_k = Sum number of pixels in the frame that have gray level k.

The cumulative distribution function of frame F (i j) is given by

$$C(k) = \sum_{m=0}^{k} P(m) \text{where } k = 0,1 \ldots., k-1 \quad (12)$$

Taking the CDF values and histogram equalization maps an input level k into an output level H_k using the equation as shown below:

$$H_k = (K-1) \times C(k) (13)$$

Traditional HE explained above, the increment level H_k can be seen easily is

$$\Delta H_k = H_k - H_{k-1} = (K-1).P(k) (14)$$

In other words, the addition level H_k is relative to the probability of its corresponding level k in the input video frame. In principle, for frames with continuous illumination levels and PDFs, such a mapping method would consummately equalize out the histogram. Nonetheless, by and by, the force levels and PDF of a computerized frame are discrete. In such a case, the conventional HE technique is not, at this point ideal. All things being equal, it brings about unwanted impacts where force levels with high probabilities regularly become over-improved, and the levels with low probabilities get less upgraded, their numbers diminished or even disposed of in the resultant picture. HE regularly brings two sorts of antiquities into the upgraded picture: over-improvement for the more-successive levels and loss of difference for the less-continuous levels. In this manner, HE frequently over-improves the foundation of the video frame and causes level immersion (cutting) impacts in little however outwardly significant territories. To beat the visual antiquities of the HE technique and add greater adaptability to it, numerous specialists proposed distinctive improvement techniques.

2.5.1 Weighted Threshold Histogram equalization

The proposed WTHE technique performs histogram leveling dependent on an altered histogram. Every probability density value P(k) in condition (14) is supplanted by a weighted and threshold PDF esteem $P_{wt}(k)$, yielding

$$\Delta H_k = (K-1).P_{wt}(k)(15)$$
$P_{wt}(k)$ = Weighted and thresholded PDF

The level-mapping technique shown in (15), by applying a transformation function T(.) to P(k),

$$P_{wt}(k) = T\big(P(k)\big) = \begin{cases} P_u & if\ P(k) > P_u \\ \left(\frac{P(k)-P_l}{P_u-P_l}\right)^r \times P_u & if\ P_l \le P(k) \le P_u \\ 0 & if\ P(k) < P_l \end{cases} (16)$$

Where Pu is the Upper threshold and P_l is the Lower threshold. The change work T(.) clasps the first PDF at an upper edge threshold Pu and a lower threshold P_l, and changes the qualities between the upper and lower limits utilizing a standardized power law function with record r>0. when r<1, the Power-lawfunction will give a higher weight to the low probabilities and less-likely levels are "secured" and over-upgrade is diminished.

Likewise, in condition (16), the weighted Pwt(k) is limited at the furthest breaking point, P_u. Thus, all levels whose PDF values are higher than P_u will have their addition braced at a most extreme worth $\Delta_{max}=(K-1).\ P_u$ (given (15) and (16)). Such upper cinching further maintains a strategic distance from the predominance of the levels with high probabilities while distributing the yield dynamic reach. From our calculation, the estimation of Pu is chosen by

$$P_u = v.P_{max}\ ,\ 0 \le v \le 1 \qquad (17)$$

P_{max} is the Peak estimation of the first PDF, the real number v characterizes the upper limit standardized to P_{max} In our proposed calculation, the standardized upper limit v is utilized as another boundary that controls the impact of improvement.

The lower edge P_l in condition (16), then again, is simply used to remove the levels whose probabilities are excessively low, to more readily use the full unique reach. The estimation of Pl is less significant in controlling the upgrade and is set an exceptionally minimum fixed value that is 0.01% in our calculation. It very well may be seen from condition (16) when r=1, P_u=1, and P_l=0 the technique WTHE reduces to the conventional Histogram Equalization.

In the proposed strategy, the power index is the primary parameter that controls the level of upgrade. With r<1, more unique reach is dispensed to the less likely levels, along these lines saving significant visual subtleties. At the point when the estimation of r continuously ways to deal with 1, the impact of the proposed work moves toward the customary HE. When r>1, more weight is moved to the higher-probability levels, and WTHE gives a much more grounded impact than the conventional HE. Utilizing r>1 is more uncommon because of its higher probability to result in over-upgrade, yet it is as yet helpful in explicit applications where the levels with higher probabilities should be improved with additional energy. The proposed change work (condition (16)) introduces thre sholding with the histogram. In the proposed WTHE strategy, the upper limit Pu adjusts to P_{max}, the most probability observed in the frame. Such a system successfully mitigates the need for physically appropriate setting thresholds, bringing about predictable upgrade impact for various sorts of video without physically changing the parameters.

From equation (16), the CDF is acquired by

$$C_{wt}(k) = \sum_{m=0}^{k} P_{wt}(m),\ for\ k = 0,1,\dots\dots K-1 \quad (18)$$

$C_{wt}(k)$= Cumulative Distribution function (CDF) and the level mapping is

$$\tilde{F}(i,j) = W_{out} \times C_{wt}\big(F(i,j)\big) + M_{adj}\ (19)$$

$\tilde{F}(i,j)$is the Mean of the enhanced frame, W_{out} is the dynamic range of the output frame and M_{adj} is the Mean adjustment factor.From our video tests, the proposed WTHE upgrade technique on the luminance part leaving the chrominance components unaltered. In condition (19) W_{out} can be composed as

$$W_{out} = \min(255, G_{max} \times W_{in})(20)$$

Where Win is the dynamic range of the input video frame and G_{max} is a pre-set maximum gain of dynamic range and it can be used enhancement gain control mechanism. From equation (19), M_{adj} is the mean adjustment quantity that reduces the luminance changes after enhancement. From equation (19), Assuming M_{adj} =0, At that point, the distinction between it and the mean of the degraded frame is determined. Put M_{adj} is equal to the value closures to this average difference such that it does not create any level of serious saturation.

Finally, we have to verify the improved video frames based on JND threshold values and the corresponding amplified contrast results are not distinguishable to human eyes. Therefore, the evaluation function represented in the following form

$$F(i\,j) = \begin{cases} 1 - \tilde{F}(i,j) & if \quad \mathrm{JNDt}(\boldsymbol{\lambda}, \theta, i, j) \le 0.5 \\ \tilde{F}(i,j)\ otherwise & (21) \end{cases}$$

Where $F(i\,j)$ enhanced videos based on weighted threshold histogram equalization $\tilde{F}(i,j)$and the final JND estimated values$\mathrm{JNDt}(\boldsymbol{\lambda}, \theta, i, j)$.

2.6 Gaussian High pass filters

Wavelet transform is decomposing the original frame into four frequency sub-groups. The unwanted signal appears in high pass coefficients, Edges and sharp changes in grayscale values in a frame that contributes essentially to high-frequency content are to be distinguished appropriately and Low-frequency content is to be attenuated. The filter order increases, less ringing impact is noticed. The edges which are high-frequency components can be seen in the improved frame and hence sharpening of the frame has been accomplished to each high-frequency subgroup. Here the filter n=2and the cut-off frequency is Do= 24.

$$H(u,v) = 1 - e^{-D^{2(u,v)/2{D_0}^2}}(22)$$

Where D0 is the cutoff frequency at a distance D_0 (nonnegative quantity), and D (u, v) is the distance from the point (u, v) to the frequency rectangle [15]. If the frame size M x N, then

$$D(u,v) = \sqrt{(u - \frac{M}{2})^2 + (v - \frac{N}{2})^2}(23)$$

2.7Color correction

The DWT based enhancement with JND threshold and noise decrease in the frequency domain and, play out the converse discrete wavelet transform to remake the luminance frame as output frame, Ye. Correction of color is the technique for matching and compensating the color in the frame. To play out the color frame by the proportion of the RGB components as follows.

$$\begin{bmatrix} R'' \\ G'' \\ B'' \end{bmatrix} = \begin{bmatrix} Ye/Yo & 0 & 0 \\ 0 & Ye/Yo & 0 \\ 0 & 0 & Ye/Yo \end{bmatrix} \begin{bmatrix} R' \\ G' \\ B' \end{bmatrix} (24)$$

Here [R", G", B"] and [R', G', B'] shows the color channels of the output and input color videos, respectively.

III. RESULTS AND PERFORMANCE ANALYSIS

We conducted the proposed JND based Enhancement technique for 3D stereoscopic video sequences. The experiments were conducted on an Intel Core i3 - 2.30 GHz CPU and 4.00 GB RAM. We have taken foggy, rainy, and Low light 3D stereoscopic, 2 to 5 sec. video sequences are downloaded from the internet sources like Videezy.com and Shutter.com. The performance parameters viz, Signal to noise ratio, Peak signal to noise ratio, and Structural similarity index module values are calculated and tabulated in table 1. The original and enhanced for low light, foggy, and rainy video frames are as shown in figure 3.

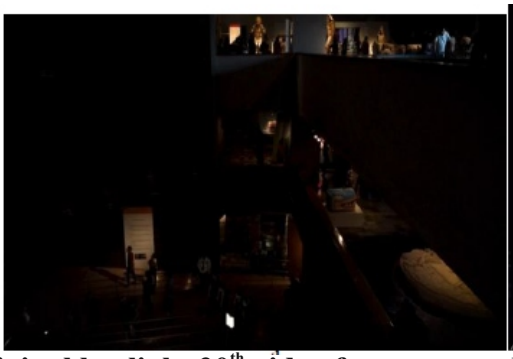

Fig.3.1 Original lowlight 20th video frame

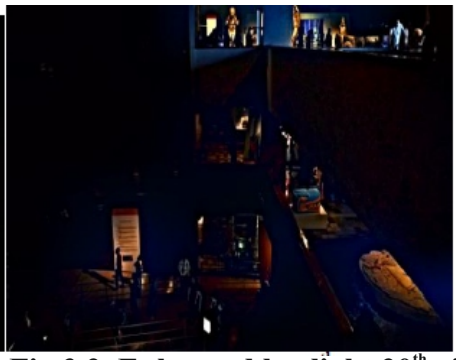

Fig.3.2. Enhanced lowlight 20th video frame

Fig.3.3. Original foggy 10th video frame

Fig.3.4. Enhanced foggy 10th video frame

Fig.3.5. Original rainy 50th video frame

Fig.3.6. Enhanced rainy 50th video frame

Figure 3. Examples of Original and Enhanced Videos frames with DWT based JND Model for different 3D Stereoscopic Videos.

Table 1.DWT-based Enhancement results without JND Model and with JND Model for different 3D Stereoscopic Videos

3D Videos	Enhancement without JND Model			Enhancement with JND Model		
	SNR	PSNR	SSIM	SNR	PSNR	SSIM
Foggy 1	22.8338	30.4726	0.8937	29.8787	34.3998	0.957
Foggy 2	22.9824	30.4378	0.6828	28.1654	34.4355	0.9559
Foggy 3	26.4774	29.5929	0.7304	27.4240	33.6167	0.9536
Rainy 1	24.7075	28.0458	0.7314	26.5252	30.2411	0.935
Rainy2	24.1194	27.0177	0.7024	24.8393	29.2811	0.8807
Rainy3	22.0714	27.0089	0.5897	24.4962	29.0153	0.8254
Low light1	19.9814	26.4916	0.5249	25.4513	28.9042	0.7722
Low light2	21.0745	24.3537	0.7895	23.1282	27.6646	0.7195
Low light3	22.9152	24.4055	0.7917	22.4068	26.8091	0.7154

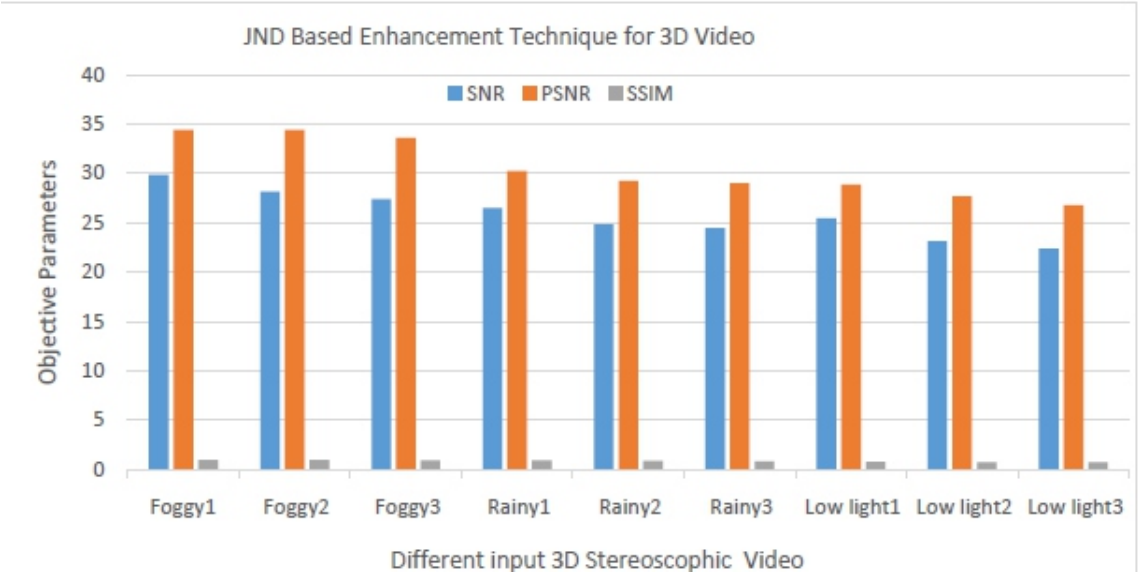

Figure 4. Analysis of the proposed technique with different degraded Stereoscopic 3D Videos

IV. CONCLUSION

We have proposed DWT based enhancement with and without JND model of different degraded stereoscopic 3D videos. Degrades videos are less dynamic domain, more noise as well as very weak in colors. Taking characteristics of degraded videos, it is developed into the three-level decomposition of input video frames into two sub-bands i.e. high- frequency information and low-frequency information. The DWT based JND model is applied to Low-frequency components. For improving the results, the weighted thresholded histogram equalization technique is applied according to the output of JND threshold values. The high-frequency components are highly affected by noise, to remove the noise and edge regions are improved by Gaussian high pass filter. Experimental analysis shows that the developed technique gives a good looking, informative, and enhanced forfoggy, rainy, and Low light 3D stereoscopic videos and very low performance for night videos.

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REFERENCES

1. *P.Merkle, K Mueller, T Wiegand," 3D Video: acquisition, coding, and display" IEEE Transaction, Consume. Electronics. 56(2) (2010) 946-950.*
2. *P.Merkle, K Mueller, T Wiegand, " 3D Video representation using depth video", In Proceedings of the IEEE, 99(4) (2011) 643-656.*
3. *J. A. Stark, "Adaptive Image Contrast Enhancement Using Generalizations of Histogram Equalization", IEEE Trans. on Image Processing, Vol. 9, No. 5, pp. 889 – 896, May 2005.*
4. *J-Y. Kim, L-S. Kim, and S-H. Hwang, "An Advanced Contrast Enhancement Using Partially Overlapped Sub-Block Histogram Equalization", IEEE Trans. on Circuits and Systems for Video Technology, Vol. 11, Issue 4, pp. 475 – 484, April 2001.*
5. *Lal, Shyam, and Mahesh Chandra. "Efficient algorithm for contrast enhancement of natural images." Int. Arab J. Inf. Technol. Vol.11, No.1, 2014.*
6. *Tingting Sun et al. "Readability Enhancement of Low Light Videos Based on Discrete Wavelet Transform." 2017 IEEE International Symposium on Multimedia*
7. *Lu-Ting Ko et al. "Haar-Wavelet-Based Just Noticeable Distortion Model for transparent Watermark." Hindawi Publishing Corporation Mathematical Problems in Engineering Volume 2012, Article ID 635738 doi:10.1155/2012/635738, Taiwan.*
8. *Chunxing Wang et al, "Visual Saliency Based Just Noticeable Difference Estimation in DWT Domain" Information 2018,9, 178, doi: 10.3390/info9070178.*
9. *Mannos, J.; Sakrison, D.J. The Effects of a Visual Fidelity Criterion on the Encoding of Images; IEEE Press: Piscataway, NJ, USA, 1974.*
10. *Xie, G.; Shen, H. Toward improved wavelet-based watermarking using the pixel-wise masking model. In Proceedings of the IEEE International Conference on Image Processing, Genova, Italy, 11–14 September 2005; p. I-689-92.*
11. *Liu, Z.; Karam, L.J.; Watson, A.B. JPEG2000 encoding with perceptual distortion control. In Proceedings of the 2003 International Conference on Image Processing (Cat. No. 03CH37429), Barcelona, Spain, 14–17 September 2003; Volume 1, p. I-637-40.*
12. *Teo, P.C.; Heeger, D.J. Perceptual image distortion. In Proceedings of the 1st International Conference onImage Processing, Austin, TX, USA, 13–16 November 1994; Volume 2179, pp. 127–141.*
13. *Hontsch, I.; Karam, L.J. Adaptive image coding with perceptual distortion control. IEEE Transaction, Image Processing. 2002, 11, 213–222.*
14. *Wang, Qing, and Rabab K. Ward. "Fast image/video contrast enhancement based on weighted thresholded histogram equalization." IEEE transactions on Consumer Electronics Vol.53, No.2, 2007.*
15. *Rafael C. Gonzalez, Richard E. Woods, "Digital Image processing" 3rd edition Pearson Education, ISBN 978-81-317-2695-2.*

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Survey on Interpretable Semantic Textual Similarity, and its Applications

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A B S T R A C T

Both semantic representation and related natural language processing(NLP) tasks has become more popular due to the introduction of distributional semantics. Semantic textual similarity (STS)is one of a task in NLP, it determinesthe similarity based onthe meanings of two shorttexts (sentences). Interpretable STS is the way of giving explanation to semantic similarity between short texts. Giving interpretation is indeedpossible tohuman, but, constructing computational modelsthat explain as human level is challenging. The interpretable STS task give output in natural way with a continuous value on the scale from [0, 5] that represents the strength of semantic relation between pair sentences, where 0 is no similarity and 5 is complete similarity. This paper review all available methods were used in interpretable STS computation, classify them, specifyan existing limitations, and finally give directions for future work. This paper is organized the survey into nine sections as follows: firstly introduction at glance, then chunking techniques and available tools, the next one is rule based approach, the fourth section focus on machine learning approach, after that about works done via neural network, and the finally hybrid approach concerned. Application of interpretable STS, conclusion and future direction is also part of this paper.

Keywords: Textual Semantic Similarity, Interpretable Textual Semantic Similarity, Application of Interpretable Textual Semantic Similarity, Deep Learning, Machine Learning, Rule based, Hybrid

I. INTRODUCTION

In this era, digitalization plays a vital role like transforming necessary information in digital way. Social channels look up users' personal information before launching any product or tool[1]. Interpreting an information enhances effectiveness of a system performance. Interpretable STS is the way of giving meaning to semantic similarity between short texts. The final goal this survey would be to show an approach of interpreting semantic textual similarity and to show the best one. Given the input (a pair of sentences), then distinguish each chunks in both sentences, next it computes similarity score for every possible pair of chunks based on the given features. Finally align most related chunks between the two sentences, with a reason why aligned. The relation interpreted as opposition, equivalence, similarity specificity, relatedness or unaligned (unrelated chunks)labeled with the similarity score from one to five. In interpretable STS dataset is crucial for both training and testing purpose. For this task Sem Eval 2015 and 2016 has been prepared dataset comprised pairs of sentences gathered from image descriptions and headlines news. The images dataset consists of images with description whereas the headlines dataset is collected from news headlines. Images dataset consist of 750 pairs of sentences used for training and 375 sentence pairs used for test.

On the other hand Headlines dataset consist of 756 pairs of sentences used for training and 375 sentence pairs used for test. Interpretable STS corpus has not existed in non-English language but recently Indonesian version is built [2].

Most importantly, recent work, show in what way the interpretable STS output used to produce descriptions automatically in NLP. Users achieved better result when additional clarification is given, in real applications [27].

All most in all works preprocessing is the first step to simplify the similarity calculation task. Many NLP tools are available for preprocessing, Stanford's NLP parser as well as OpenNLP framework were usually preferred by many authors. Actually, all researchers performed some kind of text (input) operation like tokenization, lowercasing, punctuation and stop word removal, lemmatization, parsing or part of speech tagging. Additionally named-entity recognition was used by many authors.

In order to identify chunks that the relationship between chunks is based on lexical selection, Abney [3] uses context-free grammar to describe the structure of chunks, providing a definition of a chunk from a linguistic perspective, which he hypothesizes is closer to how humans parse texts.

A chunk is a textual unit (a sequence) of adjacent words grouped together basis on their part of speech tag that indicate their internal relations [4], [6]. Based on this linguistic properties, chunking is parsing the sentence into a chunk based sentence structure form. Many linguistic parser used to chunking the input sentences with some post processing [7].

To chunk the input sentences the authors of NeRoSim system [5] created a rule based chunks determination. Inspire system uses Answer Set Programming to determine chunk boundaries [10]. In ExB Themis systema default Open NLP chunker, is used[8].On other hand Open NLP chunking tool output modified based on a rules observed from the dataset[7]as well as based on their dependency [9], [14].In order to maximize chunk accuracy enormous of rules were discovered [13].Some of those rules concerns how punctuations, conjunctions, and prepositions are handled [11], [12], [27]. Primarily concatenating two or more chunks (like preposition and noun phrase,noun phrases and conjunctions) and forming new chunks[27], [13], [14].

Another chunking tool was developed based on Conditional Random Fields (CRF) using both CoNLL-2000 shared task training data and test data. It generates shallow parsing features such as previous and next words from current word, and their POS tags [14].Having present notion of chunking and available tools for this purpose let's look at possible ways of chunk alignment score calculation and type prediction. Several approaches were proposed including rule based, machine learning (ML), neural network and hybrid approach.

II. RULE BASED

To this date, a few of the interpretable STS systems were rule-based that built on top of too much use of linguistic features and resources. The works conducted based on rule derived from observation of training dataset. One of well-known rule based system is NeRoSim [5] which depends on two methods, which is corpus and knowledge based. As corpus based NeRoSim used pre-trained Mikolov word representations [15] as knowledge based methods NeRoSim strictly lookup synonym, antonym and hypernyms features from WordNet. Chunks aligned twice to optimize alignment to calculate sentence similarity as in Stefanescu et al. [26, [5]. LexiM [16] is another rule based system purely based on lexical overlap (string or sub-string matches) contained 13 rules. Rev system extends LexiM by implementing the rules of LexiM and additional rules by manual data analysis of PoS categories and synonyms from the headlines training set. Rev system works with string distance similarity for lexical overlap, PoS

match and semantic similarity (i.e. synonyms) based strategies [16]. Based on rule while aligning a given chunk pair, NeRoSim checks has 7 defined conditions. Moreover, a precedence of rules well defined for all relation types and NOALIC relation assigned to a chunk as the last option.

Similarity score between the chunk pair using Mikolov word vectors. If a chunk to be mapped has no match, NOALIC assigned. For type EQUI 3 rules are applied by precedence unconditionally, the rest rules are applied only if none of these conditions 1 to conditions 5 are satisfied. OPPO type assigned fora content word in chunk of sentence 1has an antonym in the chunk of sentence 2 [5].

If chunk X contains all content words of chunk Y plus some extra content words that are not verbs, X is a SPE of Y or vice-versa. If chunk X contains only one noun and chunk Y contains only one noun and if chunk X noun is hypernym of chunk Y noun, chunk Y is SPE of the chunk X or vice versa [5]. SIMI type assigned based on many rules such as: unmatched word in both chunks is a number, either chunk has a token of LOCATION or DATE-TIMEtype. If pair chunks share one or more noun and Mikolov based similarity is >= 0.4 assign 3 score otherwise 2 score. The last one is if C-6 is not satisfied, score determined based on Milkov similarity [5]. REL relation type assigned if both chunks not share noun but share at least one content word. Scores are assigned as perMilkov similarity. NeRoSim limited alignment one chunk with another one only, but if a chunk attempt to align with the one already aligned and has strong similarity of Milkov similarity, it assign ALIC relation with score of 0 [5]. Similarly, Venseseval system [17] built a system that is an adaptation of a pre-existing (VENSES) system, first makes analysis of semantic fora text including its structure and it looks for chunk linking information using knowledge resources. The Venseseval system takes pair of sentence, then select first chunk in first sentence and recursively attempt to match to every chunks in second sentence. For each chunk pair start matching procedures check from EQUI/OPPO then SPE1/SPE2 then SIMI/REL else assign NOALI label to chunk of sentence one and move to next. Similarly it repeats up to end of chunks in sentence one. Finally, the algorithm checksall NOALI marked chunks for possible multiple align matches with all already matched chunks except chunks labeled EQUI[17]. Moreover, thus rule based algorithm is constructed from too much different rules for similarity score assign. Chunk matching use different resources at different levels. To determine EQUI and SIMI relation WordNet in the same synset, and path one level similarity per formed. VerbOcean3and thesaurus used to determine REL relations [17].

III. MACHINE LEARNING

This section discusses about methods of chunk alignment, scoring and extracting their interpretation based on ML approach. Usually this approach more focus on a syntactic form of a chunks, for example count of POS and/or the count of words in a chunk pair [13]. In order to align chunks monolingual word aligner supervised ML techniques as Sultan [18] was chosen by two teams named UBC and ExB [11], [8]. Likewise, SVCSTS team [13] extends the technique but, IISCNL team [19] proposed a novel algorithm named iMATCH for alignment which handles many-to-many chunk alignment, based on Integer Linear Programming. Unsupervised ML is not used by many authors as supervised one. Unsupervised ML extract a defined score from dataset and use it along with other features to train a model [8]. STS score is computed using ν-SVR with default SVR parameter settings via LibSVM's. Fails to differentiate SIMI and REL type [8]. On the other hand, supervised ML uses many features like length, counts of parts of speech, order of words in each chunk in pair to assign a type.Count of nouns, verbs, adjectives and prepositions in both chunk taken into account. The path similarity between words of pair chunks. Unigram as well as bigram overlaps between chunk pairs considered to predict alignment type [13]. The UBC team built a cube with information from several sources including Random Walks

over Wikipedia and WordNet (depth related features), string similarity (Jaccard overlap related features), numbers (segment length related features), negation and antonym. Support Vector Machine (SVM) implementation using randomly shuffled 5-fold cross validation used to induce the model [11]. Similarity, supervised multiclass classification based on Random Forrest Classifier assign type and score for aligned chunks.Chunk Length Difference, Common Word Count, Has Number, Is Negation, Edit Distance Score, PPDB Similarity, cosine of W2V and Bigram Similarity. Wordnet based feature like, Path Similarity, IsHyponym, Synonym and Antonym Count [19]. FBK-HLT-NLP group constructs expandable and scalable pipeline framework, in which each component produces diverse features autonomously and at the conclusion, all highlights are solidified by a ML tools, which learns a relapse demonstrate for foreseeing the likeness scores from given sentence-pairs. The framework built combining diverse linguistic features in a classification show for foreseeing chunk-to-chunk arrangement, connection type, and STS score. The framework adopted string likeness, character/word n-grams, and pairwise similitude in UKP; in any case, on best of that the creators include other recognized features, like information of syntactic structure, semantic word similarity, and alignment a total of 245 features [9].

Several WordNet based features evaluates the type of relation between chunks by considering all the lemmas within the two chunks and checking whether a lemma in chunk1 may be an antonym, synonym, hyponym, meronym, hypernym, or holonym of a lemma in chunk2 [9].

A distributional representation of the chunk adds up to 200 features for chunk match, to begin with calculating word embedding and after that combining the vectors of the words within the chunk Mikolov word2vec with 100 dimensions [9]. WEKA was utilized for learning a relapse show to foresee the likeness scores a ML toolkit. Exploit the syntactic information by the mean of three particular toolkits: Syntactic Tree Kernel, Distributed Tree Kernel, and Syntactic Generalization. Then combines the yield of the three classifiers organized in a pipeline. For each adjusted chunk match, it includes the type and the STS score [9].

IV. DEEP LEARNING

This section discusses about deep learningand neural network based chunk aligning, scoring and labeling their relation. Chronological order of alignment prediction was strictly considered as in Sultan [18]. In [12] system the alignment began with token to token matrix performed on weighted sum of lowercased, stemmed or lemmatized token overlap, and cosine similarity between Mikolov's vectors. Once the token-token network is built, the alignment component makes utilize of fragment locales to gather every token. By carrying out this operation over all portions of the combine the module gets the chunk-chunk matrix. Once the matrix has been calculated, the final step is finding the sections (x, y) that maximize the association weights [12].

On different aspect neural network based approach (normal arrow) left and right segments are processed through a recurrent ANN generating as output a d-dimensional vector for every enter segment stated in [12]. Features computed out of those vectors are then fed to each a regressor and a classifier that produce the similarity rating and the relation label. In the backward propagation, weights are adjusted in the recurrent ANN combining the gradients that propagate from the models. As a two-layer architecture, a classifier and regressor work on the top of a recurrent ANN [12]. While the models at the top layer are trained to provide scores and labels, the underlying recurrent net attempts to capture the semantic representation of entering segments and feed it upwards.

Both models on the top layer are simultaneously trained in a supervised manner, and the delta error messages computed on them are used to train the bottom layer net. That is, to train the ANN's weights, the gradient propagating from both models on the upper layer was being used. The model works in the following way: one at a time, the ANN from the bottom layer processes fragment words and continues the same technique until no more words are left. At any specific time, the net updates its internal memory state, so that the semantic recognition of the segment continues to be captured[12].

When the two segments have been processed, the net results are d-dimensional vectors of segment representation. In the upper layer, these vectors are used to compute features for models. The two ANN models (RNN and LSTM) are coded according to the [25] equations. The concatenation of distance and angle gives 2 * d-dimensional vector. This resulting vector is used as the input in top layer models. Feed forward neural networks are used with relation to the upper layer models [12].

As a means of making a system more interpretable, the splitting of sentence level scores through subsequence alignments has been suggested. Predicting an agreement between chunks of sentence x and sentence y is the issue of interpretable STS. In sentence x, not all chunks are matched with a chunk in sentence y (and vise-versa). It was pointed out that a novel pointer network based alignment model was introduced in a recent study to align constituent chunks that are represented using BERT. Chunk representation is obtained from BERT[22] based on a chunked sentence, and by concatenating context - dependent embedding between the first and last word of a chunk. Word matrices are of the same dimension and the embedding of the project chunk into a lower vector dimension. The PN 'points' from chunks in x to chunks in y, thus. The system alignments are bidirectional to penalize misalignments in pairs of sentences. Guiding neural networks with integrated external sources has been shown to increase prediction accuracy by combining effective data-driven learning.

Two intuitive principles were employed for the chunk alignment phase. First relation rule is obtained from ConceptNet (i.e. Antonym, Synonym, IsA, RelatedTo, SimilarTo, Distinct From or Form Of) and the second rule is syntactical similarity (Jaccard similarity between POS tags of ancestor/children nodes two words) of two sentences as dependency parse trees [20].

V. HYDRIDE

Let, look at rule-based approach blend with ML approach. The VRep methods merges the two approaches and extracts for each chunk pair a total of 72 syntactic and semantic factors. VRep combines the ideas of NeRoSim's and SVCSTS's. NeRoSim is a rule based on the semantic link between chunk pairs, examining that two chunks contain antonyms, synonyms, etc. The methods of SVCSTS pay attention to the syntactic forms, while counting parts of speech and the number of words addressed in the ML approach in a chunk pair. Both these systems identify a chunk by using attributes derived from the chunk pair itself [21]. Gold standard chunk pairs of task 2 test data from the 2015 SemEval were used to learn their classifier, which generates a classification decision list. The classifier used many features and a series of rules. Classifiers were trained with chunk pairs from every data set (student answers, headlines, and images), both individually and combined [21]. UWB team [23] won in SemEval-2016 competition in the Gold standard chunk scenario. UWB is paired with a wide range of different models and aspects of similarity. In the method, ML and rule-based approaches to the task are explored [23]. More emphasis on ML and experimenting with a broad range of ML algorithms and also with many kinds of features based on rules. Four categories of features (lexical, syntactic, semantic, and external) employed. Lexical features consist word lemma overlap, word base structure overlap, difference in

chunk length, difference in word sentence positions. POS tagging and parsing are performed with Stanford CoreNLP [24] for syntactic features.

If one chunk is associated with several chunks in the other sentence, these chunks should be combined into one chunk after processing. To evaluate the similarity of chunks of a sentence the core of the method is to use distributional semantics. The authors of UWB method used the chunk similarity as a feature in unsupervised ML approach. The authors employ classification frameworks for chunk alignment, score and type classification by Voted perceptron (Weka), Maximum entropy (Brainy), and Support vector machines (Brainy) respectively. Little options used in rule-based approach which contributes to achieve best results for calculating chunk similarity with Word2Vec and the modified lexical semantic vectors. Type classifications classify all matched pairs of chunks as per predefined set of types [23]. In another work, for Indonesia a researchers adopt two best technique of SemEval-2016 named UWB which uses word embedding [23] and VRep that utilized WordNet to represent word semantic [21]. The adaptation of UWB and VRep is performed by changing English resources (such as word embedding and WordNet) in Indonesia [2].

VI. APPLICATION OF INTERPRETABLE STS

It is very important when learners engage with the application of an intelligent tutoring system through natural language explanation[1].In NLP, the scientific discovery of semantic similarity in text is very relevant and widely studied, with various tasks such as entailment, semantic similarity, etc.

Specificallyto clarify an advantage of interpretableSTS application, judgments to humans is required, it was pointed out that, in [27] performed two user studies on English text. In this work the authors first developed a verbal expression algorithm that returns the text verbalizing their commonalities or differences between the two sentences, given the pair of sentences, their similarity score, as well as the dictated and scored alignment between pairs of chunks. After that, differentiated the activities of the users without and with the Interpretable STS verbalizations. Finally, the results shows that Interpretable STS explanations are effective in both studies [27].

In any application, Interpretable STS can be applicable if showing additional explanation of similarity gives motivation and answer why x is similar with y. Even in recommendation system explanation of why the system recommend something or some product is valuable.

VII. CONCLUSION AND FUTURE WORK

To conclude let, look at state-of-the-art on allevaluation methods such asalignment, score, type prediction and overall results. BERT based chunk alignment is the best one by alignment of 97.73% on headlines and 96.32% on images dataset regardless of any further description about its chunking standard. The next table shows the best result of three datasets in two known chunk standard which presented on SemEval-2016. To show the overall results across datasets for score& type twogroups UWB and DTSim won for the gold chunks scenario, and another two groups FBK-HLT-NLP and DTSim wonfor the system chunks scenario. Moreover, DTSim obtained the best overall results but,from Answer-Students dataset the archived result was not good. The following table contains state-of-the-art on three dataset (Headline, Image, Answer-Student) with two chunks (GoldChunk and SysChunk).

Deep neural network BERT based alignment accuracy is more than 96% however, this method is not trained for score calculation. Score calculation result as state-of-the-art is less than 85% it shows as it

needs working on it. Similarly type prediction is still less than 75% also the overall interpretableSTS result is less than 75%.Toimprove overall performance of the interpretableSTS deep learning approach is promising.

Table-I:state-of-the-art on align, score, and type prediction

Dataset name	Alignment	Score	Type	Score &Type
Images Syschunks	IISCNLP	FBK-HLT-NLP	DTSim	DTSim
	84.6%	78.6%	62.8%	61%
Images Goldchunks	UWB	UWB	UWB	UWB
	89.4%	84.1%	68.7%	67.1%
Headlines Syschunks	DTSim	DTSim	DTSim	DTSim
	83.8%	76%	56.1%	54.7 %
Headlines Goldchunks	IISCNLP	UWB	Inspire	Inspire
	91.4%	83.8%	70.3%	69.6%
Answer-Students Syschunks	DTSim	FBK-HLT-NLP	FB-HLT-NLP	FBK-HLT-NLP
	81.8%	75.9%	56.1%	55.5%
Answer-Students Goldchunks	VRep	IISCNLP	IISCNLP	IISCNLP
	87.9%	82.6%	65.1%	63.9%

REFERENCES

1. *G. Majumder, P. Pakray, D. Avendaño, "Interpretable Semantic Textual Similarity Using Lexical and Cosine Similarity," Social Transformation – Digital Way. CSI 2018. Communications in Computer and Information Science, vol 836. Springer, Singapore. https://doi.org/10.1007/978-981-13-1343-1_59*
2. *R. C. Rajagukguk, M. L. Khodra, "Interpretable Semantic Textual Similarity for Indonesian Sentence," 5th International Conference on Advanced Informatics: Concept Theory and Applications (ICAICTA), 2018, pp. 147-152*
3. *Abney, S. 1996. Tagging and Partial Parsing, Corpus-Based Methods in Language and Speech. Kluwer Academic Publishers, Dordrecht*
4. *Nay Lin, et al: "Developing a Chunk-based Grammar Checker for Translated English Sentences," 25th Pacific Asia Conference on Language, Information and Computation, pp. 245–254.*
5. *R. Banjade, et al. "NeRoSim: A System for Measuring and Interpreting Semantic Textual Similarity," Proc. 9th International Workshop on Semantic Evaluation (SemEval 2015), Denver, Colorado, June 4-5, 2015, pp. 164–171.*
6. *Chang, C.C., Lin, C.J, "LIBSVM: A library for support vector machines," ACM Trans. On Intelligent Systems and Technology2, 27:1–27:27(2011)*
7. *Ana O, et al. ASAP-II: From the Alignment of Phrases to Text Similarity. Proceedings of the 9th International Workshop on Semantic Evaluation (SemEval 2015), Denver, Colorado, June 4-5, 2015, pp. 184–189.*
8. *C. Hanig, R. Remus, X. D. LaPuente, "ExB Themis: Extensive Feature Extraction from Word Alignments for Semantic Textual Similarity," Proc. 9th International Workshop on Semantic Evaluation (SemEval 2015), Denver, Colorado, June 4-5, 2015, pp. 264–268.*
9. *N. P. An, S. Magnolini, O. Popescu, "FBK-HLT: A New Framework for Semantic Textual Similarity," Proc. 9th International Workshop on Semantic Evaluation (SemEval 2015), Denver, Colorado, June 4-5, 2015, pp. 102–106.*
10. *M. Kazmi, P. Schüller, "Inspire at SemEval-2016 Task 2: Interpretable Semantic Textual Similarity Alignment based on Answer Set Programming," Proc. SemEval-2016, San Diego, California, June 16-17, 2016, pp. 693–699.*
11. *Eneko Agirre, et al. "UBC: Cubes for English Semantic Textual Similarity and Supervised Approaches for Interpretable STS," Proc. 9th International Workshop on Semantic Evaluation (SemEval 2015), Denver, Colorado, June 4-5, 2015, pp. 178–183.*
12. *I. Lopez-Gazpio, E. Agirre and M. Maritxalar, "iUBC at SemEval-2016 Task 2: RNNs and LSTMs for interpretable STS," Proc. SemEval-2016, San Diego, California, June 16-17, 2016, pp. 681–686*
13. *S. Karumuri, V. K. Reddy and S. C. Raj, "UMDuluth-BlueTeam: SVCSTS - A Multilingual and Chunk Level Semantic Similarity System," Proc. 9th International Workshop on Semantic Evaluation (SemEval 2015), Denver, Colorado, June 4-5, 2015, pp. 107–110.*

14. *R. Banjade, N. Maharjan, N. B. Niraula and V. Rus, "DTSim at SemEval-2016 Task 2: Interpreting Similarity of Texts Based on Automated Chunking, Chunk Alignment and Semantic Relation Prediction," Proc. SemEval-2016, San Diego, California, June 16-17, 2016, pp. 726–730.*
15. *Tomas Mikolov, et al. "Efficient Estimation of Word Representations in Vector Space," Proc. Workshop at ICLR, 2013*
16. *T. P. Ping, K. Verspoor and T. Miller, "Rev at SemEval-2016 Task 2: Aligning Chunks by Lexical, Part of Speech and Semantic Equivalence," Proc. SemEval-2016, San Diego, California, June 16-17, 2016, pp. 777–782.*
17. *R. Delmonte, "VENSESEVAL at Semeval-2016 Task 2: iSTS - with a full-fledged rule based approach," Proc. SemEval-2016, San Diego, California, June 16-17, 2016, pp. 713–719.*
18. *Md. A. Sultan, S. Bethard, and T. Sumner, "Dls©cu: Sentence similarity from word alignment," Proc. 8th International Workshop on Semantic Evaluation (SemEval 2014), Dublin, Ireland, 2014, pp. 241–246.*
19. *L. S. Tekumalla and Sharmistha, "IISCNLP at SemEval-2016 Task 2: Interpretable STS with ILP based Multiple Chunk Aligner," Proc. SemEval-2016, San Diego, California, June 16-17, 2016, pp. 790–795.*
20. *S. Maji , R. Kumar , M. Bansal , K. Roy and P. Goyal, "Logic Constrained Pointer Networks for Interpretable Textual Similarity," Proc. Twenty-Ninth International Joint Conference on Artificial Intelligence (IJCAI-20).*
21. *S. Henry and A. Sands, "VRep at SemEval-2016 Task 1 and Task 2: A System for Interpretable Semantic Similarity," Proc. SemEval-2016, San Diego, California, June 16-17, 2016, pp. 589–595.*
22. *J. Devlin, M. Chang, K. Lee, and K. Toutanova, "Bert: Pre-training of deep bidirectional transformers for language understanding," In NAACL-HLT, 2019, pp. 4171–4186.*
23. *M. Konopik, O. Prazak, D. Steinberger and T. Brychcin, "UWB at SemEval-2016 Task 2: Interpretable Semantic Textual Similarity with Distributional Semantics for Chunks," Proc. SemEval-2016, San Diego, California, June 16-17, 2016, pp. 720–725.*
24. *Christopher D. Manning, et al. "The Stanford CoreNLP natural language processing toolkit," Proc. ACL: System Demonstrations, 2014*
25. *Kai Sheng, et al. "Improved semantic representations from tree-structured long short-term memory networks," 2015.*
26. *Dan Stefanescu, et al. A sentence similarity method based on chunking and information content. In Computational Linguistics and Intelligent Text Processing, pages 442–453. Springer. 2014b.*
27. *I. Lopez-Gazpio, et al. Why do you say they are similar? Interpretable Semantic Textual Similarity*

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Blockchain Covid-19 Tracker for Educational Institutions

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A B S T R A C T

The current COVID-19 pandemic has changed our lives in unimaginable ways. It has brought forth the need to know our location, the people we've been in contact with, and other details like our body temperature and more to contain the spread of this virus. This information is even more vital when it comes to students, as their return to school increases their exposure level. There are quite a few existing systems that must be integrated to solve this problem. Currently, we have in use thermal sensors to record people's temperatures by scanning, we have card readers in buses to confirm the student's presence, and we have online portals where teachers can log a student's attendance for each class. Using blockchain, we can incorporate these systems to create an effective, transparent COVID-19 tracker. In this paper, we discuss a new blockchain-based tracking system that ensures transparency between the student, school and government to prevent the spread of the virus and help in contact tracing. We facilitate the integration of the above-mentioned systems using blockchain and school/national ID cards.

Keywords: Blockchain, COVID-19 pandemic, student, thermal sensors, card readers, online portals, school, transparency, contact tracing

I. INTRODUCTION

Block chain is basically a growing set of records in which new information and data is entered and monitored. This is considered as an efficient way to record data as opposed to databases as the information cannot be tampered with or erased. These are ledgers that are connected using cryptography. For quite a while, blockchain has been the most new and budding technology. The booming popularity in this sector has largely been due to the rampant and growing use of cryptocurrency. Bitcoin was the reason most people became educated about blockchain and its uses. One of the most redeeming factors about a blockchain is its complete transparency and autonomy. It often appealed to large groups of people especially while undergoing large transactions as it did not involve any third party and wasn‟t controlled by any one organization. This is one of the many uses of block chain. With the situation of our "new normal" due to COVID-19 and schools reopening blockchains might help the situation. Schools can implement this technology to keep track of whom the students are encountering and notify them if anyone tests positive and thus manage to control the situation better.

II. EXISTING SYSTEMS AND USES OF BLOCKCHAIN

As blockchains are a relatively newer technology, it has just recently started taking off. The complete capabilities and applications of blockchain technology have not been completely put to use yet as people have just started exploring its uses.

Using blockchain in healthcare, which is one of the most vital sectors in an economy, is just being uncovered. Blockchains are seen as a more transparent and efficient upgrade of databases and EHR (Electronic Health Records). Implementing the blockchain to log the data of the patients will give both

patients, doctors and any required personnel easy access to their medical record. Patients often go to different treatment sites and doctors and thus gaining access to information compiled in one place is time and data efficient. This blockchain system uses a public key and the blockchain is distributed among trusted individuals. One very useful aspect of using blockchain technology in healthcare is the decentralized resources. The blockchain contains cryptographically signed contracts which are known as smart contracts. In healthcare, several contracts have to be upheld and respected such as the registrar contract, patient-provider relationship contract and the summary contract. All these are encoded in the blockchain. This provides a more patient centric approach. Currently, blockchains are used for data sharing, access control and health records but there is large potential for growth of blockchain in areas like supply chain and drug prescription management. There is also a lot of potential for blockchain usage in the field of education. Existing solutions such as Blockcerts, cryptocurrency and the Ethereum Blockchain (Ethereum still requires software to build smart contracts and access to databases however) are being used to permanently secure certificates, receive payments from students and provide student funding via blockchains in terms of vouchers respectively. Other potential uses of blockchain technology that is currently being explored in this field is using blockchain to verify multi-step accreditation, to facilitate automatic recognition and transfer of credits, to track intellectual property and more. Shifting our gaze away from blockchain, it is also interesting to examine the systems that have suddenly come into the spotlight due to the coronavirus pandemic and the notion of children returning to school under such circumstances .Information about a student‟s attendance and temperature has become essential to ensure every child‟s safety and well-being. To provide this information, three systems are especially significant: thermal scanners, bus card readers and digital attendance logs. Thermal cameras detect infrared wavelengths and use the received thermal energy from them to create images which reflect the temperature of that individual. The brighter the image, the hotter the object. Thermal scanners can be used to accurately state an individual‟s temperature to 0.1 degrees Fahrenheit.

Since fever is a common symptom of the virus, handheld thermal scanners have become a common sight to see in public places due to its non-invasive nature and no requirement of contact between the individual whose temperature is being recorded and the individual recording it. These thermal scanners can often also be linked to card readers and other systems which allows the data to be logged in a database. Another feature that has become commonly-seen in buses are card readers that log the students‟ presence in the bus. These readers use radio frequency identification technology to identify if a student has boarded or exited the bus and transmit the recorded information to a secure database or any other data storage system. The last system is the digital attendance log, where teachers log each student‟s attendance for each class of the day into the school online attendance database or corresponding system.

III. PROPOSED BLOCKCHAIN TRACKING SYSTEM

As seen previously, blockchain has a number of uses in healthcare and education. However, the pandemic has made it necessary to use blockchain in a completely new way linking these two fields: the need of the hour is to use blockchain technologies to facilitate contact tracing among school-going children, i.e. identify the people who might have come into contact with an infected individual and gather more information about these contacts. We propose the creation of a COVID-19 Tracker that will integrate the systems mentioned previously using blockchain to create a system where a student‟s attendance and temperature will be recorded and will be accessible to the school, the government and the individual student and their parents.

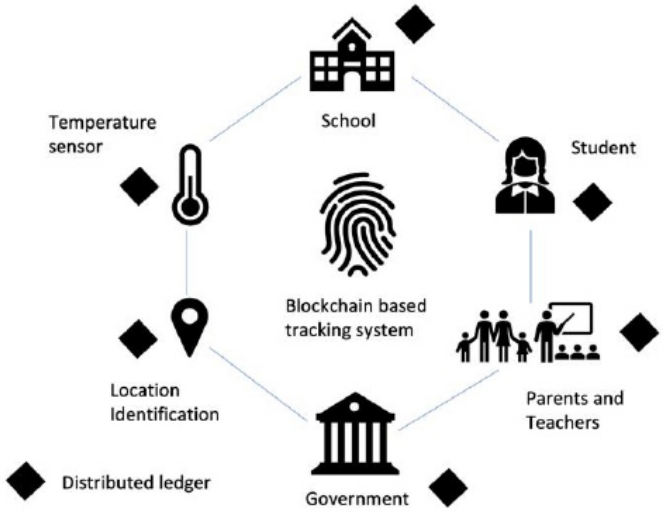

Fig. 1. Parties involved in the blockchain-based COVID tracker

The student must download and install the COVID Tracker for easy access, and submit information about their identity which will need to be verified. This would include the details present on their Emirates ID (national identification) and school ID card (student identification) so that both parties can check the individual‟s information and since both parties must be privy to this tracker. Once the student has been verified as a citizen and registered as a student of a particulat school, other details that are important for the school must be added, such as grade, section and bus number. It is also to be noted that the sensitive information provided for verification is only for that one step and will not be accessible to anyone after that instance to ensure safety and security. When the student boards the bus, their presence is logged into the blockchain through the card reader that they use to scan their school ID card. Upon arrival in school, their temperature is taken, and that information as well is added to the blockchain from the thermal scanner. Throughout the day, each teacher takes attendance of the students present in each period and logs that in as they normally would, with the only addition being that this information is now also being added to the blockchain and being linked to each student in such a way that one can access each student‟s attendance through the day individually. A final temperature reading is taken at the end of the day and the presence of the student is recorded on the final bus trip back home. This information can also be legitimized by the school to ensure accuracy and then is finally uploaded. Students can check their data as well and request for a change in case of incorrect attendance or any other change. The advantages of using a blockchain system are that it is an extremely secure system which cannot be tampered with, users have unique identification and are authenticated, and it provides vast amounts of information that is easily accessible, which is especially important in the case of an emergency, such as a COVID case. In case a student tests positive for the virus, his/her classmates and all those that he has come in contact with can be easily traced using his/her attendance records. This helps in finding out who all must be quarantined and who all are at significant risk of contracting the virus. Temperature records can also be examined if required. All information is added to the blockchain through smart contracts, making the information secure and private, as the blockchain system ensures that other students cannot access another student‟s data, which is important to maintain security and to prevent mass panic and chaos in case of a coronavirus case in school. The decentralized system also ensures that the data can be accessed by the school and the government with ease. It is not only important for school officials to have access, but we must also remember that the government would also require this information for official numbers and tracking in such a scenario, and hence the decentralized system would increase efficiency

not only within parties but also between parties. The system is also distributed, which prevents potential data loss. In totality, blockchain helps integrate key systems to create an efficient record-keeping process that is easily accessible to all officials and to individual students, ensuring transparency and quickness in the process, rather than records being stored separately and only being available to a few record keepers.

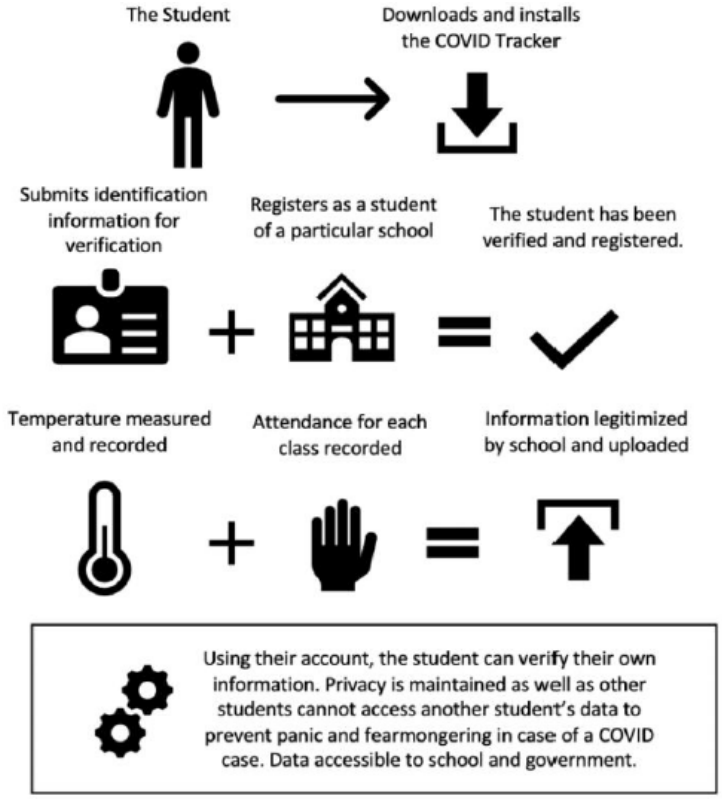

Fig. 2. Outline of the blockchain-based tracking system

IV. CONCLUSION

The times we are facing today are undoubtedly difficult and we must thus proceed with great care. As the „new normal" is accepted, schools and educational institutions have started opening all over the world. Our proposed system of COVID-19 tracing can be a very efficient way of minimizing and taking control of this situation. This method can help governments and schools estimate the number of patients and provides important data that can be used to figure out how we can better handle the situation. As this might continue for a while, new systems have to be implemented in order to ensure the safety of students, teachers, school staff, drivers and parents. There are a large number of stakeholders in this situation and this guarantees their health to a certain extent. This will also open several unexplored realms of blockchain which will help further integrate technology into our daily lives.

REFERENCES

1. *Azaria, Asaph, et al. "MedRec: Using Blockchain for Medical Data Access and Permission Management." 2016 2nd International Conference on Open and Big Data (OBD), 2016, doi:10.1109/obd.2016.11.*
2. *"Contact Tracing." Wikipedia, Wikimedia Foundation, 5 Aug. 2020, en.wikipedia.org/wiki/Contact_tracing.*
3. *Grech, Alexander; Camilleri, Anthony F.: Blockchain in Education. Luxembourg: Publications Office of the European Union 2017, 132 S. - (JRC Science for Policy Report) - URN: urn:nbn:de:0111-pedocs-150132 - DOI: 10.2760/60649*
4. *"How Do Thermal Cameras Work?" FLIR Systems, 16 June 2020, www.flir.com/discover/rd-science/how-do-thermal-cameras-work/.*
5. *Hölbl, Marko, et al. "A Systematic Review of the Use of Blockchain in Healthcare." Symmetry, vol. 10, no. 10, 2018, p. 470., doi:10.3390/sym10100470.*

6. Keisha. "RFID Card System Designed for Tracking School Bus Riders." AlphaCard Blog, 23 June 2015, www.alphacard.com/blog/rfid-card-system-designed-for-tracking-school-bus-riders/.

AUTHOR PROFILE

Anoushka Kapur is a Grade 12 student at GEMS Modern Academy, Dubai. She is very passionate about STEM and is looking forward to pursuing Computer Science in her higher education. She thinks that technology‟s biggest use is to facilitate social good and to create solutions for a brighter tomorrow. She completed a research opportunity at MAHE Dubai in the field of blockchain with her co-author, MaleehaMatto, which led them to write this paper. She is 17 years old and is based in the UAE.

MaleehaMatto is a 17-year-old student studying at GMA who has taken a keen interest in computer science; though this interest wasn‟t always prevalent, but rather an eventual growth over time. Her interest in blockchain piqued while talking with one of her teachers about the same. Though this topic seemed a bit boring and complex at first, after reading more about it, she found it to be one of the most interesting topics in IT. Many of her research papers in school also revolved around blockchainand its working and she did an internship which further fueled her curiosity and interest in such topics.

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Investigation Misbehavior Configuration Nodes with Secure Neighborhood on Energy Consumption for DYMO Routing Protocol in MANETS

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A B S T R A C T

We calculate misbehavior of energy consumption during configuration nodes between neighborhood nodes with specific investigation on secure environment with DYMP routing Protocol. An experimental analysis of DYMO, M-DYMO (misbehavior DYMO), S-DYMO (Secure-DYMO) has been carried out using QualNet 5.1 simulator. The simulation results have been derived using self-created network scenarios by incorporating secure neighborhood in de-facto DYMO by varying the network size as small, medium and large, Node Traversal Time, ART, Buffer Size. From the experiment results, it has been concluded that energy consumption increases as security is incorporated in the existing routing protocol. From the results, the variance of total energy consumed in all modes of energy (transmit, receive and idle) for nodes in DYMO,M-DYMO and S-DYMO under Random waypoint Mobility Model is maximum for larger network size which is 3.380037 mj , 3.363414 mj and 3.612123 mj. For random waypoint mobility model the variance of total energy consumed in all modes of energy is maximum at 0.2320866668 at 115 nodes. In this research paper, an effort has been made to investigate the impact of secure neighborhood on energy consumption and QoS metrics of Dynamic MANETs On-Demand (routing protocol) (DYMO) in MANETS.

Keywords: MANETs, DYMO, M-DYMO, S-DYMO, Energy Consumption, secure neighborhood.

I. INTRODUCTION

A Mobile Ad-hoc Network (MANET) is a group of two or more autonomous nodes that connect without any centralized node administration. MANETs have few prominent structures, such as dynamic topology, restricted storage as well as bandwidth, which make them attractive for certain applications, and at the same time create difficulties for effectively and accurately routing packets to a specific destination. From figure 2 there is a shortage of defined topology in these forms of networks, because they are sometimes referred to as fewer network infrastructure, because every node has the potential to act whether as a router otherwise host or mutually. MANET routing is a daunting activity and has generated exceptional interest from researchers all over the world. From the literature survey it was found that none of the current protocols are the strongest to justify the functionality and are ideal for effective routing. By improving its achievement of different metrics such as throughput, end to strangle, packet delivery ratio, etc., investigators strive to reveal the effectiveness of the existing routing protocol. The wireless networks can be infrastructure based and infrastructure-less. The infrastructure-less wireless network is described as "ad hoc" networks. MANETs are special type of Wireless ad hoc networks. A MANET is a collection of autonomous mobile nodes linked by wireless links. Figure 1 demonstrates mobile ad hoc scenario.

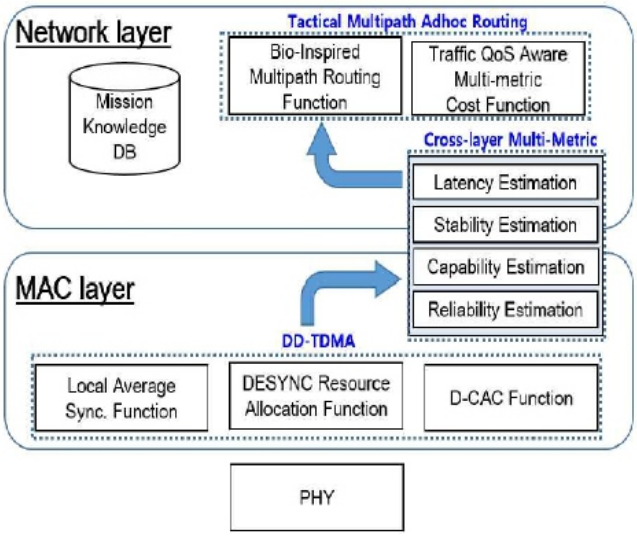

Figure.1: Mobile Ad hoc Network Architecture

MANET carries the hope of the future, with the potential to create networks at any time and wherever. MANET is a wireless network containing mobile nodes that have a complex topology and no networks or centralized control already in place. For multiple systems as well as settings, like emergency situations (e.g. catastrophe recovery), military environments and people, MANET is a workable solution. MANET can be quickly implemented, since traditional wireless networks do not require costly facilities.

Figure.2: Mobile Ad hoc network scenario

One of the difficult issues in the MANET [1][2] is to course the bundles commencing basis to objective securely in occurrence of aggressors. The nodes in MANETs can join or leave the network at anytime. So it possesses dynamic topology. In MANETs, every hub goes about as both host and switch. This implies that each hub advances bundles and along these lines, each hub takes an interest in steering measure. in MANETs, the hub's assets like battery lifetime, processor handling abilities are restricted. By and large, the remote channel isn't s protected. Due to these features, routing firmly is difficult. The MANET directing conventions [3][4][5][6] can be characterized into different sorts practical , imprudent and hybrid.

In this paper, the figure 3, we studied DYMO [7][8] and S-DYMO [20] the directing convention in presence of an unstable climate. The simulations are accomplished for 35, 75, and 115 numbers of hubs utilizing QualNet5.1 network simulator [9]. Organization of the paper: In this paper section-I manages

the presentation of MANETs and their qualities. Review of literature related to DYMO, secure neighborhood, security attacks etc., is given in section-2. The methodology and the replication environment are located in section-III. The results are graphically denoted and analyzed in section-IV. Section-V offers conclusion & future extent of this work.

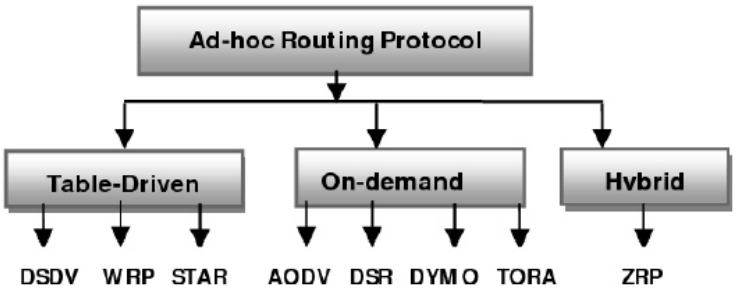

Figure.3: Mobile Ad hoc network scenario

II. LITERATURE REVIEW

2.1. Dynamic Manet On-Demand (routing protocol) (DYMO): Routing is the way toward finding a way to the planned objective.

DYMO is Dynamic Manet On-Demand (routing protocol) for versatile impromptu organizations conveyed in antagonistic conditions. DYMO addresses two intently related issues, the first one is route anonymity in which DYMO keeps solid enemies from following a bundle stream back to its source or objective and the subsequent one is area protection. DYMO guarantees that enemies can't find the genuine characters of neighborhood transmitters. The plan of DYMO depends on "broadcast with hidden entrance data", a novel organization security idea that incorporates highlights of two existing organization and security instruments, specifically "broadcast" and "secret entryway data". DYMO utilizes the ideas of the Trap door work. DYMO steering resolution has been planned by Perkins & Chakeres [3] as headway to the current AODV convention. It is likewise considered to as replacement of AODV/ ADOVv2 also continues refreshing till date. DYMO works like its archetype for example AODV and doesn't add any additional adjustments to the current usefulness however activity is besides very less difficult.

DYMO is a simple-responsive convention where for example, courses are processed on interest as necessary. Not at all like AODV, DYMO doesn't uphold superfluous HELLO notifications, & operation is clearly focused on sorting numbers to all packages. It is a responsive steering system that displays unicast courses on demand or when necessary, using grouping statistics to guarantee circle opportunities. It empowers interest, multi-bounce unicast steering among hubs in a specially selected portable organization. The basic duties are disclosure and assistance. Course revelation is done at source hub to an objective towards which it has no valid path. In addition, courses are assisted to evade the existing catastrophic courses commencing the guiding table also to decrease the package drop in the event of any course break or hub disappointment.

M-DYMO is misconduct configuration to transform from normal node to malicious node to change behaviour from normal node to degrade QOS efficiency. It is complicated for them to follow the amount of hubs in the territory, who has been the sender or recipient, where a stream of parcels came since and where it goes (i.e. what are the past hops as well as the subsequent bounces on course), not to mention the

source transmitter and the target receiver of the stream. The pseudonymity strategy relies on an organizational protection concept called "broadcast with secret entry data"".

Advantages and Disadvantages of DYMO Protocol

DYMO adds new structures over AODV. Production evaluation demonstration that DYMO defeats AODV as MANET. The procedure can be outlined:

- The protocol is energy-efficient while the system is wide and mobile
- DYMO's routing table is relatively less memory-consuming than AODV's Route Aggregation.
- Protocol overhead reduces with expanded network sizes and high versatility.

Even then, DYMO protocol is not doing well with low mobility. The workload for such situations is very large and needless. Another weakness is the protocol's applicability as described in the DYMO draft, which specifies that DYMO achieves well when traffic is guided beginning 1 section of the network to alternative.

It indicates poor efficiency when random traffic is very tiny, and overhead routing outstrips real traffic.

A) Packet Distribution Fraction (PDF): Percentage of data packets sent to aim & overall number of knowledge packets sent through basis.

B) End-to-End Latency (AEED): Length between the source node and destination node, including loading period and queue duration.

C) Overhead routing (RO): complete routing packets exchanged through simulation. Routing overhead is significant since it tests a protocol's scalability, the degree it can operate in congested or limited bandwidth environments.

Complete number of signals successfully delivered, i.e. total digit of bits transmitted per second. Also denotes to the amount of data transmission from source to endpoint in a specified time.

2.2 Security Attacks: MANET attacks[11] can be loosely divided into 2 main category-passive attacks and aggressive attacks, so according means of attack[12][13].

2.2.1 Passive Attacks: A passive attack obtains data exchanged in the network without disrupting the operation of the communications. Eg. : eavesdropping, traffic analysis, and traffic monitoring.

2.2.2 Active Attacks: An active attack involves information interruption, modification or fabrication. Eg: jamming, impersonating, modification, denial of service (DoS), and message replay.

2.2 Eavesdropper: Eavesdropping is accidental receivers able to intercept and translating communications and interactions. Eavesdropping's aim [14, 15] is to collect any classified details that should be held secret through contact. Confidential details can involve node position, public key, private key, or even passwords.

2.2.1. Passive Eavesdropping: In this the noxious hubs recognize the data by tuning in to the message transmission in the telecom remote medium.

2.2.2. Active Eavesdropping: In this, the malevolent hubs effectively snatch the data by means of sending questions to transmitters by masking themselves as a benevolent hub. The eavesdropper can drop all parcels (dark opening assault) [16]or burrow the bundles starting with one area then onto the next (wormhole attack)[17].

2.3 Secure Neighbor: To prevent this eavesdropper, we have employed secure neighborhood [9] using pair-wise secret key authentication method.

This method is used when IPSec is absent [20]. In secure neighbor confirmation (SNAuth), each portable hub builds up a confirmed neighborhood moving. Intermittently, every portable hub X transmissions its character parcel <SNAuth-HELLO, X> to its area. Here, Y is neighbor of X.

This method is pictorially depicted in figure 4.
Step 1a.) Y selects a random nonce n1.
Step 1b.) Y encrypts n1 with k and sends the encrypted result to X i.e.

<CHALLENGE, Y, ENCk (n1)>.
Step 2a.) X receives the encrypted message sent by Y.
Step 2b.) Since X knows k, it decrypts Y's message with k and obtains n1, the nonce of Y.
Step 2c.) X creates another nonce n2.
Step 2d.) X encrypts (n1 XOR n2) with the same key k and sends the encrypted result as response to Y i.e. <RESPONSE1, X, n2, ENCk (n1 XOR n2)>.
Step3a.) Y receives the encrypted message sent by X.
Step 3b.) Y decrypts X's message with key k gets (n1 XOR n2).
Step 3c.) If Y gets the same consequence commencing XORing n2 in the reply & its own challenge n1, then X passes the test . GOTO step 3e.)
Step 3d.) Else Y neither sends any packet to X nor receives any packet from X ; Y only receives the reaction packets from X untill a accurate <RESPONSE1> packet from X passes the test.
Step 3e.) Y puts X in its secure neighbor list.
Step 3f.) Y selects a random nonce n3
Step eg.) Y encrypts (n1 XOR n2 XOR n3) with k and sends this as a confirmation response to X as **<RESPONSE2, Y, n3, ENCk (n1 XOR n2 XOR n3)>.**
Step 4a.) X receives the encrypted message from Y.
Step 4b.) X decrypts Y's message with key k and obtains (n1 xor n2 Xor n3)
Step 4c.) If this matches the consequence of XORing n1 that is earlier decrypted, its own n2 and n3 in the RESPONSE2 packet , GOTO step 4d.)
Step 4d.) X puts Y into its secure neighbor list.

This 3rd-way handshake is compulsory because X needs to confirm that Y actually knows "k".

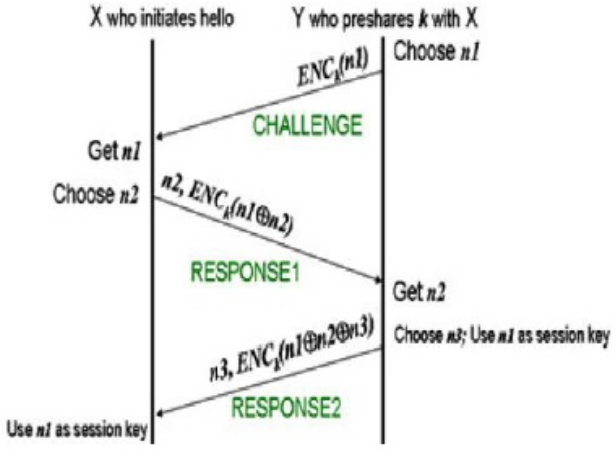

Figure 4: Secure neighbor method using pair wise secret key

2.3.1. Dynamic Source Routing (DSR): DSR is a routing protocol that is still required, in which the data sender may specifically specify the sequence of nodes used to transmit a packet. The packet header includes multiple average routing nodes. To seize the source route learned, each node job is to preserve the route cache. It is demonstrated that "Route Discovery and Route Maintenance" are the two major components of DSR, which both preserve and evaluate routes to random destinations.

Limiting the massive bandwidth usage incurred by MANET control packets is the explanation for creating such a protocol. By omitting messages from the time updates required, this phase is accomplished, which normally occurs in the table-driven method. DSR is an auto-maintaining routing protocol which provides networks. The protocol will also utilize wireless telecommunications services and broadband networks of up to 200 nodes. A complex source routing network may be individually managed and configured by managers. In DSR, each trigger resolves the route for use in conveying its samples to destinations picked.

There are two big components called road management and path exploration. Transmission route remains optimal and loop-free when network requirements shift. Path management means that even though the route is changed during transmission. The optimal path amongst a given basis & destination is defined by route discovery.

This safe neighborhood protocol is placed in the current Anonymous On Demand routing protocol.

III. METHODOLOGY AND BACKGROUND RESEARCH WORK

Most of the safe specially appointed directing conventions proposed so far will in general zero in on the insurance strategies instead of computational expense and energy utilization. The principle destinations have been to explore the materialness of the current secure plans for MANETS by limiting the energy utilization to upgrade the organization life and add to the improvement of asset effective and secure to upgrade the organization.

Any experts indicated some answers for help

Dynamic MANET atmosphere QoS. Yet they're not dealing with having defense necessities near to hold gadgets, where reserves are scarce. This is because the security arrangement costs additional assets and reduces network life.

It might likewise unfavorably influence the QoS. In this way, it could be important to think about the provisioning of security to limit energy utilization in order to give network life in a coordinated way.

To assess the plans proposed in this work and to pick the most appropriate assessment approach, three assessment techniques were recognized

1. Simulation,
2. Experimental and
3. Mathematical

Simulation is picked, as the exploratory system isn't practicable while the numerical procedure is exceptionally prohibitive. This reproduction strategy is to assess the assortment of outcomes. The outcomes are broken down and contrasted and DYMO alongside S-DYMO. Ends are drawn from assessments of the proposed steering convention (S-DYMO).

3.1 Simulation Scenarios: All the Simulation are finished utilizing QualNet 5.1 organization test system. The Simulation boundaries are clarified beneath.

From the table 1 shows the parameter configuration for all the hubs move [9] with speeds going from 0m/s to 10m/s with high mobility. In this scenario, node deployment model used is random. Constant Bit Rate traffic (CBR) [19] model is utilized to create traffic at a deterministic rate with some randomizing vacillate empowered on the between bundle takeoff span. Bundle size was set to 512 bytes is shown in the figure 5 and 6. The following simulation parameters are used:

TABLE 1. SCENARIO PARAMETERS

Routing Protocol	DYMO, S-DYMO
SECURE-NEIGHBOR-TIMEOUT	5sec
Terrain	1000m x 1000m
Pause Time	0 sec
Simulation Time	300 sec
Mobile Nodes	35,75,115
Node Placement Model	Random
Propagation Model	Two-ray
Mobility Model	Random Way Point
Energy model	Generic
Minimum Speed	0 m/s
Maximum Speed	10 (m/s)
Traffic	CBR
Packet size	512 bytes
MAC layer	802.11
Antenna Type	Omni directional

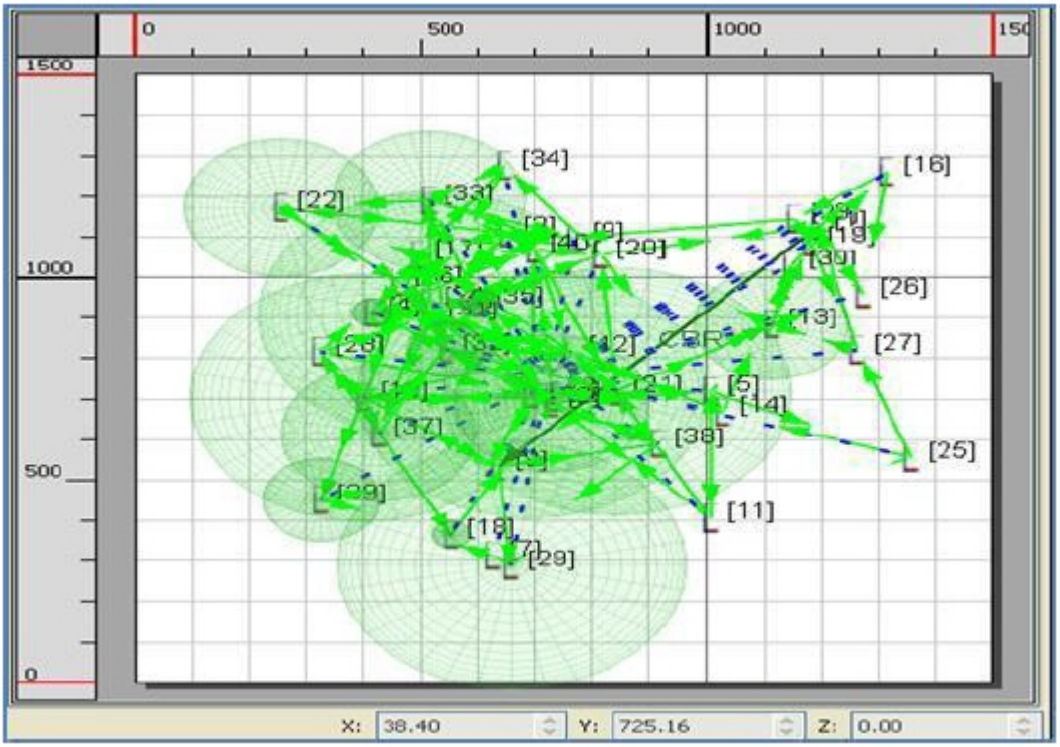

Figure 5: Simulation scenario for 35 nodes

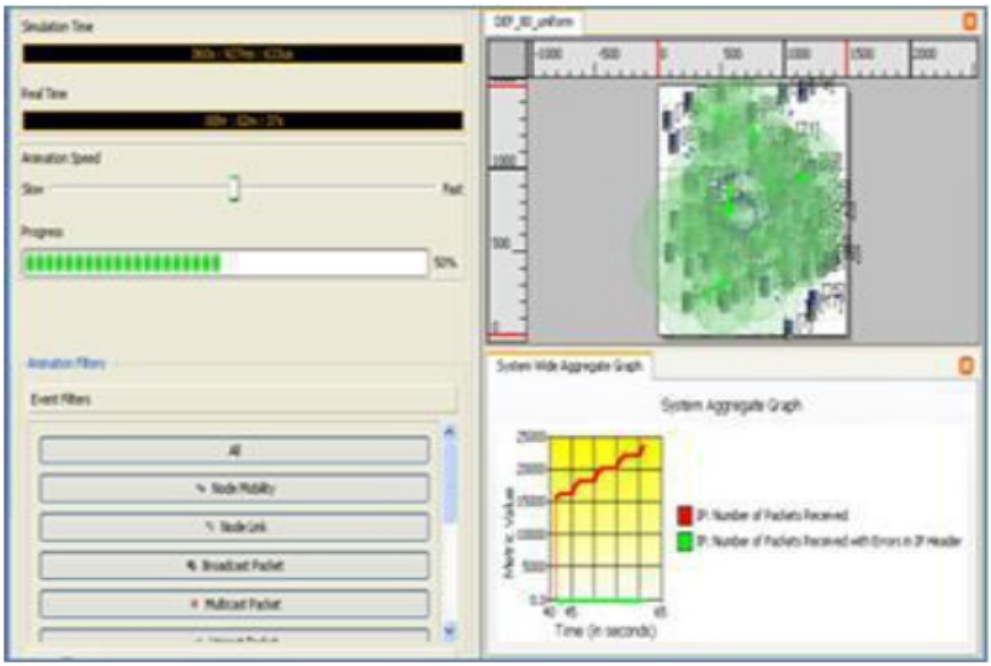

Figure 6: Simulation scenario for 75 nodes showing dynamic environment

The simulation environment screen shots of DYMO protocol is presented in figure 5

3.2 What happens in S-DYMO: From figure 7, all the sending node should check its neighbor nodes to know whether neighboring nodes are reliable or not. This is done by the sender by sending a challenge to its neighbor nodes. If the response is received within 5 sec, it is considered to be a safe node; otherwise, the node is exempted from routing process. The anonymous routing scheme of DYMO is then used.

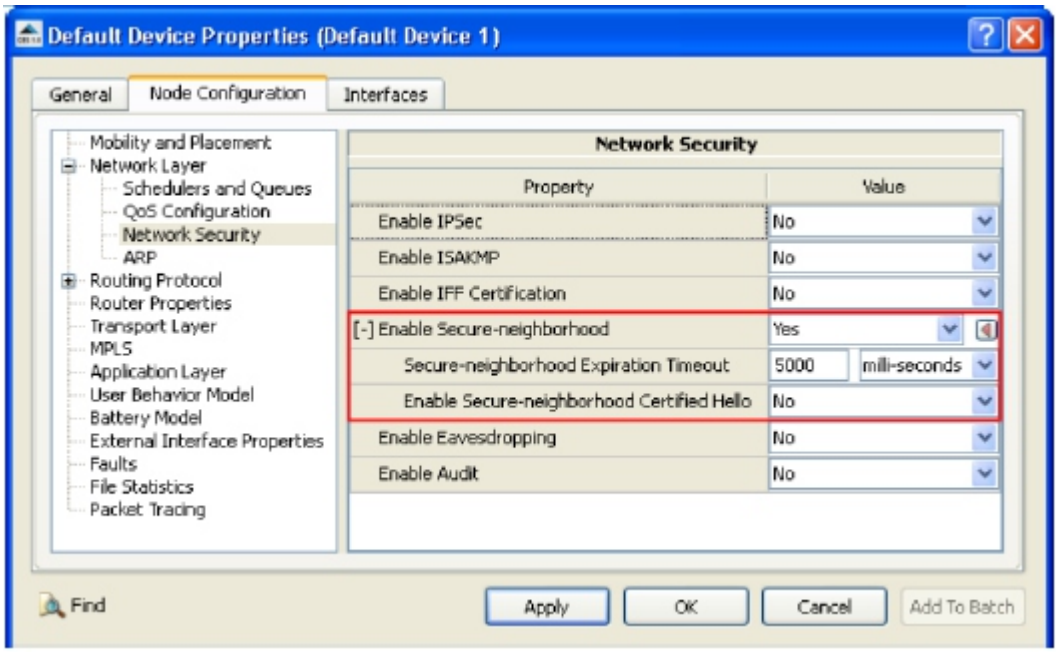

Figure 7: Selection of S-DYMO in QualNet

IV. RESULTS AND ANALYSIS

Initially, we present consequences of QoS measurements – throughput, normal start to finish deferral and normal jitter. Finally, we present measurements identified with energy utilization [18].

4.1Throughput (bits/s): The rate of effectively sent information every second in the organization during reproduction. The variety of throughput under two-ray propagation models for nodes in DYMO, S-DYMO is given in figure 8. The throughput for DYMO in random waypoint is maximum for larger network size at 2678 and is minimum at 850 for smaller network size. The throughput for S-DYMO is maximum for larger network at 3687 and is minimum at 1002 for smaller network.

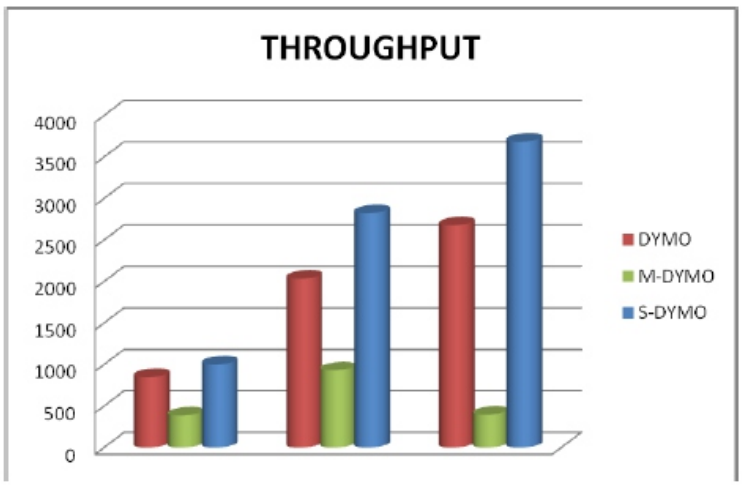

Figure 8: Variation of throughput with network size under random waypoint mobility model for DYMO &S-DYMO

4.2 Average end-to-end delay(s): The time is taken on behalf of a bundle to go from a basis to an objective. The variety of normal start to finish delay under the irregular waypoint portability model for hubs in DYMO, S-DYMO is given in figure 9.

The end-to-end postponement for DYMO in random waypoint is maximum for larger network at 0.085262 and is minimum at 0.048958 for smaller network. The end-to-end deferral for S-DYMO in random waypoint is maximum for larger network at 0.130941 and is minimum at 0.095626 for smaller network.

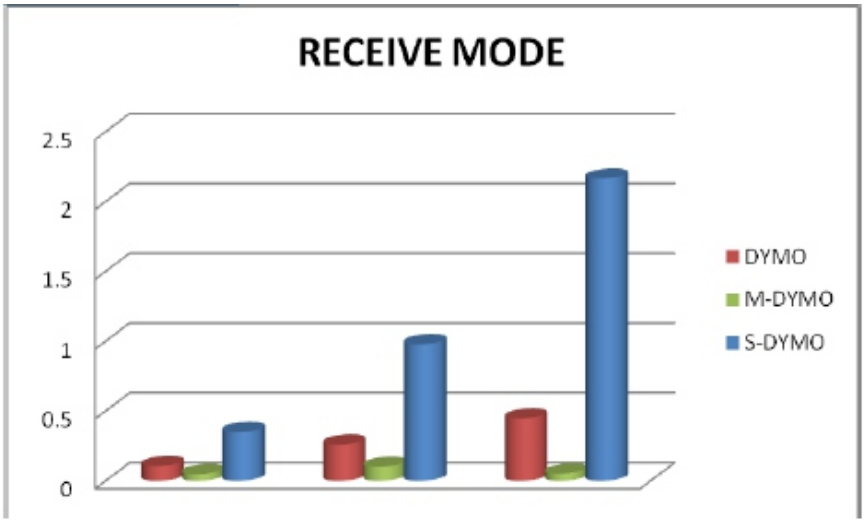

Figure .9: Variation of delay with network size under random waypoint mobility models for DYMO &S-DYMO

4.3. Average jitter (s): The variance of minimum and maximum interruption is jitter. The dissimilarity of average jitter under random waypoint mobility models for nodes in DYMO, S-DYMO is given in figure 10. The jitter for DYMO in random waypoint is maximum for medium network at 0.061417 and is minimum at 0.101682 for smaller network. The jitter for S-DYMO in random waypoint is maximum for larger network at 0.173246 and is minimum at 0.1187 for smaller network.

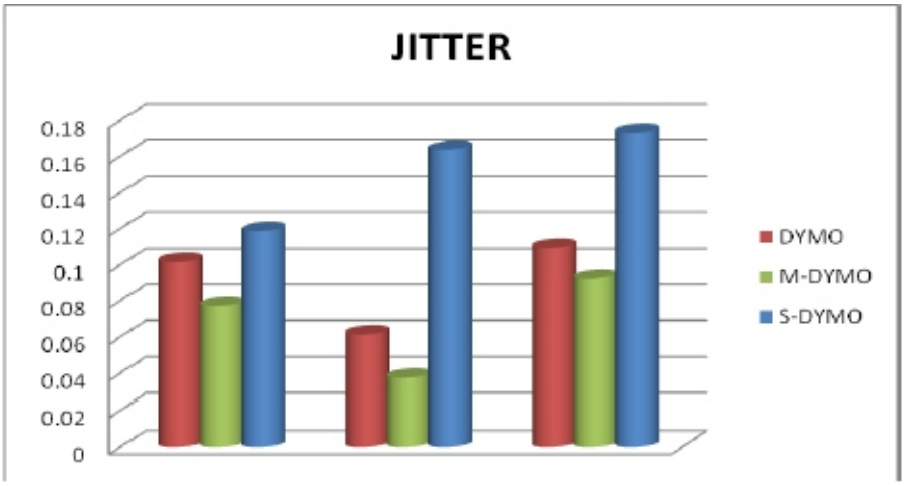

Figure 10: Variation of jitter with network size under random waypoint mobility models for DYMO &S-DYMO

4.4. Energy consumed in transmit mode: A hub should be in transmission mode as it sends knowledge bundles to organizational hubs. These hubs anticipate capacity to transmit knowledge packets and Transmission Resources (Tx). The variance of energy absorbed in transmit mode in DYMO, S-DYMO node mobility models is shown in Figure 11. DYMO's random waypoint energy usage in transmit mode is 0.148124 overall for larger networks and 0.106884 minimum for smaller networks. S-random

DYMO's waypoint energy usage in transmission mode is 0.730888 limit for larger network and 0.358859 for smaller network.

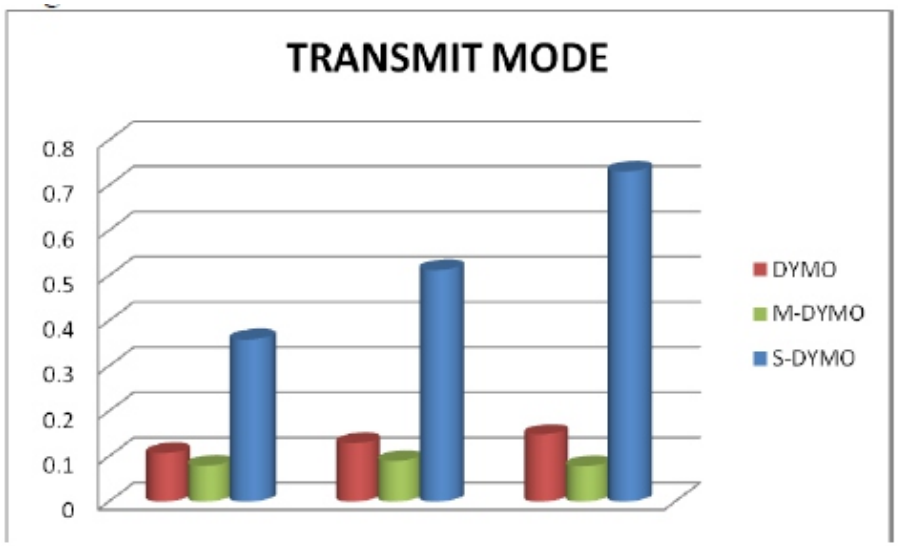

Figure 11: Variation of energy consumed in transmit mode mode with network size under random waypoint mobility model for DYMO &S-DYMO

4.5. Energy expended in receiving mode: When a hub collects a packet of knowledge from various hubs, it is said to be in receiving mode and the energy is used to get the parcel is called Reception Energy (RX). The variance of energy absorbed in receive mode in DYMO, S-DYMO node mobility models is shown in Figure 12. DYMO's random waypoint energy usage in receive mode is 0.446787 overall for larger networks and 0.106843 minimum for smaller networks. Energy usage in receiving mode for S-DYMO in random waypoint is 2.16518 overall for larger networks and 0.350962 minimum for smaller network.

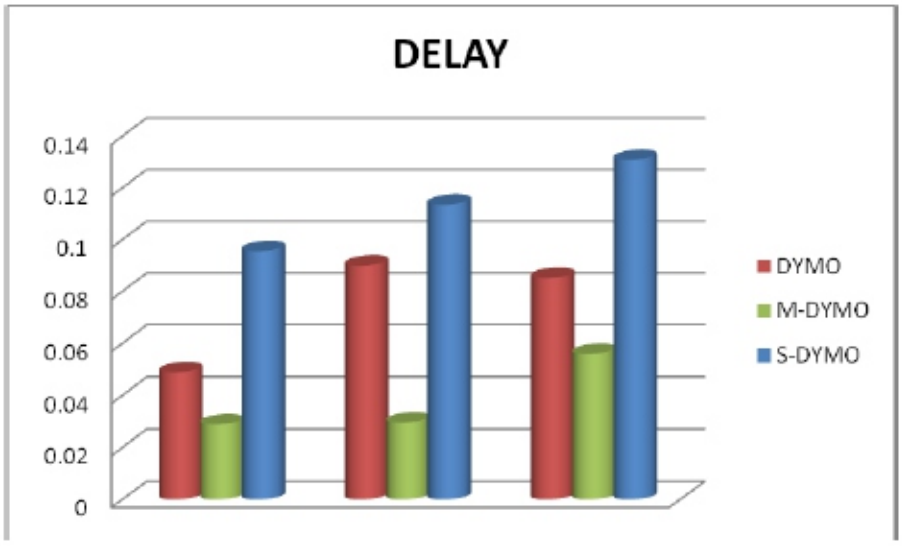

Figure 12: Variation of energy consumed in receive mode with network size under random waypoint mobility models for DYMO &S-DYMO

4.6. Energy consumed in idle mode: In this mode, for the most part, the hub is neither sending nor accepting any information parcels. However, this mode devours power on the grounds that the hubs need to tune in to the remote medium constantly to distinguish a bundle that it ought to get so the hub would

then be able to switch into get mode from inert mode. The variety of energy devoured in the inert mode under random waypoint mobility models for nodes in DYMO ,S-DYMO is given in figure 13.The energy consumption in idle mode for DYMO in random waypoint mobility model is maximum for smaller network at 9.89245 and is minimum at 9.5452 for larger network. The energy consumption in idle mode for S-DYMO in random waypoint is maximum for smaller network at 9.64605 and is minimum at 7.9403 for larger network.

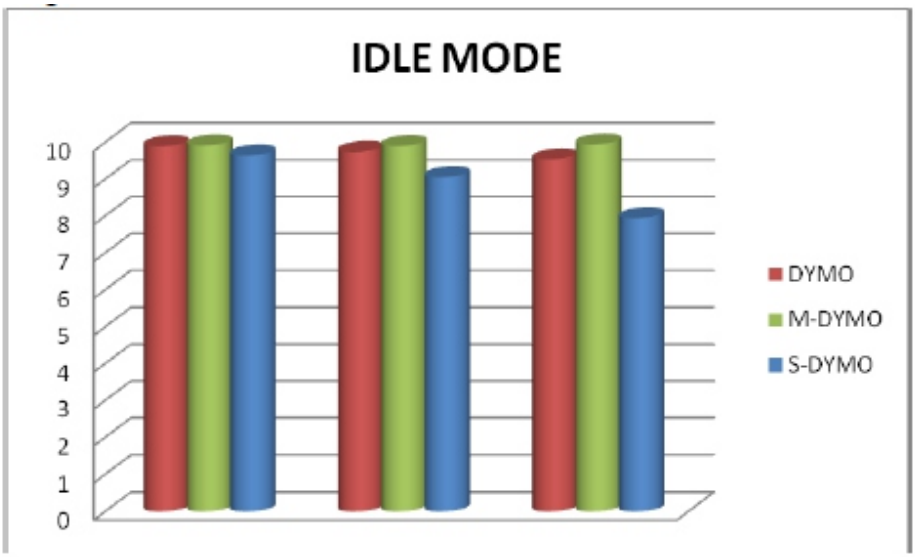

Figure 13: Variation of energy consumed in idle mode with network size under random waypoint mobility models for DYMO &S-DYMO

4.7. Total Energy (mJoule): Complete energy is the sum of all various energies. The variance of total energy absorbed under random waypoint mobility systems for nodes in DYMO,S-DYMO is seen in Figure 12. For DYMO in random waypoint, overall energy usage in send, receive and idle modes is 3.380037 limit for larger network and 3.368726 minimum for smaller network. For S-DYMO in random waypoint, overall energy usage in send, receive and idle modes is 3.612123 limit for larger network and 3.451957 minimum for smaller network. We specifically observed that M-DYMO degrades efficiency with regular DYMO. Figure 6 to Figure 14.

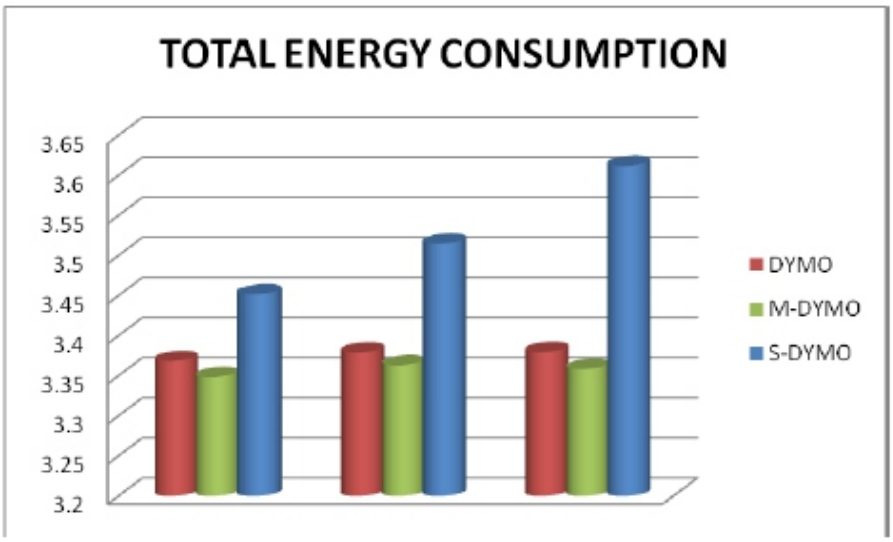

Figure 14: Variation of total energy with network size in all modes under random waypoint mobility models for DYMO &S-DYMO

V. CONCLUSION

From the findings of the trial, energy usage improved as encryption was integrated into the current routing protocol. Network size raises energy usage declines in random waypoint for DYMO in idle mode. In idle mode, no effect of network size raises energy consumption arbitrarily for M-DYMO. Whereas in the case of S-DYMO, as network size grows energy usage declines randomly in idle mode. It is stated that increased network size energy usage is lower for S-DYMO.

REFERENCES

1. *D. P. Agrawal and Q-A Zeng. "Introduction to Wireless and Mobile Systems," Brooks/Cole Publishing, ISBN No. 0534-40851-6, 436 pages, 2003.*
2. *S. Giordano and W. W. Lu, "Challenges in mobile ad hoc networking," IEEE Communications Magazine, vol. 39, no. 6, pp. 129–181, June 2001.*
3. *J. Broch, D. Maltz, D. Johnson, Y. Hu, and J. Jetcheva. "Multi- Hop Wireless Ad Hoc Network Routing Protocols."ACM/IEEE International Conference on Mobile Computing and Networking (MOBICOM''98), pages 85-97, 1998.*
4. *Latiff, L. A. and Fisal, N. 2003.,,Routing Protocols in Wireless Mobile Ad Hoc Network – A Review''.The 9th Asia-Pasific Conference on Communication (APCC 2003), vol. 2, pp. 600- 604.*
5. *[5]S. Lee, M. Gerla, and C. Chiang. "On-Demand Multicast Routing Protocol."IEEE Wireless Communications and Networking Conference (WCNC''99), 1999.*
6. *J. Broch, D. Maltz, D. B. Johnson, Yih-Chun Hu, J. Jetcheva. "A Performance Comparison of Multi-Hop Wireless Ad Hoc Network Routing protocols."Proceedings of the Fourth Annual ACM/IEEE on Mobile Computing and Networking, MOBICOM 98, October 1998.*
7. *C.E. Perkins, E.M. Royer & S. Das, Ad Hoc On Demand Distance Vector (DYMO) Routing, IETFInternet draft, draft-ietf-manet-DYMO-08.txt, March 2001*
8. *C. E. Perkins, and E. M. Royer, "Ad-Hoc On-Demand Distance Vector Routing," in Proceedings of the 2nd IEEE Workshop on Mobile Computing Systems and Applications, New Orleans, LA, pp. 90-100, February 1999.*
9. *QualNet 5.1Developer Model Library, Scalable Network Technologies, Inc.,http://www.scalable-networks.com*
10. *Jiejun Kong, Xiaoyan Hong. DYMO: anonymous on demand routing with untraceable routes for mobile adhoc networks. MobiHoc''03, June 1–3, 2003, Annapolis, Maryland, USA*
11. *Bing Wu, Jianmin Chen, Jie Wu, Mihaela Cardei, "A Survey on Attacks and Countermeasures in Mobile Ad Hoc Networks",*
12. *WIRELESS/MOBILE NETWORK SECURITY Y. Xiao, X. Shen, and D.-Z. Du (Eds.) pp.,2006 SpringerS. Yi and R. Kravets, Composite Key Management for Ad Hoc Networks.Proc. of the 1st Annual International Conference on Mobile and Ubiquitous*
13. *R. Oppliger, Internet and Intranet Security, Artech House, 1998.*
14. *Qiu Wang and Hong-Ning Dai and Qinglin Zhao,*
15. *"Eavesdropping Security in Wireless Ad Hoc Networks with Directional Antennas"*
16. *Satoshi Kurosawa, Hidehisa Nakayama, Nei Kato, Abbas Jamalipour2, and Yoshiaki Nemoto, "Detecting Blackhole Attack on DYMO-based Mobile Ad Hoc Networks by Dynamic Learning Method", International Journal of Network Security, Vol.5, No.3, PP.338–346, Nov. 2007*
17. *Anuj K. Gupta1, Harsh Sadawarti and Anil K.Verma, "Implementation of Dymorouting Protocol", International Journal of Information Technology, Modeling and Computing (IJITMC) Vol.1, No.2, May 2013.*
18. *Viren Mahajan, Maitreya Natu, and AdarshpalSethi, "ANALYSIS OF WORMHOLE INTRUSION ATTACKS IN MANETS", 2008 IEEE*
19. *Neeraj Tantubay, Dinesh Ratnam Gautam and Mukesh Kumar Dharjwal , "A Review of Power Conservation in Wireless Mobile Ad hoc Network (MANET)",IJCSI Vol.8, Issue 4, No.1 , July,2011.*
20. *Ayyaswamy Kathirve,and Rengaramanujam Srinivasan, "Analysis of Propagation Model using Mobile Ad Hoc Network, Routing Protocols", International Journal of Research and Reviews in Computer Science (IJRRCS), Vol. 1, No. 1*
21. *Muhammad Inayat Ullah,Nasir Nawaz, "Measuring the Effect of CBR and TCP Traffic Models over DYMO Routing Protocol", Global Journal of Computer Science and Technology Volume 11 Issue 14 Version 1.0 July 2011, Global Journals Inc. (USA),Online ISSN: 0975-4172 & Print ISSN: 0975-4350.*

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