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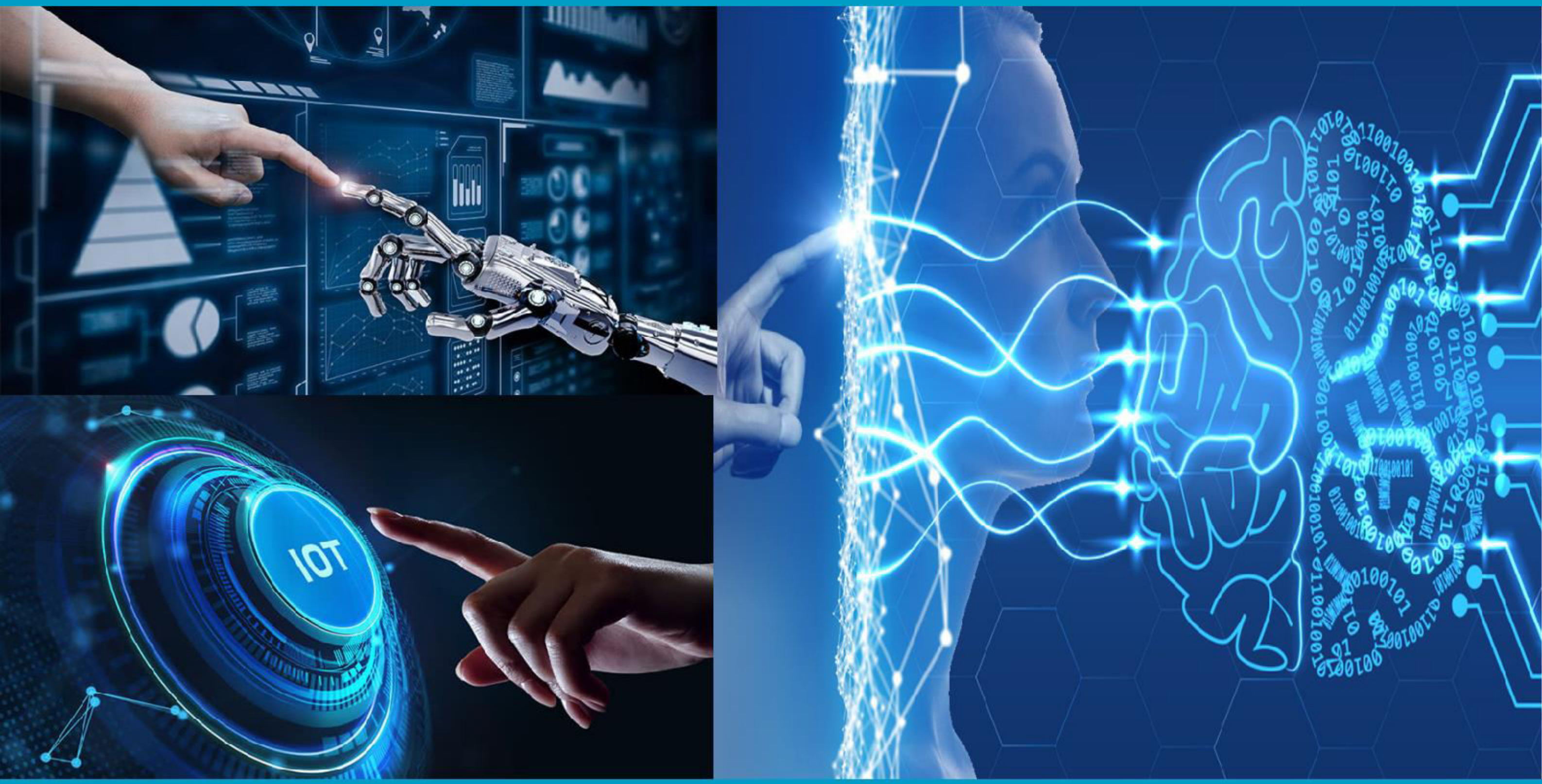

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Comparative Energy Analysis on Dissipation in DTN and WSN

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ABSTRACT: Environment is being continually monitored by sensor networks that are wireless. In certain fields, the malleability of sensor nodes is absolutely necessary. It is necessary for the protocol to manage both power consumption and packet leakage if it is to maintain the long-term viability of the network and the continuous delivery of data packets. The LEACH Mobile protocol reduces the amount of data packets that are lost and increases the number of data packets that are distributed. The latter demands a higher amount of fuel since the control systems are more complex. The ever-increasing amounts of power that are required to run devices should be the primary focus of any research that involves the LEACH Mobile protocol. This MATLAB 2013-designed GUI that works wirelessly simulates the execution described in the results chapter. These three buttons serve as a WSN and DTN packet loss estimator, comparative energy and analysis, and one WSN Random Distributed Node. In WSN and DTN mode, the routing protocol that is employed is called Basic LEACH. The data shown in the graph that contrasts WSN (with a modified LEACH) with DTN demonstrates that (Basic WSN having DTN). This graphic depicts a calculation of the trade-off between communication and energy dissipation that was performed using 3000 data rounds. A second green line represents communication that is not explicitly mentioned. The decline in DTN's energy was far more severe than that of WSN (Mod-Leach). DTN is executed in MATLAB in the manner that was explained. This system does not depend on the way that was explained before or that was recommended; rather, it has its own one-of-a-kind approach to calculating DTN assessment. Only the DTN estimate and security check will make use of this information. The DTN network functions exactly as described. The execution of the created DTN has been finished, and the results are provided as a function of the amount of time, energy, and packets delivered per second. The estimate that has the lowest fraction of estimates that have been stolen is always the most valued estimate. The presented computation makes optimal use of DTN's resources. The results of the packet analysis performed on both the WSN and the DTN indicate that the packet deliver rate is 100%, the amount of energy that was used was 1.49*10-3, and the amount of time that had passed was 418.82 milliseconds.

KEYWORDS: WSN, DTN, Mod-Leach, LEACH Mobile protocol

I. INTRODUCTION

Communications in space need a unique sort of network known as a delay-tolerant network (DTN), which must be able to operate dependably even when subjected to challenging conditions and enormous physical distances. In this kind of environment, a conventional internet connection would be completely unusable, and networks would be plagued by frequent outages, high error rates, and latency that lasted for several hours or perhaps many days. In spite of these challenges, it is feasible to carry out consistent data transfers with the assistance of a DTN, which results in internet operations that are more reliable. The introduction of delay-tolerant networks in 2003 marked the beginning of their use in long-distance communication, and since then, nothing has been able to match their level of dependability. Interplanetary communications are susceptible to disruptions, delays, errors, and data loss because to the vast distances that separate Earth and spacecraft. These distances may be hundreds of thousands or millions of kilometers. More focus has to be placed on the application level in order to address these issues, which cannot be resolved using conventional

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terrestrial networking technologies. It's true that they're handy, but DTNs beat them hands down when it comes to versatility and automatically transmitting data. They just can't compete with DTNs. The Space Packet Protocol and the CCSDS File Delivery Protocol are two examples of this kind of protocol. It is unfortunate that it does not take into consideration the time-dependent aspect of connectivity; this omission may help to explain why it has not been implemented in a space system. Despite the fact that it can only be used for file transfers, the CCSDS File Delivery Protocol (CFDP) provides a reliable method for delivering files. [1-10]

II. LITERATURE REVIEW

Perez et al. (1998), Comprehension of HIV-1 Protease Inhibitor Binding Energy. To rule out force-field dependency, they ran simulations on the same collection of 3D objects using the AMBER force field. When all the studied inhibitors were combined, a novel model was established that accounted for 91% of the variation in biological activity. Furthermore, COMBINE analysis elucidated the contributions to activity from certain residues, which might lead to the development of more potent inhibitors.

Zangeneh et al. (2010), Potato production in Iran's Hamadan area, using various agricultural technology; energy consumption and cost comparisons. This research looked on the energy habits of the potato industry in Iran's Hamadan area. Tractor and agricultural equipment ownership, as well as the sophistication of farming technology, were used to split the studied population in half. Farmers in Group I owned their own farm equipment and used advanced farming techniques, whereas those in Group II did not. Group I used a total of 157.151 GJ ha1, whereas Group II used a total of 153.071 GJ ha1. Most of the energy used by members of Group I came from power generators (36.6%), followed by chemical fertilizers (25.3%). (24.79 percent). Both groups relied heavily on NRE sources. Consequently, the sustainability of potato production and the environment would benefit from a decrease in the overall NRE ratio, and in particular in the use of chemical fertilizers.

Kuswardhani et al. (2013), Analysis of the costs and benefits of growing vegetables in greenhouses vs. open fields in West Java. This study calculates the energy needed to grow tomatoes, chili peppers, and lettuce in greenhouses and open fields. They conducted in-depth interviews with 530 farmers in West Java, Indonesian vegetables in the months of JaneDec, 2010. Estimates of energy use were derived from measured input and output data and their respective conversion factors. The findings show that 47.62, 41.55, 58.84, and 24.54 GJ/ha were consumed in the production of tomatoes, chilies (medium and high land), and lettuce in greenhouses (GH), respectively. However, 49.01, 41.04, 57.94, and 23.87 GJ/ha were needed for the cultivation of tomatoes, chilies (on medium and high land), and lettuce in the open field (OF), respectively. When comparing greenhouse and open field vegetable production, the output-to-input energy ratio for tomatoes (0.85), chilies (0.49), and lettuce (1.2) was all greater for greenhouse production than for open field vegetable production. Mean net returns from greenhouse vegetable production were calculated at $7,043.0 /ha (922,15,299 /ha), whereas those from open field vegetable production were calculated at $571 /ha (44,117.2 /ha). If they looking for energy efficiency and financial return among greenhouse veggies, tomato production comes out on top.

Khan et al. (2015), Properties, Applications, and Toxicities of Nanoparticles. Nanoparticles (NPs) may take many forms, and this review will cover them all along with their production, characteristics, and uses. NPs are nanoparticles with sizes between 1 and 100 nm. Based on their characteristics, form, or dimensions, they may place them in a variety of categories. Fullerenes, metal NPs, ceramic NPs, polymeric NPs, etc., are only few examples of the many classes of NPs. In part because of their small size and large surface area, NPs exhibit novel physical and chemical characteristics. According to reports, their optical qualities change according on size, with varying sizes resulting in varied hues owing to absorption in the visible spectrum. Their one-of-a-kind proportions and construction also contribute to their responsiveness, hardness, and other characteristics. These features make them promising candidates for a wide range of industrial, medicinal, environmental, and other uses. Lead, mercury, and tin NPs are said to be so stiff and stable that they cannot be readily degraded, which may have serious consequences for the environment.

Ahmad et al. (2020), Global energy demand and consumption in the past and the future are thoroughly examined. With the primary industrial sectors' load requirements taken into consideration, this research gives a critical integrated analysis of energy consumption in both developed and developing countries. Global CO_2 emissions, energy consumption, energy supply, and international trade in fossil fuels, renewable energy, and other energy sources are all covered (such as wind, solar, geothermal, tidal, etc.). Both supply and demand forecasts allow for a time range of 1990

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to 2040 to be included in the research. Energy demand in the OECD, G7, BRICS, EU, EN, NA, CIS, ALP, MEA, and AA regions were all accounted for.

III. SIMULATION AND RESULT

Wireless sensor networks are becoming popular yet have unique power management requirements. In certain places, the ability of sensor nodes to change their behavior quickly and easily is critical. Data packets need to be delivered reliably and sustain the network's long-term health; hence consideration of packet leakage and power consumption should be baked into the protocol. We provide an explanation of LEACH and the LEACH Phone in this thesis. The LEACH Mobile protocol beats even the original LEACH in terms of data packet failure and effective data packet distribution. Gas consumption is higher in the former due to the higher number of controls. Any future research at any level of the LEACH Mobile protocol should center on the protocol's rising energy usage. [11-15]

3.1 Proposed Algo

The algorithm for the proposed protocol is given as follows:
Algo. 1. Clusters Formation

Input: list of non- elected nodes

Output: clusters' members

Begin

If (CHs are initialized) then

for each node $j \in m$ do

if (node is non-elected node and energy >0) then

Estimate distance between CH and BS

for each node $k \in$ CHs do

Estimate distance between j and k

Estimate the distance from BS

join to the closest one

end for

transmit packet to the closest node j

end if

end for

end if

end

Algo2
Start
Comm
Set ns mode on
Assign initial E;
Round R=3000;
Up round 1: n;

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Set up the LEACH;
Feature enable 2-Com
Feature Enable 2-Hop
Start Com
{
Ei = E- Edisp;
}
Plot the Graph
Ei vs Round;
End

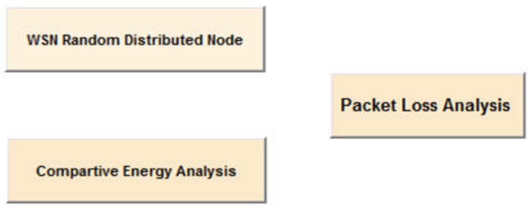

Figure 1: Basic Layout of Project

This above is the basic wireless based simulative executed button developed in MATLAB 2013. The Three button as one is WSN random distributed node along with comparative energy and analysis and one as estimator of packet loss analysis in WSN and DTN. The routing protocol used is the basis LEACH which could be applied to both WSN and DTN mode.

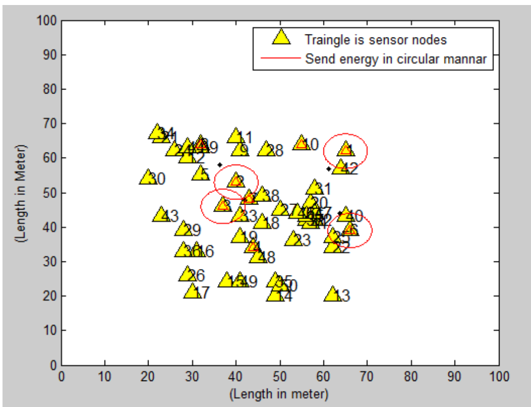

Figure 2: Energy generated in circular manner

The above figure is the simulative presentation of the sensor nodes (in triangle) indulging in communication with each other's. A black dot is the packet transmission from one node to others.

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```
r3 =

   105


r3 =

   106


r3 =

   107


r3 =

   108


r3 =

   109


r3 =

   110
```

Figure 3: Number of Communication rounds

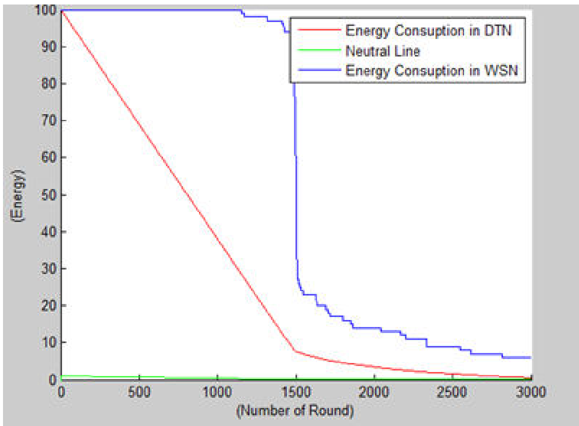

Figure 4: Energy vs. number of rounds of Energy Consumption in DTN, Natural Line, and Energy Consumption in WSN

See above for a graph contrasting WSN (using modified LEACH) with standard DTN (Basic WSN having DTN). This diagram depicts a 3000 round-based computation of the trade-off between communication and energy dissipation. Another green line represents the concept of non-initiated communication. The accompanying graph shows that DTN has a much steeper energy decline compared to the planned WSN (Mod-Leach).

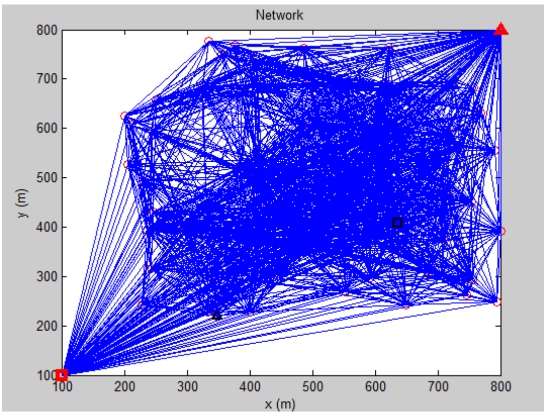

Figure 5: DTN Network

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DTN Configuration (0) WSN (1) Press = (0/1): 1

Number of packets (max=500)? 200

In MATLAB, the DTN is run as described above. This system is independent of the aforementioned and suggested method and includes its own distinct calculating evaluation with which to compare the DTN. This is used just in the DTN estimate computation and its associated security check.

```
Message Postponded because of low security!
Packet Remaining: 63
Message Postponded because of low security!
Packet Remaining: 63
Packet Remaining: 62
Packet Remaining: 61
Packet Remaining: 60
Packet Remaining: 59
Packet Remaining: 58
Message Postponded because of low security!
Packet Remaining: 58
Message Postponded because of low security!
Packet Remaining: 58
Message Postponded because of low security!
Packet Remaining: 58
Packet Remaining: 57
Message Postponded because of low security!
Packet Remaining: 57
Message Postponded because of low security!
Packet Remaining: 57
Packet Remaining: 56
Packet Remaining: 55
Packet Remaining: 54
Message Postponded because of low security!
Packet Remaining: 54
Message Postponded because of low security!
Packet Remaining: 54
Message Postponded because of low security!
Packet Remaining: 54
```

```
stolen_rate =

     0


Total_Time =

  418.8239


Total_Energy =

   1.4912e+03


Packet_Delivery_Rate =

   100
```

Figure 6: Packet loss analysis

All of the above is how the DTN network operates. The value of the estimate with the lowest stolen rate, regardless of its placement in the final rankings, is high. The reason for the above calculation is to maximize the benefits of the DTN infrastructure. As the result extracted from the packet analysis of the WSN and DTN, it is very clear that the packet deliver rate is 100 % in consumed energy is 1.49*10^3 with elapse time of 418.82ms. [16-30]

IV. CONCLUSION AND FUTURE SCOPE

In order to keep a close eye on the ecosystem, scientists use wireless sensor networks. Power consumption and dependability are two major challenges when coordinating wireless sensor networks because of the limited lifetime of individual nodes and the difficulty of easily replacing them. Sensing nodes' adaptability is crucial in certain settings. If we want to ensure the network's sustainability and the reliable transmission of data packets, we need to design the protocol with these factors in mind. This thesis examines LEACH and provides a definition of the LEACH Phone. When it comes to effectively distributing data and reducing the impact of data packet loss, the LEACH Mobile protocol outperforms even LEACH. The latter consumes more gasoline since it has additional control systems. The ever-increasing energy needs of devices should be the primary focus of any and all research conducted at any stage of the LEACH Mobile protocol. This graphical user interface (GUI) was developed in MATLAB 2013 and is available in the results chapter; it is runtime simulation based and uses wireless connectivity. The three buttons represent one randomly distributed node in a WSN, provide energy and analysis comparisons, and one estimates packet loss in a WSN or DTN. The routing protocol in use is termed basic LEACH, and it can function in both wireless sensor network (WSN) mode and data transmission network (DTN) mode. WSN (with a modified LEACH) outperforms the more traditional DTN as seen in the graph (Basic WSN having DTN). The picture depicts the result of a 3000-data-point computation depicting the trade-off between communication and energy dissipation. For the sake of clarity, let's say that the green line represents a second line of dialogue that wasn't initiated at the outset. DTN's energy reduction was far more severe than the WSN had predicted, as seen in the accompanying graph (Mod-Leach). Following the previous description, the DTN is implemented in MATLAB. This system has its own method of calculating evaluation in order to compare to the DTN

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and is not dependent on the methodology mentioned above or the one that was suggested. This is used only for the DTN estimation and the associated security check. All of DTN's features and capabilities are mentioned above. Once the constructed DTN has completed its execution, the results will be provided as a function of the time and total energy utilized, as well as the packet delivery rate. The value of the estimate with the lowest proportion of stolen estimations is high regardless of its final position.

The aforementioned calculation was performed with the goal of extracting maximum value from the DTN infrastructure. Results from the packet analysis of the WSN and DTN show that the packet deliver rate is 100%, the amount of energy utilized was 1.49*10-3 joules, and the elapsed time was 418.82 ms.

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