Communication overhead mainly depends on packet size and it considered for network lifetime. It is the number of packets has to be transmitted from one node to another. It can be viewed from the Fig.5 that TWDA is 29% lesser and outperforms the available scheme DTEM in terms of overhead.

Packet delivery ratio is the relative size of data packets received and the data packets transmitted in the system. To achieve efficiency in transmission, there should be high packet delivery ratio. When the packet delivery ratio is high, then the data received at the receiver will have fewer drops. Hence from fig.6, the values calculated for Packet delivery ratio of the existing DTEM exhibits poor performance than that of proposed TWDA.

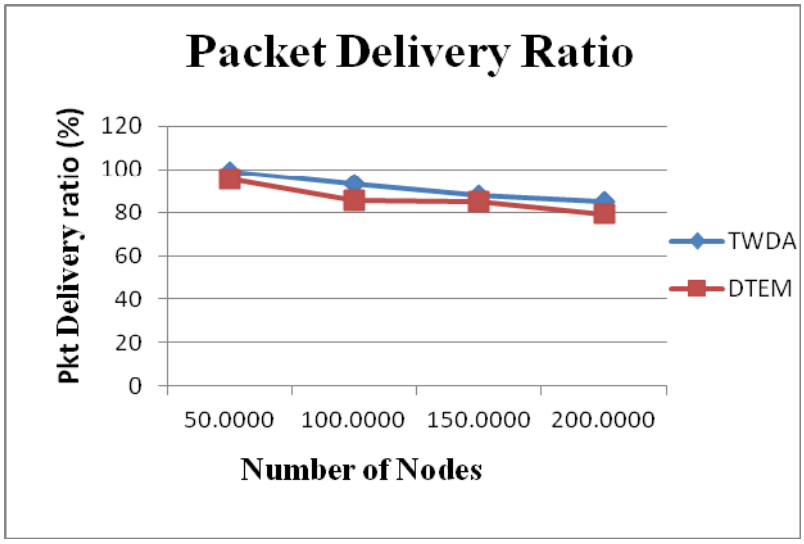


Fig. 6. Packet delivery ratio measured in percentage w.r.t. the varying node numbers

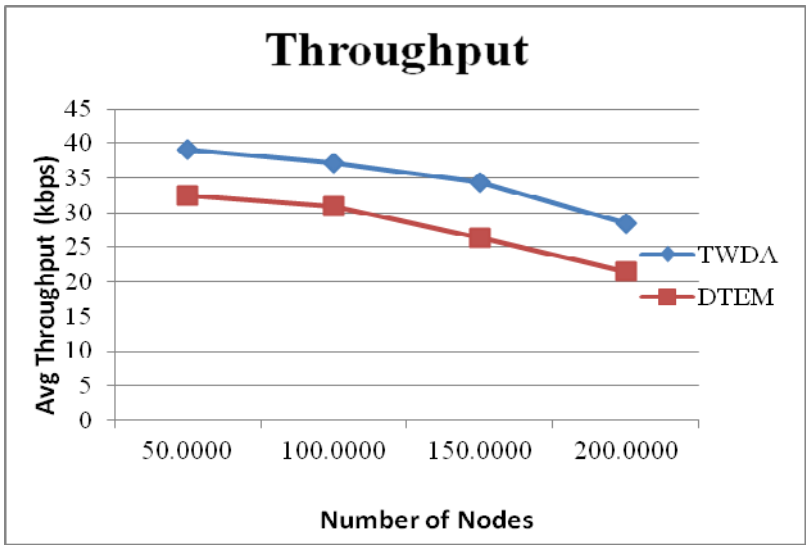


Fig. 7. Throughput is measured in kbps w.r.t. the varying node numbers

Throughput is a ratio of number of packets in the structure will be processed in an available time period. While taking the proposed TWDA from fig.7, throughput is 26% higher when compared with the existing DTEM algorithm.

Table 1. Evaluation metrics of the proposed TWDA method and EETM method

| Metrics | TWDA | | | | DTEM | | | |
|---|---|---|---|---|---|---|---|---|
| Node density | 50 | 100 | 150 | 200 | 50 | 100 | 150 | 200 |
| Average Delay (sec) | 0.1235 | 2.4231 | 4.7123 | 8.5122 | 1.5123 | 4.7561 | 6.2899 | 11.5129 |
| Energy consumption (Joules) | 21.64 | 24.01 | 28.44 | 34.42 | 31.49 | 36.28 | 42.38 | 46.01 |
| Packet loss % | 4.51 | 13.89 | 17.53 | 22.53 | 9.04 | 15.21 | 23.23 | 28.61 |
| Communication overhead ( bytes) | 2.51 | 8.31 | 12.52 | 15.30 | 5.76 | 10.59 | 14.55 | 19.60 |
| Packet delivery ratio (%) | 99.12 | 93.22 | 88.01 | 85.21 | 95.21 | 85.86 | 84.88 | 79.21 |
| Throughput(kbps) | 39.04 | 37.21 | 34.44 | 28.42 | 32.49 | 30.88 | 26.38 | 21.50 |

The delay, overhead, packet loss and energy consumption of TWDA is 48%, 29%, 26% and 31% lower with respect to the present DTEM. TWDA throughput is 26% higher when compared with the existing DTEM algorithm. Packet delivery ratio of the existing DTEM exhibits poor performance than that of proposed TWDA. The comparison of DTEM and TWDA based on the average values of the performance metrics shown in table 2.

Table 2. Comparative Metrics

| Model | Average Delay (sec) | Energy consumption (Joules) | Packet loss (%) | Communication overhead (bytes) | Packet delivery ratio (%) | Throughput (kbps) |
|---|---|---|---|---|---|---|
| DTEM | 6 | 39 | 19 | 12.6 | 86 | 28 |
| TWDA | 3.9 | 27 | 14.6 | 9.7 | 91 | 35 |

In table 2 it is evident that the network lifetime increased because delay, energy consumption, percentage on packet loss and communication overhead of the proposed TWDA are less when compared with the existing DTEM. The Packet delivery ratio and Throughput of the proposed TWDA are higher when compared with the existing DTEM.

## 5. Conclusion

In sensor network, the security of data is a vital issue. The tiny sensor devices had their own limitations and they will have disastrous effects to the attacks that are mounted against the routing service in WSN. However, since there is a high demand in resources, the standard techniques that have been used are not able to safeguard against these classical routing attacks. This work implements trust rating function which is used in modified CSA to form the DAT along with watermarking techniques leads a new exposure to evolve a security system with energy efficiency by deploying the available resources in WSNs. Hence in this proposed work, an efficient data transmission technique with high security in WSN is designed and compared with the existing method. Further, the TWDA technique will be enlarged by including various characteristics considering more indicators.

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