

Table 2: Results of detection of nodes in SAODV

Total Nodes	Normal Nodes	Idle Normal Nodes	Blackhole nodes	True Positive	True Negative	False Positive	False negative
30	25	3	2	1	0	2	0
40	30	5	5	4	1	3	0
50	35	8	7	5	2	6	1
60	40	10	10	9	1	8	0
80	45	12	13	12	1	11	0

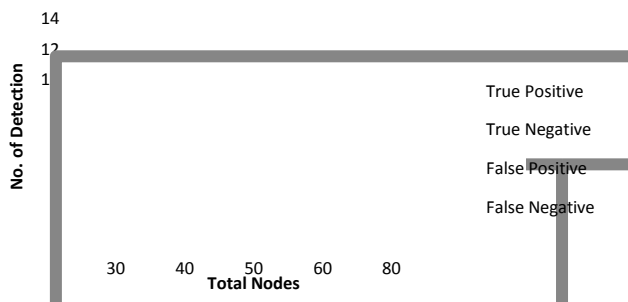


Figure 2: Behaviour of SAODV in blackhole node detection

As we can see clearly that in case of True Positive SAODV works efficiently. But from table and graph we can see that as the number of nodes increases the False Positive detection rate also increases in SAODV. In this case the reliability of the SAODV is decreased as the number of idle normal nodes increases.

6. Proposed Modification in SAODV

```

1. Analyze DRI entry to identify the black node
2. If (BlackHole(IN))
{
Ack= send(Sample Packet, IN)
If(Ack != NULL)
{
Set Route=secure
Set IN.Blackhole=False
}
Else
{
3. Set Route=Insecure
4. Set IN.Blackhole=True
5. Black all node the communication with IN
}
}
    
```

To decrease the false positive detection rate in SAODV we do some minor change in the blackhole detection technique. As above we see that in SAODV blackhole detection is based on the DRI table. In the process of detection every node checks its own DRI table entry for the next node on the path. Also from the above discussion we have seen that the DRI entry for any blackhole node and normal idle node is the same on every node. This is caused by the false positive rate in SAODV. To decrease the false positive rate of the blackhole detection, we did some changes in the algorithm. In this when any node analyzes the DRI table entry for the next node in the path, if it found the symptoms of blackhole detection then it should

confirm the node by sending a sample packet to it. If the packet is dropped and an acknowledgement doesn't come then it is confirmed that the node is a blackhole. But if the node is a normal idle node then it will send an acknowledgement. If the sender node gets an acknowledgement then it confirms it as a normal node. After the modification in the SAODV algorithm we measure the behavior of the modified SAODV for the same setup given above in the table. We have seen a large decrease in the false positive rate of blackhole detection. The results are shown in the table. The modification in the SAODV algorithm is given in the section above.

7. Experiments Results for Improved SAODV

For the same parameters and setup used in the simulation of AODV we simulate the modified SAODV against blackhole detection. And the results are given in the table below.

Table 3: Results of detection of nodes in Modified SAODV

Total Node	Normal Nodes	Idle Normal Nodes	Black hole nodes	True (+)	True (-)	False (+)	False (-)
30	25	3	2	1	2	1	0
40	30	5	5	5	0	1	1
50	35	8	7	6	1	2	0
60	40	10	10	10	0	2	1
80	45	12	13	11	1	3	2

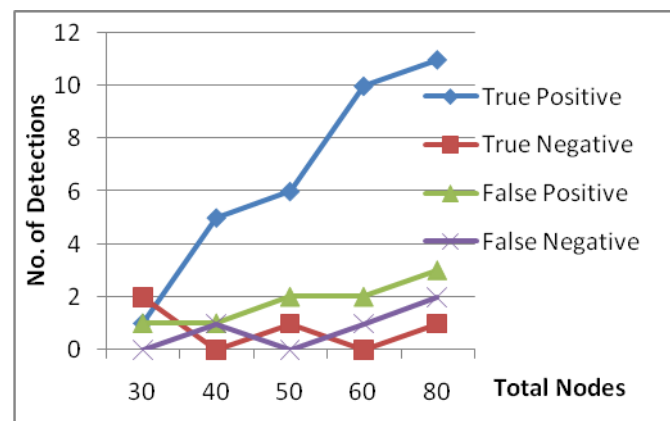


Figure 4: Behavior of Modified SAODV in blackhole node detection

8. Comparison of SAODV and Modified SAODV

As tables 2 and 3 show that the false detection rate in SAODV decreases as the number of nodes increases. From fig.2 and fig.3 we can see the rates for detections against the blackhole node. In this modification our objective was to decrease the false positive detection of the blackhole node. From fig.4 we can see the comparative graph for False Positive in SAODV and Modified SAODV.

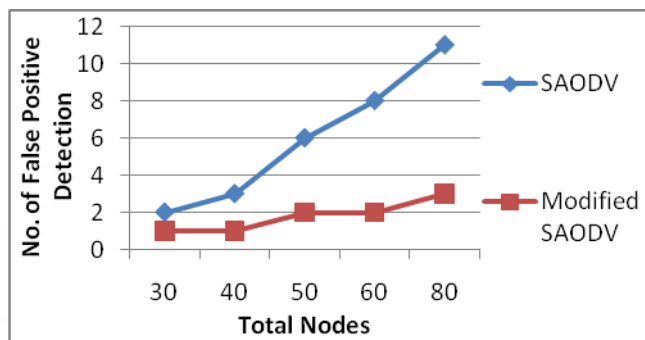


Figure 5: Comparison of SAODV and Modified SAODV against false positive detection

9. Conclusion

The presented work is defined as the improvement over the existing AODV protocol to provide the reliable and safe communication. The presented work has provided the solution to problem of false positive detection of blackhole nodes in SAODV. This improved SAODV protocol is called Modified SAODV protocol used the concept of DRI table based mapping to identify black hole nodes and provide the reliable and safe route over the network. The presented work has observed the network nodes under reliability parameters and generate the effective communication route. In this work, at the first level, the reliable node identification is done by proving the node identity.

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