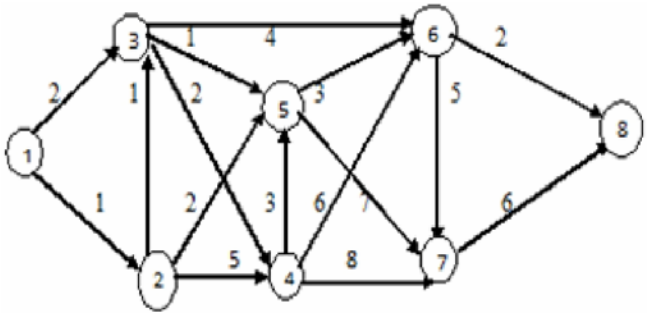

Figure 2: Network Path to be route from 1 to 8

Iteration 0: Set the first node as visited label [0, -]
Iteration 1: Nodes 2 and 3 can be covered from node 1. Thus, the list of labeled nodes (Unvisited and visited) becomes

Table 6.1: First iteration of Shortest Path Selection

Node	Label	Status
1	[0, -]	Visited
2	[0+1, 1]=[1,1]	Unvisited
3	[0+2, 1]=[2,1]	Unvisited

Between the two unvisited labels [1, 1] and [2, 1], node 2 get the smaller distance (u_2=1). So the status of node 2 is changed as visited.

Iteration 8: The iteration will be completed when all the node status as visited. If any unvisited node are there the process to identify shortest path algorithm is not completed properly. The result of final iteration given in table 6.3

Table 6.3: Final Iteration of Shortest path Selection

Node	Label	Status
1	[0,-]	Visited
2	[1,1]	Visited
3	[2, 1]	Visited
4	[4, 3]	Visited
5	[3, 2] , [3, 3]	Visited
6	[6, 3] or [6, 5]	Visited
7	[10,5]	Visited
8	[8, 6]	Visited

So the shortest path to reach the base station 8 from node 1 through hop nodes gives the following sequence
(8) → [8,6] → (6) → [6,5] → (5) → [3,3] →(3) →[2,1] → (1)
So the shortest route to reach the base station is 1→3 →5 → 6 → 8
The routing path shown in the following figure 3 in blue color

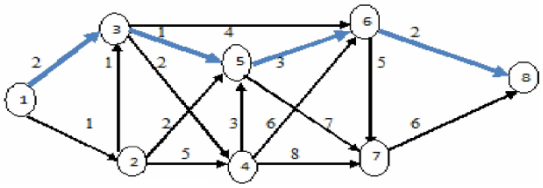

Figure 3: Shortest Path Identification

Some other routes with shortest distance to node 8 to node 1 are 1→ 3 →5 →6 →8 and 1 →2 →5 → 6 →8. The detected object, routes based on the above mentioned algorithm [10].

The shortest path has been identified, based on that the information will be routed. This is called primary path routing

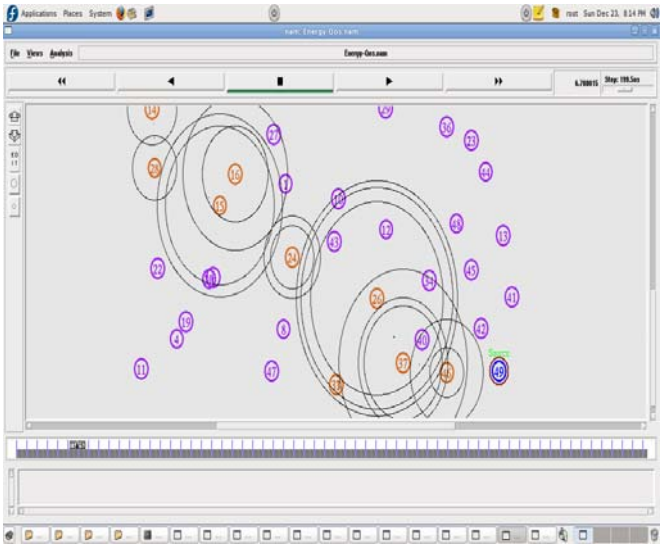

Figure 4: Primary Path Routing

6. Energy Level Path

After identifying the shortest path the nodes are route the data packets as shown in the 4. During this time all the energy of nodes calculated

The overall energy consumption in individual constituent is [11]

$$E_{individual,i}(\Delta t) = \sum_{u=1}^{Nu} \sum_{seS} \sum_{weW} (e_{u,x}, e_{u,w}, t_{u,x})$$

The energy consumption is calculated using [12]

$$E_{consumd,i}(\Delta t) = E_{inttial,i}(t-\Delta t) - E_{residual,i}(t)$$

The node which sensed the object using sleep wake up method [1], routes the information packet based on the shortest path algorithm mentioned above. During the routing the energy level of hop nodes calculated and it compare with other nodes in the network as the mathematics model discussed above. If the energy of nodes reduced at particular level, the routing path has been changed and priority given to energy level path then, shortest path. The nodes which are having maximum energy will be included in the routing path. The primary path follows the existing shortest path and the secondary path follows proposed based on the residual energy as shown in the figure 5

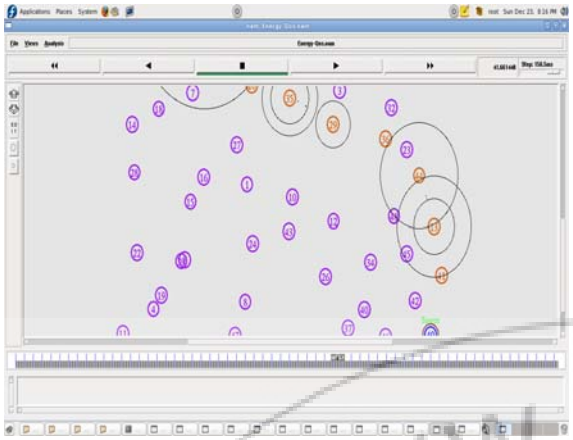

Figure 5: Secondary Path Routing

7. Results

Initially the data are route through an existing shortest path algorithm it is said to be primary path. Up to 35 seconds it executes after that, the path will be changed based on the energy level of the nodes in the network. It is said to be secondary path. The secondary path starts from 35th seconds and executes up to 70 seconds. Initially the data transmitted through primary path up to 35 seconds, during transmission the energy level of nodes which is in the routing path decreased at particular level, but nodes which are not in routing path retains its energy at the same level. So the network selects the nodes which are having more energy to route the data as secondary path. According to the proposed research, the energy level reduced at 5% when routing, the shortest path routing will be changed to energy based routing. The primary path delay at the time of routing is zero and its calculated at the time interval of 5 seconds. When the time is 10 seconds the delay is 0 and till 35th seconds the network follows primary path. The average primary path delay at 35th second is 0.0578244 Seconds.

The average delay calculated from 45th second to 70 second, because primary path taken from 0-35 second and 10 seconds to change the path. Secondary path follows the energy based routing which is proposed method. The following table 1 and figure 6 illustrate the average delay of proposed secondary path.

The secondary path starts from 45th seconds. When it is in 45th second the average delay is 0. The average secondary path delay at 70th second is 0.0448482 sec.

In the simulation the secondary path follows the primary path. The primary path routing starts from 0 to 35 seconds and secondary path from 45th to 70th seconds. In between these 10 seconds has been taken to change the path from first to second. The comparison of existing shortest path routing and proposed energy based routing after time 'T' is shown in the table 7.7 and figure 7.7.

Table 1: Comparison of Average path delay in Primary and Secondary Path

After Seconds	*Average Path Delay in Milliseconds*	
	Primary Path	*Proposed Secondary Path*
10	0	0
15	57.7202	48.8261
20	57.2956	49.8419
25	59.7643	49.8657
30	58.2982	48.8416
35	57.8244	44.8482

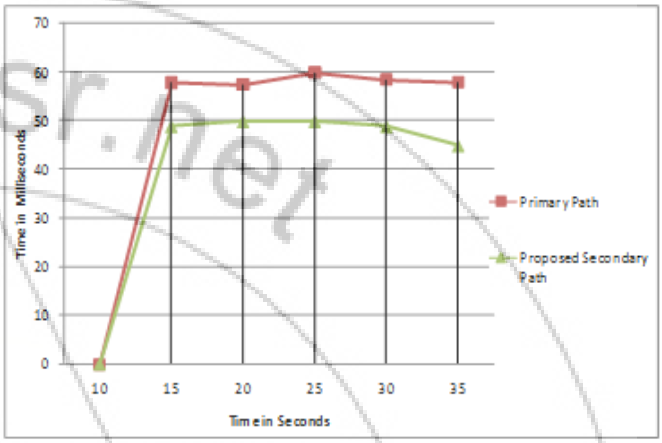

Figure 6: Comparison of Average delay of Primary and Secondary Path

When the network follows the primary path, it consumes the energy continuously in the shortest path. Secondary path route the packets base on the energy so average time delay has been reduced in the secondary path of in the proposed method.

8. Conclusion

This paper describes the dynamic bandwidth allocation to the nodes to transmit data from source to destination. After identifying an object by the node, it selects shortest path routing method to transmit the information. During the routing period the nodes calculate the residual energy of all nodes. If the residual energy of node is reached at a particular level, the routing path has been changed based on the energy. As the network follows energy based routing, the efficiency and life time of the node increased.

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Author Profile

Dr. M. Nagarajan is working as Associate Professor in School of Computer Science at CMS College of Science & Commerce, India has completed MCA, M.Phil and Ph.D in Computer Science; he published 10 International Journals and 3 National Journals. His research area includes Wireless Sensor Networks.