

## LIST OF FIGURES

FIGURE NO.	CAPTION	PAGE NO.
1.1	Sensor Networks design and Application	2
1.2	Placement of topology control algorithm in protocol stack	4
1.3	Motivation graph	5
1.4	Taxonomy of topology control algorithm	6
1.5	Workflow diagram	9
2.1	Industrial application of wireless sensor network	36
2.2	Agriculture monitoring system	38
3.1	Multi-hop network architecture	41
3.2	Star Network Topology	44
3.3	Mesh Network Topology	45
3.4	Hybrid Star Mesh Network Topology	45
3.5	Multistate and Power control Topology	46
3.6	Taxonomy topology control construction	48
3.7	Taxonomy for coverage	49
3.8	Taxonomy for connectivity	49
3.9	Sparser topology after reducing transmission power	51
4.1	Working of LEBTC algorithm	71
4.2	Data flow Diagram for LEBTC	72
4.3	Topology formation using RNG	73
4.4	Topology formation using GG.	74
4.5	Topology formation using FETC	74
4.6	Energy Aware routing (loop iterated 2 times)	75
4.7	Energy Aware routing (loop iterated 5 times)	76
4.8	Energy Aware routing (loop iterated 10 times)	76

4.9	Shortest path routing (loop iterated 10 times)	77
4.10	Shortest path routing (Loop iterated 10 times Topology control period =after 10 transmission)	77
4.11	Energy Aware routing (Loop iterated 10 times Topology control period =after 10 transmission)	78
4.12	Energy aware routing (Loop iterated 10 times Topology control period =after 5 transmission)	78
4.13	RSSI based routing for 100 nodes	79
4.14	Energy aware routing for 300 nodes	79
4.15	Shortest path based routing for 300 nodes	80
4.16	RSSI based routing for 300 nodes	80
4.17	Comparison RNG, GG and LEBTC	81
4.18	Performance and Comparative Analysis Energy Aware routing for 100 nodes	81
4.19	Performance and Comparative Analysis shortest path routing for 100 nodes	82
4.20	Performance and Comparative Analysis RSSI based routing for 100 nodes	82
4.21	Performance and Comparative Analysis Energy aware routing for 300 nodes	83
4.22	Performance and Comparative Analysis shortest path routing for 300 nodes	83
4.23	Performance and Comparative Analysis of RSSI based routing for 300 nodes	84
4.24	TOP performer amongst link based algorithm (100 nodes)	87
4.25	TOP performer amongst link based algorithm (300 nodes)	87
5.1 (a)	DFD 0 for improved POLY	98
5.1 (b)	DFD 1 for improved POLY	98
5.2 (a)	Polygon Formation for dense network at step 1	99
5.2 (b)	Polygon Formation for dense network at step 2	100

5.3 (a)	Polygon Formation for sparse network at step 1	100
5.3 (b)	Polygon Formation for sparse network at step 2	101
5.4	Comparison Poly and Improved Poly for message overhead	102
5.5	Comparison Poly and Improved Poly for energy overhead	102
5.6	Comparison Poly and Improved Poly for Residual energy	103
5.7	Comparison Poly and Improved Poly for Connectivity	103
5.8	Comparison Network lifetime for static and dynamic topology control with energy harvester	105
5.9	Comparison Energy overhead for static and dynamic topology control with energy harvester	105
5.10	Comparison Residual Energy for static and dynamic topology control with energy harvester	106
5.11	Message overhead for static and dynamic topology control with energy harvester	106
5.12	Performance Analysis of Connectivity with different network sizes	108
5.13	Performance Analysis of Message overhead with different network sizes	109
5.14	Performance Analysis of Energy Overhead with different network sizes	109
5.15	Performance Analysis of message overhead with different network sizes , Static and Dynamic maintenance.	110
5.16	Performance Analysis of Connectivity with different network sizes , Static and Dynamic maintenance.	110
5.17	Performance Analysis of network lifetime with different network sizes , Static and Dynamic maintenance.	111
5.18	Top Performer amongst all CDS based algorithm	112

6.1	Moore neighborhood	117
6.2	Von Neumann neighborhood	117
6.3	Margolus neighborhood.	117
6.4	Block Neighborhood	118
6.5	Slider neighborhood	118
6.6	Basic Cyclic Self-reproduction System	118
6.7	Color Bootstrap	118
6.8	Cyclic Spiral	119
6.9	Amoeba	119
6.10	Turbulent Phase	119
6.11	DFD IMP TCA1	122
6.12	DFD IMP TCA2	123
6.13	DFD L0 for imp CCA	124
6.14	DFD L1 for imp CCA	124
6.15 (a)	DFDL2 for imp CCA	125
6.15 (b)	DFD L3 for imp CCA	125
6.16 (a)	Deployment of Sensor	139
6.16 (b)	Deployment status of sensors after time steps 50	140
6.17	Network Lifetime Vs Active nodes for Imp TCA1	141
6.18	Network Lifetime Vs Connectivity for Imp TCA1	141
6.19	Network Lifetime Vs Coverage for Imp TCA1	142
6.20	Network Lifetime Vs Energy for Imp TCA1	142
6.21	Network lifetime vs. active nodes for Imp TCA1 and ImpTCA2	144
6.22	Network lifetime vs. connectivity for Imp TCA1 and Imp TCA2	144
6.23	Network lifetime vs. coverage for Imp TCA1 and Imp TCA2	145
6.24	Network lifetime vs. energy for Imp TCA1 and Imp TCA2	145

6.25	Network lifetime Vs Variance in nodes energy reserved in joule for Imp CCA	147
6.26	Network lifetime Vs Active nodes for Imp CCA	147
6.27	Network lifetime Vs Coverage for Imp CCA	148
6.28	Network lifetime Vs Active nodes for all CA based algorithm	148
6.29	Network lifetime Vs Energy for all CA based algorithm	149
6.30	Network lifetime Vs coverage for all CA based algorithm	149
6.31	Performance and Comparative Analysis (Network lifetime Vs active nodes )	150
6.32	Performance and Comparative Analysis (Network lifetime Vs coverage )	150
6.33	Performance and Comparative Analysis (Network lifetime Vs energy )	151
6.34	Top performer amongst cellular automata based algorithm	153