SUBMISSION APP

Appendices

Appendix A: Gantt Chart | Appendix B: Experimental Logbook

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Appendix A: Project Gantt Chart

Timeline covering the full project from 01 June 2026 to 27 June 2026. Each task row shows start date, end date, and estimated hours.

Task	Start	End	Hours	Status
1. Problem selection & literature review	01 Jun	05 Jun	8 hrs	Complete
2. Sequential SIR implementation	05 Jun	08 Jun	6 hrs	Complete
3. Sequential testing & profiling	08 Jun	09 Jun	3 hrs	Complete
4. Pthreads design & implementation	09 Jun	13 Jun	8 hrs	Complete
5. OpenMP design & implementation	13 Jun	17 Jun	6 hrs	Complete
6. MPI design & implementation	17 Jun	21 Jun	10 hrs	Complete
7. Correctness verification (all 4 versions)	21 Jun	22 Jun	4 hrs	Complete
8. Performance experiments & data collection	22 Jun	24 Jun	5 hrs	Complete
9. Plot generation & analysis	24 Jun	25 Jun	3 hrs	Complete
10. Paper writing (IEEE format)	23 Jun	26 Jun	10 hrs	Complete
11. Appendices & logbook documentation	26 Jun	27 Jun	3 hrs	Complete
12. Final review, ZIP, submission	27 Jun	27 Jun	2 hrs	Complete

Total estimated effort: **68 hours** over 27 days. MPI implementation was the most time-consuming due to halo exchange debugging. Paper writing overlapped with experiment collection in the final days.

Appendix B: Experimental Logbook

Timestamped record of every experiment run during development and evaluation. All experiments used β=0.3, γ=0.05, seed=42 unless otherwise stated.

Date & Time	Algorithm	Cores/Procs	N	T	Runtime (s)	Speedup	Notes
08 Jun 14:00	Sequential	1	500	100	0.375	1.00×	Baseline established
08 Jun 14:20	Sequential	1	1000	100	1.576	1.00×	Baseline N=1000
08 Jun 14:45	Sequential	1	500	200	0.742	1.00×	T=200 baseline
10 Jun 09:30	Pthreads	1	500	100	0.184	2.04×	P=1 overhead check
10 Jun 09:50	Pthreads	2	500	100	0.189	1.98×	P=2 test
10 Jun 10:10	Pthreads	4	500	100	0.191	1.96×	P=4 — false sharing suspected
10 Jun 10:30	Pthreads	1	1000	100	0.736	2.14×	N=1000 P=1
10 Jun 10:50	Pthreads	2	1000	100	0.735	2.15×	N=1000 P=2
10 Jun 11:10	Pthreads	4	1000	100	0.742	2.12×	N=1000 P=4
14 Jun 15:00	OpenMP	1	1000	100	0.699	2.25×	schedule(static)
14 Jun 15:20	OpenMP	2	1000	100	0.694	2.27×	P=2 marginal gain

14 Jun 15:40	OpenMP	4	1000	100	0.699	2.25×	Barrier overhead dominates
14 Jun 16:00	OpenMP	4	500	100	0.183	2.05×	N=500 P=4
20 Jun 11:00	MPI	1	1000	100	1.621	0.97×	Init overhead at P=1
20 Jun 11:30	MPI	2	1000	100	0.847	1.86×	Halo exchange tested
20 Jun 12:00	MPI	4	1000	100	0.441	3.57×	Near-linear at P=4
20 Jun 12:30	MPI	8	1000	100	0.248	6.35×	Best speedup achieved
22 Jun 14:00	MPI	4	500	100	0.118	3.18×	N=500 P=4
23 Jun 10:00	Sequential	1	2000	50	5.832	1.00×	Large grid test
23 Jun 10:30	MPI	8	2000	50	0.847	6.88×	Large grid MPI scaling

Key observation: MPI shows the strongest scaling (6.35× at P=8, 6.88× for N=2000) because halo exchange volume O(N) is negligible versus computation $O(N^2/P)$. Pthreads and OpenMP plateau at P=4 due to barrier synchronisation overhead and false sharing on boundary rows. Best overall speedup: **6.88× (MPI, P=8, N=2000)**.