Master Plan - Isak Hammer

Solving Cahn-Hilliard Equation using CutCIP

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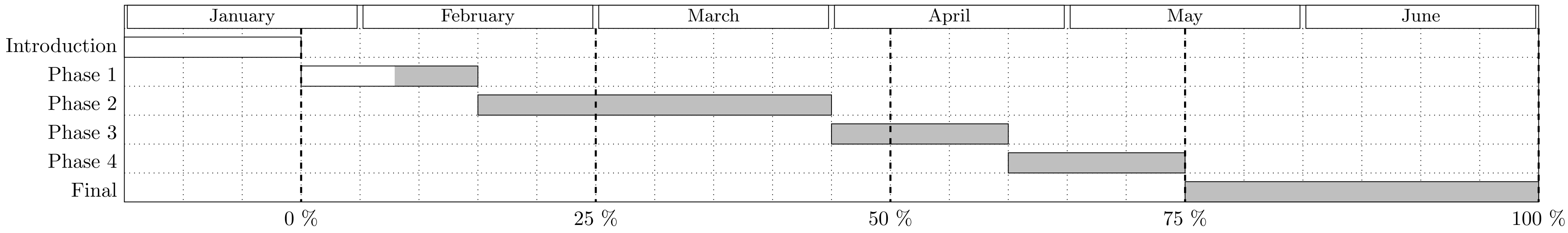
	Phase 1	**Phase 2**	**Phase 3**	**Phase 4**	**Report**
Estimated time	2-3 Weeks	4-5 Weeks	2 Weeks	3 Weeks	
Problem	CutDG for $-\Delta u = f$	CutCIP for $\Delta^2 u = f$	CutCIP for $\partial_t u + \Delta^2 u = g$	CutCIP for $\partial_t u + \Delta^2 u + f(u) = g$	
Goals	• Analysis ☑ Coercivity ☑ Boundedness ☐ Constructing g_h based on assumptions. ☐ Start writing my interpretation into the report. • Implementation ☐ Poisson Nitsche ☑ L^2 convergence ☑ H^1 convergence ☐ Poisson DG-Nitsche ☑ L^2 convergence ☑ H^1 convergence ☐ Poisson Cut ☐ L^2 convergence ☐ H^1 convergence **Only convergence for $k = 1$?** ☐ Poisson CutDG ☐ L^2 convergence ☐ H^1 convergence	• Analysis ☐ Coercivity ☐ Boundedness ☐ A priori estimates ☐ Condition number † • Implementation ☐ First plot ☐ L^2 convergence ☐ H^1 convergence	• Analysis ☐ BDF analysis • Implementation ☐ First plot ☐ L^2L^2 convergence ☐ L^2H^1 convergence	• Implementation ☐ Fixed point method ☐ L^2L^2 convergence ☐ L^2H^1 convergence	☐ Introduction ☐ Mathematical background ☑ Computational domains ☐ Broken Sobolev Spaces ☐ Inverse estimates ☐ CutDG $-\Delta u = f$ ☐ Construction of CutDG ☐ Well-posedness ☐ Numerical experiments ☐ CutCIP for $\Delta^2 u = f$ ☐ Weak form in H^4 ☐ Construction of CutCIP ☐ Well-posedness ☐ A priori estimates ☐ Numerical experiments ☐ CutCIP for $\partial_t u + \Delta^2 u = g$ ☐ Time discretization ☐ Numerical experiments ☐ CutCIP for $\partial_t u + \Delta^2 u + f(u) = g$ ☐ Fixed point methods ☐ Numerical experiments ☐ Conclusion
Comments	Mostly based on (Gürkan and Massing, 2019)	† Not prioritized			
Digression		2nd order mixed formulation	2nd order mixed formulation	Solve $\partial_t u + \kappa(u)\Delta^2 u = g$	



1 Other

1) Easter 5.-10. April

References

Gürkan, Ceren and André Massing (2019). "A stabilized cut discontinuous Galerkin framework for elliptic boundary value and interface problems". In: *Computer Methods in Applied Mechanics and Engineering* 348, pp. 466–499.