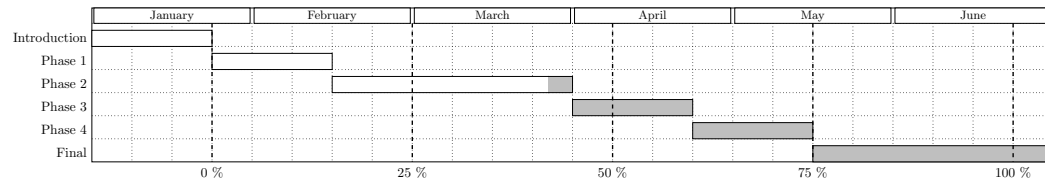


MASTER PLAN - ISAK HAMMER

SOLVING CAHN-HILLIARD EQUATION USING CUTCIP

Version: March 28, 2023

	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 $\partial_t u + \Delta^2 u + f(u) = g$	Progress in report
Goals	<ul style="list-style-type: none"> Analysis <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Coercivity <input checked="" type="checkbox"/> Boundedness <input checked="" type="checkbox"/> A priori estimates <input checked="" type="checkbox"/> Condition number <input checked="" type="checkbox"/> Constructing face based g_h Implementation <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Poisson CutDG <ul style="list-style-type: none"> <input checked="" type="checkbox"/> L^2 convergence <input checked="" type="checkbox"/> H^1 convergence <input checked="" type="checkbox"/> $a_h, *$ convergence <input checked="" type="checkbox"/> Implement \mathcal{P}^2 elements 	<ul style="list-style-type: none"> Analysis <ul style="list-style-type: none"> <input checked="" type="checkbox"/> Initial problem setup <input checked="" type="checkbox"/> Coercivity <input checked="" type="checkbox"/> Boundedness <input type="checkbox"/> A priori estimates <input type="checkbox"/> Constructing g_h <input type="checkbox"/> Condition number † Implementation <ul style="list-style-type: none"> <input checked="" type="checkbox"/> CIP Nitsche Implementation <input checked="" type="checkbox"/> CutCIP Implementation <input checked="" type="checkbox"/> First plot <input type="checkbox"/> L^2 convergence <input type="checkbox"/> $a, *$ convergence 	<ul style="list-style-type: none"> Analysis <ul style="list-style-type: none"> <input type="checkbox"/> BDF analysis Implementation <ul style="list-style-type: none"> <input type="checkbox"/> First plot <input type="checkbox"/> $L^2 L^2$ convergence <input type="checkbox"/> $L^2 H^1$ convergence 	<ul style="list-style-type: none"> Implementation <ul style="list-style-type: none"> <input type="checkbox"/> Fixed point method <input type="checkbox"/> $L^2 L^2$ convergence <input type="checkbox"/> $L^2 H^1$ convergence 	<input type="checkbox"/> Introduction <input type="checkbox"/> Mathematical background <input type="checkbox"/> CutDG $-\Delta u = f$ <ol style="list-style-type: none"> Strongly considering removing this section Very similar to CutCIP. <input type="checkbox"/> CutCIP for $\Delta^2 u = f$ <ul style="list-style-type: none"> <input type="checkbox"/> Weak form in H^4 <input type="checkbox"/> Construction of CutCIP <input type="checkbox"/> Well-posedness <input type="checkbox"/> A priori estimates <input type="checkbox"/> Numerical experiments <input type="checkbox"/> CutCIP for $\partial_t u + \Delta^2 u = g$ <ul style="list-style-type: none"> <input type="checkbox"/> Time discretization <input type="checkbox"/> Numerical experiments <input type="checkbox"/> CutCIP for $\partial_t u + \Delta^2 u + f(u) = g$ <ul style="list-style-type: none"> <input type="checkbox"/> Fixed point methods <input type="checkbox"/> Numerical experiments <input type="checkbox"/> Conclusion
Comments	Mostly based on (Gürkan and Massing, 2019)	† Maybe			<ul style="list-style-type: none"> Marked done only if it is 95% done. Page counter: 21
Digression		Aggregated FEM (Badia, Verdugo, and Martín, 2018) for \mathcal{P}^k , $k = 1, 2, 3$		Solve $\partial_t u + \kappa(u)\Delta^2 u = g$	



Other

- 1) Maybe exam in mid of April?
- 2) Easter 5.-10. April