|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Milestones | Steps | Tools involved | Deadline | Estimated number of hours | Effective number of hours |
| Understand the ϕ-FEM technique | 1. **Read the documents related to ϕ-FEM**  * Read the introductory paper * Read the Neumann boundary case |  | 03/11/2020 | 20 | 10 |
| The Poisson equation | 1. **Install FEniCS using Docker**  * Install the most recent version * Test the installation with the demo case provided  1. **Solve the Poisson equation using the classic FEM technique**  * Use a simple domain (a unit disk) * Validate this step by differentiating a known solution and verifying the results  1. **Perform the convergence study in norms and**  * According to the theory, the slopes must be respectively close to 2 and 1  1. **Solve the Poisson equation using the ϕ-FEM technique, without stabilising terms. Compare the results with the classic FEM technique**  * Validate this step by comparison with the test cases in the paper  1. **Repeat the preceding test, while applying stabilizing terms**  * Validate this step by comparison with the paper * Repeat the exact test cases in the paper if necessary | Docker  FEniCS | 10/11/2020 | 25 | 50 |
| The elasticity equation | 1. **Reformulate the elasticity equation using ϕ-FEM**  * Take inspiration from the Poisson formulation  1. **Solve the equation using FEniCS**  * The method can be validated using academic cases as done in the papers * The method can also be validated on classical solid mechanics cases such as beams | Docker  FEniCS | 19/01/2021 | 25 | 30 |
| Simulations on organ geometries | 1. **Find the geometries** 2. **Integrate the results into SOFA** | Docker  FEniCS  SOFA | 19/01/2021 | 25 | 0 |