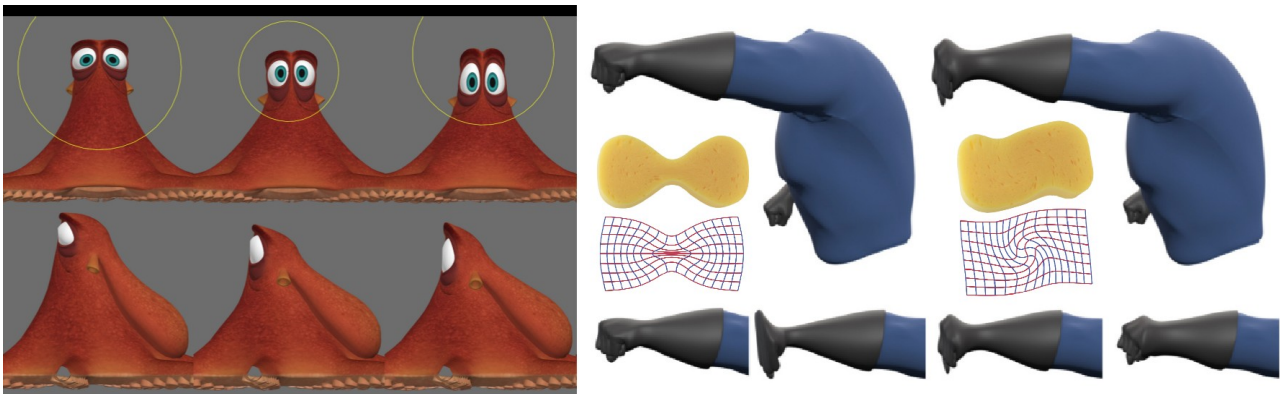


Interactive Animation Generation using Green's Function

This project aims to implement an interactive system to generate or edit elastic deformation and dynamics using Green's functions. The preliminary knowledge includes basic and simple notions of partial differential equations and their particular analytical solutions, i.e., Green's function. Also, you should have basic skills of programming in C++ and using open-source GUI libraries, such as `imgui`¹.



Objectives

In this project, you will implement a system to deform or animate an object with user-specified external loads in an interactive fashion. To begin with, you need to implement the Kelvinlet, the Green's function of isotropic linear elasticity, and its regularized variant [1] to generate static deformation as an object is experiencing a point-wise force. Later, the force vectors should be generalized to affine loads. In your system, a flexible user interface is requested for manipulating spatial position, direction, and magnitude of an exerted load. Once the static deformation has been successfully reproduced, you need to extend your solver to support generating animations by implementing the dynamic Kelvinlet [2], to add some wave-like secondary motions to edited objects. During the development, you are always encouraged to push the performance of your program to the limit, for instance integrating some spatial data structures to reduce algorithmic complexity or exploring GPU programming for massive parallelization.

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References

- [1] De Goes, Fernando, and Doug L. James. "Regularized kelvinlets: sculpting brushes based on fundamental solutions of elasticity." *ACM Transactions on Graphics (TOG)* 36.4 (2017): 1-11.
- [2] De Goes, Fernando, and Doug L. James. "Dynamic kelvinlets: secondary motions based on fundamental solutions of elastodynamics." *ACM Transactions on Graphics (TOG)* 37.4 (2018): 1-10.

¹ <https://github.com/ocornut/imgui>