

Meeting Notes - Preparation for Semester 1 Capstone

Post-Meeting Summary
Last Updated: September 7, 2019

1 Action Items

This section will contain a list of tasks assigned from the initial meeting. Items may be referenced in more detail within the following sections of the document.

- **Agenda**

1. Go through previous tasks.
2. Project Proposal due Sep 16.
3. Funding Application, due Sep 18.
4. Linearization of half-line equations.
5. Perturbation expansions.
6. Next meeting.

- **From Previous Meeting**

1. *Derivation of Euler*. Read through Sections 1.1, 1.2, and 2.1 from [1].
2. *Derivation of Euler*. Read Chapter 1 of [3].
3. *Euler for Irrotational Flow*. It's important to note that many people formulate the free-surface problem in terms of $u(x, z, t)$, $v(x, z, t)$, $p(x, z, t)$, and $\eta(x, t)$. That is, in terms of the bulk velocities, the pressure, and the free surface. However, in (??)-(??), the problem is formulated in terms of a velocity potential $\phi(x, z, t)$ and $\eta(x, t)$. Section 1.1.3 from [3] has a good discussion of this difference (rotational vs. irrotational).
4. Compare derivations and information from both [1, 3].
5. Choose either the scaling in Section 4.1 from [2] or those given in Section 1.3 of [3]. Your choice (note the differences). Nondimensionalize Euler's equations in the velocity potential formulation.
6. Derive the wave equation from the Euler's equations. You may find the discussion in Section 4.1.4 from [2] useful.
7. *Background knowledge*. Watch these videos YouTube MIT playlist

References

- [1] Alexandre Joel Chorin and Jerrold E Marsden. *A mathematical introduction to fluid mechanics*, volume 3. Springer, 1990.
- [2] Bernard Deconinck. Lecture notes: Nonlinear waves, October 2010.
- [3] R.S. Johnson. *A modern introduction to the mathematical theory of water waves*, volume 19. Cambridge University Press, 1997.