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Non-Dimensionalization and Scaling of Helmholtz Equation and Schrodinger Equation, Which Reformulated for Fluid Dynamics AHMAD REZA ESTAKHR, Independent Researcher — In fluid mechanics, the Reynolds number (Re) is a dimensionless number $R_e = \frac{F_int}{F_vis}$ I defined Reynolds number in a different situation, through the Helmholtz equation which represents the time-independent wave equation, $\nabla^2\psi + k^2\psi = 0$ Now i consider wave vector k as Reynolds number per a characteristic linear dimension so, $\nabla^2\psi + \frac{R_e^2}{L^2}\psi = 0$ which led to the non-dimensionalization and scaling of Helmholtz equation, $L^2\nabla^2\psi + R_e^2\psi = 0$ this equation is applicable to fluid dynamics. then I reformulate schrodinger equation, $-\frac{\mu^2}{2\rho}\nabla^2\psi + U_v\psi = E_v\psi$ where the μ denotes viscosity, ρ is density, U_v and E_v are potential and total energy per unit volume. non-dimensionalization tricks: $\frac{\mu^2}{2\rho} = \frac{\mu Lv}{2R_e}$ where the v is velocity, L is linear dimension. now if we take factor of $\frac{\mu v}{L}$ from both side of equation, the Non-dimensionalization and scaling of schrodinger equation for fluid dynamics will be, $-\frac{L^2}{2R_e}\nabla^2\psi + U_v^*\psi = E_v^*\psi$

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