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SOLVING NONLINEAR EQUATIONS TO FREE BOUNDARY PROBLEM IN NEUTRON TUBE

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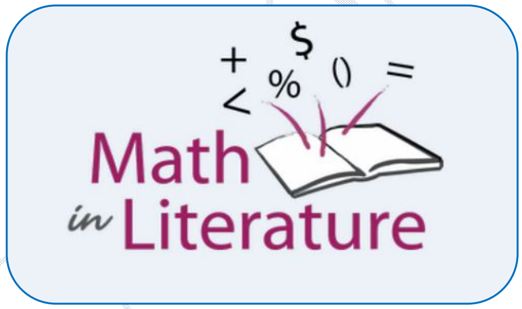
ABSTRACT :



The term free boundary problem (FBP) refers to a problem in the modern applied mathematical literature in which one or several variables must be fixed in different domains of space or space-time, for which each variable is controlled in its domain,by a set of state laws. If the domains are known, this problem usually reduces to solving ordinary differential equations (ODEs) or partial differential equations (PDEs). Now, the novelty of the FBP is the fact that the domain is a priority unknown and has to be determined as part of the problem, thanks to many physical boundary laws or many open boundary conditions caused by the phase constraints. The interplay of state laws for single phase and special phase transition situations allows mathematical modeling based on physics and engineering to combine mathematical analysis and geometry in sophisticated ways. Let us show the basic section of a set of open boundary problems: In the process of evolving over time, the main difficulty of theory is to track free boundary or boundary movements; moving these problems is also called free boundary problem. In cases where time does not appear, the common name is FBP. Another fundamental difference is the difference between many-phase problems and simple one-step problems, where the open boundary is the bounding hypersurface of the equation driven phase. The one-stage problem with a vacuum is usually considered to be a two-step problem, usually in the second phase of a minor.

KEYWORDS : *free boundary problem (FBP) , mathematical literature.*

INTRODUCTION

Different equations have always had a strong relation to the real world and are often generated in mathematical models of physical systems. Famous examples are Newton's second law of motion, Maxwell's equation in electrodynamics, and the Schrodinger equation in quantum physics.

Such equations are often specified in a given domain, but sometimes the domain is not preferred. This is the difference between the classical partial differential equations and the problem with open borders. In other words, a different equation is traditionally stated in the fixed domain sayΩ, satisfy the equation if there is some unknown function like μ. This should be compared to the free boundary problem where both domain Ωand the function μare unknown. The term "free" means that the domain boundary δΩof the domain Ω is not predefined.

Solution of Viscosity and PDE's Elliptic:

Let's start with some of the suggestions used in the first part. A common second order will be written as a partial differential equation…

$F(D2\mu(\chi), D\mu(\chi), \mu(\chi), (\chi) = f(\chi), \chi € D$ 1.1

Here, D is a non-empty domain in R^n, n ≥ 1, which is assumed to have asmooth boundary ∂D. A point x ∈ Rnis also denoted ($x1, x2, . . . ,xn$). The function F maps $S \times R^n \times R$ to R, where S is the space of symmetric matricesin $R^{n \times n}$. The symbols Dμ and $D^2\mu$ denote the gradient and Hessian of thefunction u respectively, and f is a function defined on D. We will onlyconsider elliptic equations, which means that *F* satisfies

The most famous example is the Laplace equation, that is, 1 when F is the sum of all pure second derivatives also denoted by Δ. If $f = 0$, (1.1) decreased by

$$\Delta \mu(\chi) = 0, \qquad \chi € D \qquad 1.2$$

Examples of non-linear equations and those that cannot be treated by linear or even semi-linear theory are the Hamilton Jacobi-Bellman equation for optimal switching problems and the equation of Isaac rising in the theory of the game…

$$\sup_{\alpha \epsilon A} \left(\sum_{i,j=1}^{n} a_{ij}^{\alpha}(x) \frac{\delta^2 \mu}{\delta x_i \delta x_j}(x) = f(x)\right) = f(x) \qquad 1.3$$

$$\sup_{\alpha \epsilon A} \inf_{\beta € \beta} \left(\sum_{i,j=1}^{n} a_{ij}^{\alpha\beta}(x) \frac{\delta^2 \mu}{\delta x_i \delta x_j}(x)\right) = f(x) \qquad 1.4$$

In above example A and B are set of index, and a_{ij}^{α}, $a_{ij}^{\alpha\beta}$ are the definite of positive metrics, generally the solution of μ in function 1.1 Our task is to ensure that equality is always against the pointits called the classical solution function. For example x_1^2 and e^{x1} are the classical solution of function 1.2 It is always enough to be constantly different in many ways, and they are also analysts in *D*.

If we exchange the right hand side function 1.2 with the function *f* which is not identical as zero.

$$\Delta\mu(x) = f(x), \qquad x € D \qquad 1.5$$

So to be clear, unless f is more regular then we are obviously not analysts. Because of the regularity of the sum of the pure second derivatives, you might expect that there are "two more derivatives than F". Perhaps the surprising fact is that this is not true in the following example.

PROBLEM OF BOUNDARY:

Imagine that you have a ring of radius R in three dimensions and a flexible screen is attached to that ring. Then the screen will reduce your total potential energy by getting the least possible area, assuming that gravity has a negligible effect. Choosing the coordinate system where the ring is located in the x_1x_2-plane, the size of the screen can be represented by the graph of the function μ (x_1x_2).

$$\int_D \sqrt{1 + |\nabla u|^2} dx_1 dx_2,$$

With the radius R, D is the disk, you will reduce the area under the limit$u(dx_1dx_2) = 0$ on the ring, It is clear that there is a solution$u(dx_1dx_2) = 0$, Suppose there is now a barrier inside the ring that will allow the screen to become flat. Then it will look different but still minimize its area. To make things easier, we extend the teller to the first order,$\sqrt{1 + |\nabla u|^2} \approx 1 + \frac{|\nabla u|^2}{2}$, due to which we can consider to minimizing the problem,

$$\int_D \left(1 + \frac{|\nabla u|^2}{2}\right) dx_1 dx_2,$$

which is corresponding to minimizing

$$\int_D |\nabla u|^2 dx_1 dx_2$$

If impediment is represented by ψ, we can find minimizers in the set{μ € $W_0^{1,2}(D): u \geq \psi$}, here the space $W_0^{k,p}(D)$Sobolev is a subset function in space

$$W^{k,p}(D) := \{v = \int_D |D^\alpha v(x)|^p dx < \infty, |\propto| \leq k\}$$

Like that $D^\alpha\mu = 0$, on δD for all $|\alpha| \leq k - 1$, now it is useful to distinguish where the set is$u = \psi\ and\ u > \psi$ we can call the set of $\Omega := \{x \in D : u(x) > \psi(x)\}$ the non-coincidence set, while $\Lambda: = \{x \in D : u(x) = \psi(x)\}$ is coincidence set, the free boundary is $\Gamma := \delta\Omega \cap D$. The word "free" comes from the fact that Γis not pre-determined. Since the solution is locally reducing energy, we can conclude that Δμ = 0 in Ω. To having compatibility, we must have μ = ψ and ∇μ = ∇ ψ on Γ.

The open boundary consists of a circle in the one-dimensional case and a circle in the two-dimensional case. If D is the *n*-dimensional ball of radius two, then the free boundary is a round with a radius of magnitude. It can already be seen in a two-dimensional case that*u''* you are unpleasant, as it jumps between zero and minus two at the free border point. It is true that you are constantly on the Lipsitz*u'*, which in general may be the best hope, even if the obstacle is smooth, and Laplacian suggests an otherwise smooth solution with a smooth border. So the regularity of your containing solutions *u* is $C^{1,1}$.The free boundary in the example is locally parsed because it is a hyper-sphere, but can usually display coups.

If we redefine u to be u-ψ, we see that Δμ = 0 at coincidence set also Δμ = -Δψ at the non-coincidence set. Supposing -Δψ = 1 and the following is a brief way to write the problem of constraint, regardless of boundary values,

$$\Delta\mu = X_{\{u>0\}},\ u \geq 0$$

HereX_Ω is the characteristic function, also called the indicator function, defined as

$$X\Omega(x) \begin{cases} 1, & x€\Omega \\ 0, & x€ / \Omega \end{cases}$$

and$\{u > 0\}$ is shorthand for $\{x€D : u(x) > 0\}$. From this suggestive notation, it is easy to change the problem in different ways. For example, an operator Δ can replace the heat operator $\Delta\mu\text{-}\delta_t$, or a simple linear second vertical ellipse with a smooth coefficient,

$$L= \sum_{i,j=1}^{n} a_{i,j}(x) \frac{\delta^2}{\delta x_i \delta x_j} + \sum_{i=1}^{n} b_i\,(x) \frac{\delta}{\delta x_i} + c(x)$$

We can also change the right hand side and we can remove this condition as well $u \leq 0$. With the replacement of Replacement of $\chi_{\{u>0\}}$which will be $\chi_{\{|Du|>0\}}$cause problems with superconductivity or $\chi_{\{u\neq 0\}}$, Arising from probable theory, there is no sign barrier problem. In all instances, however, the question of the regularity of the solutions and the open borders is addressed. The optimal regularity of *u*, that is, $C^{1,1}$ (C^1 in *x* and $C^{0,1}$ in the parabolic case) can be proved in all the above mentioned problems, and is also one of the main results in Paper A and Paper B. Solve a completely non-linear free boundary problem.

Nevertheless, there are some problems for which the solution is not C1, the solution to the unstable obstacle problem, is given by

$\Delta u = -\chi_{\{u>0\}}$

It is generally difficult to prove statements regarding the regularity of the free boundary, and one assumption (which is unfortunately difficult to investigate) is that the blown boundary is of the maximum of C maximum $(e.x, 0)^2$for some continuous c and the direction e. The one limitation here is the limitation of the form…

$$\lim_{j\to\infty}\left(\frac{u\,(r_j x+x^0}{r_j{}^2}\right) \quad , r_j\rightarrow 0,$$

Another interesting question is how the open border interacts to a certain extent. In the problem of classical and non-signaling constraints, the free border touches a fixed boundary of tangent,

CONCLUSION:

The semi-humid state of what we call balanced semi-humidity, see the paper for an explanation. We also introduce the idea of super-sub solutions and sub-super solutions. Unfortunately, it was discovered long after writing this article that a straightforward variable conversion to a quasi-monotone system could be reduced.

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