THESIS INFORMATION

Thesis title: **Regularization of some inverse problems in diffusion processes**
Speciality: Analysis of Mathematics
Code:62460102
PhD Student:Vo Van Au
Academic year: Course 26 (09/2016 - 09/2019)
Supervisor: Assoc. Dr. Nguyen Huy Tuan
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1. SUMMARY OF THE THESIS CONTENT:

In this thesis, we will focus on presenting three main topics about the inverse nonlinear parabolic problem.

Topic 1, consider the inverse problem for nonlinear parabolic with constant coefficients.

Topic 2, consider the inverse nonlinear parabolic problem with non-local coefficients.

Topic 3, consider the inverse parabolic problem with nonlinear sourceand nonlinear coefficients.

The methods used are: new Fourier truncation method, Quasi-reversibility (QR) method, Modified Quasi-reversibility method.

The thesis is divided into 04 chapters.

Chapter 1: Recalling some knowledge about functional analysis, real calculus, ill-posed problems, and some necessary results.

Chapter 2: Presenting the parabolic problem backward in time with constant coefficients in Hilbert space.

$$\begin{cases} u_t + Au = F(t;u(t)), \quad t \in (0,T), \\ u(T) = \varphi. \end{cases} \tag{1}$$

Where: for A is a positive, unbounded self-bound operator defined on a subspace of Hilbert space H such that A − 1 is a compact operator. Apply the new Fourier series truncation method to correct the problem (1). Our aim is to reduce the conditions of the exact solution and the Lipschitz coefficient compared to the previous results.

Chapter 3: Inverse problem for nonlinear parabolic equations with non-local coefficients. Consider the following problem

$$\begin{cases} u_t = a\left(\int\limits_{\Omega} f(x)u(x,t)\right)\Delta u + F(x,t;u(x,t)), & (x,t) \in \Omega \times (0,T), \\ \dfrac{\partial u}{\partial \sigma} = 0, & (x,t) \in \partial\Omega \times (0,T), \\ u(x,T) = \varphi(x), & x \in \Omega. \end{cases} \tag{2}$$

Use Quasi-reversibility (QR) method to regularization the problem (2). In this chapter, considering the source function F satisfies the global Lipschitz condition and the local Lipschitz.

Chapter 4: Parabolic problem backward nonlinear time with nonlinear coefficients. Consider the problem

$$\begin{cases} u_t - \nabla \cdot \big(a(x,t;u(x,t))\nabla u\big) = F(x,t;u(x,t)), & (x,t) \in \Omega \times (0,T), \\ u(x,t) = 0, & (x,t) \in \partial\Omega \times (0,T), \\ u(x,T) = \varphi(x), & x \in \Omega. \end{cases} \quad (3)$$

Use Modified Quasi-reversibility (QR) method to regularization the problem (3). In this chapter, considering the source function *F* satisfies the global Lipschitz condition and the local Lipschitz.

2. THE NEW RESULTS OF THE THESIS:

In this thesis, we give the following new results:

Firstly, consider the problem with the cases: constant coefficients, non-local coefficients, nonlinera coefficients

Secondly, consider the problem ofthe source function *F* satisfies the global Lipschitz condition and the local Lipschitz.

The main results of the thesis have been published in three prestigious international articles (05 SCI): *Acta Applicandae Mathematicae* (SCI, Q2), *Journal of Mathematical Analysis and Applications*, (SCI, Q1), *nverse Problems*, (SCI, Q1), *Discreteand Continuous Dynamical Systems - Series A*, (SCI, Q1), *SIAM Journal on Mathematical Analysis*, (SCI, Q1).

3. THE PROBLEMS NEEDS TO CONTINUE STUDY

In the future we will study the following issues:

1. Continue to study the system of partial differential equations.
2. Study the partial differential equationscontain random elements.
3. Study the problem of partial differential equations with some different types of fractional derivatives.

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