On Stabilization of Hyperbolic FitzHugh-Nagumo Model

Jamila Kalantarova

Koc University, Istanbul, Turkey
JKALANTAROVA@KU.EDU.TR

Abstract

We study the following closed-loop feedback control problem for hyperbolic FitzHugh Nagumo equations

$$\begin{cases} \tau\partial_t^2 u + \partial_t u - \partial_x^2 u + f(u) + v = w, \ x \in (0,L), t > 0, \\ \partial_t v + bv - du = 0, \ x \in (0,L), t > 0, \end{cases}$$

under the homogeneous Dirichlet's boundary conditions, where $b > 0$, $d > 0$ and $\tau > 0$ are given numbers, w is the control function, $f : \mathbb{R} \to \mathbb{R}$ is a continuously differentiable function satisfying the conditions

$$f(s)s - \mathcal{F}(s) \geq -r_1 s^2, \ \forall s \in \mathbb{R},$$

$$a_1|s|^{p+2} - r_2 s^2 \leq \mathcal{F}(s) \leq a_2|s|^{p+2} + r_3, \ \forall s \in \mathbb{R}.$$

We apply feedback controllers involving the first N Fourier modes and finite volume elements of the function $u(x,t)$, to show global stabilization of the system to the zero stationary state.