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EDUCATION IS CHARACTER

Event-triggered Predictive Control of Networked Control Systems with Output Transmission

Thesis submitted in the partial fulfillment for the Award of Degree

Doctor of Philosophy

By

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2024

To

The

Supreme Personality

Lord Shiva

and

My Beloved Family

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It is certified that the work contained in the thesis titled **Event-triggered Predictive Control of Networked Control Systems with Output Transmission** by **Haritha Mittapally** has been carried out under my supervision, and this work has not been submitted elsewhere for a degree. It is further certified that the student has fulfilled all the requirements of the Comprehensive Examination, Candidacy, and SOTA for the award of a Ph.D. Degree.

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DECLARATION

I, **Haritha Mittapally**, certify that the work embodied in this thesis is my own bonafide work and carried out by me under the supervision of **Dr. Sandip Ghosh** and **Dr. Shyam Kamal** from July-2019 to October-2024, at the Department of Electrical Engineering, Indian Institute of Technology (BHU), Varanasi. The matter embodied in this thesis has not been submitted for the award of any other degree/diploma. I declare that I have faithfully acknowledged and given credits to the research workers wherever their works have been cited in my work in this thesis. I further declare that I have not willfully copied any other's work, paragraphs, text, data, results, etc., reported in journals, books, magazines, reports, dissertations, theses, etc., or available at websites and have not included them in this thesis and have not cited as my own work.

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Date: 03/10/2024 Haritha Mittapally

List of Figures

Nomenclature

List of Greek and Roman Symbols

$\mathcal{R}$	Set of real numbers
$\mathcal{N}$	Set of positive numbers
$\mathcal{R}^*$	The set of all *-tuples of real numbers
P	Positive definite matrix
γ_k	Communication decision at k^{th} instant
ϵ	Scalar value $(0 < \epsilon < 1)$ to be chosen for ET

Abbreviations

NCS	Networked Control System
MBPC	Model-based Predictive control
MPC	Model Predictive control
ET	Event-triggering
ETT	Event-triggered Transmission
PT	Predictive Triggering
PET	Predictive Event Triggering
ST	Self Triggering
NPC	Networked Predictive Control
ETPC	Event-triggered Predictive Control
TEPC	Two-channel Event-triggered Predictive Control
PTPC	Predictive Triggered Predictive Control
LQR	Linear Quadratic Regulator
LMI	Linear Matrix Inequality