Safe and Optimal controller synthesis for Hybrid System

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***Abstract*—Hybrid systems are commonly used in engineering applications(eg. logic-dynamic controllers, internet congestion even physical systems with impact,etc). Hybrid systems have been used to model several cyber-physical systems.In This work, we propose a methodolody which provide safety and optimal behaviours to hybrid systems.**

***Index Terms*—component, formatting, style, styling, insert**

I. Introduction

Hybrid systems are widely used in engineering applications and its importance has grown up considerably these last years, because of their ease of implementation for controlling cyber-physical systems. A switched systems is a set of dynamical systems, each with its own dynamical behaviour controlled by a parameter mode u whose values are in a finite set U(See [**?**]). However, due to the composition of many switched systems together, the global switched systems has a number of modes and dynamics which increases exponentially. Switched systems have numerous applications in control of mechanical systems, the automotive industry, and many other fields.

II. Safety Hybrid Systems

In this part is presented a method based on correction by design of discrete linear switched system in the time. the method consist of given a objective region *R* of state space, the method built a set *S* and a control that guide any element from *S* a *R*. This method works in an iterative way to back to reach the region *R*. The method can also be used for synthesize a stability control that is keep inside of R, whole states start in *R*.

Problem 1 *((R,S) - Stability Problem).* Given a switched system as shown in figure before, a set of recurrence $\mathbb{R}^n$ and a safe set S $\subset \mathbb{R}^n$,find a control rule $\sigma : \mathbb{R}^+ \to U$ such that, for any initial condition $x_0 \in R_1$ and any perturbation $\varpi : \mathbb{R}^+ \to U$ the following holds:

- *Recurrence in* R*:there are a monotonically strictly increasing sequence of (positive) integers $k_t, t \in \mathbb{N}$ such that for all $t \in \mathbb{R}^n, \phi(k_l\tau; t_0, x^0, \sigma, w) \in \mathbb{R}$.*
- *Stability in* S*: for all $t \in \mathbb{R}^n, \phi(t; t_0, x^0, \sigma, w) \in S$.*

Problem 2 *((R_1, R_2, S) - Reachability proglem). Given a switched system of the form shown above, two sets $R_1 \subset \mathbb{R}^n$ and $R_2 \subset \mathbb{R}^n$ and a safety set $S \subset \mathbb{R}^n$, find a control rule σ : $\mathbb{R}^+ \to U$ such that, for any initial condition $x_0 \in R_1$ and any perturbation $\varpi : \mathbb{R}^+ \to U$, the following holds:*

- *Reachability from R_1 to R_2: there exists an integer $k \in \mathbb{N}$ such that we have $\phi(k_l\tau; t_0, x^0, \sigma, w) \in R_2$.*
- *Stability in S: for all $t \in \mathbb{R}^+, \phi(t; t_0, x^0, \sigma, w) \in S$.*

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III. Stochastic Hybrid Game

Before you begin to format your paper, first write and save the content as a separate text file. Complete all content and organizational editing before formatting. Please note sections III-A–III-E below for more information on proofreading, spelling and grammar.

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Problem 3*(Control Synthesis Problem)*. Let us consider a sampled switched system. Given three sets R,S and B, with $R \cup B \in S$ and $R \cap B = \varnothing$ find a rule $\sigma(.)$ such that, for any $x(0) \in R$.

- *τ-stability: $x(t)$ return in R infinitely often, at some multiples of sampling time τ.*
- *safety: $x(t)$ always stays in S/B.*

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A. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, ac, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

B. Units

- Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as "3.5-inch disk drive".
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- Use a zero before decimal points: "0.25", not ".25". Use "cm^3", not "cc".)

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Number equations consecutively. To make your equations more compact, you may use the solidus (/), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

$$a+b=\gamma \tag{1}$$

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Please use "soft" (e.g., `\eqref{Eq}`) cross references instead of "hard" references (e.g., `(1)`). That will make it possible to combine sections, add equations, or change the order of figures or citations without having to go through the file line by line.

Please don't use the `{eqnarray}` equation environment. Use `{align}` or `{IEEEeqnarray}` instead. The `{eqnarray}` environment leaves unsightly spaces around relation symbols.

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E. Some Common Mistakes

- The word "data" is plural, not singular.
- The subscript for the permeability of vacuum μ_0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter "o".
- In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
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TABLE I
TABLE TYPE STYLES

Table Head	**Table Column Head**		
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[a]Sample of a Table footnote.

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Fig. 1. Example of a figure caption.

ACKNOWLEDGMENT

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References

[1] G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955.

[2] J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.

[3] I. S. Jacobs and C. P. Bean, “Fine particles, thin films and exchange anisotropy,” in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.

[4] K. Elissa, “Title of paper if known,” unpublished.

[5] R. Nicole, “Title of paper with only first word capitalized,” J. Name Stand. Abbrev., in press.

[6] Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, “Electron spectroscopy studies on magneto-optical media and plastic substrate interface,” IEEE Transl. J. Magn. Japan, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].

[7] M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.

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