A Standard Notation for Real-Time Scheduling

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Introduction

- Last 20 years has seen significant growth in the number of people active in the Real-Time Scheduling community and the number of publications

- Today more than ever, it is important we make our research as easy as possible for others to understand and build upon

- All experienced difficulty and frustration trying to decipher unfamiliar, arbitrary and cryptic notation [1]

Proceedings: http://www.cs.unc.edu/~baruah/AlanFest/Procs.pdf

[1] It would be unfair to pick out any one paper for criticism but I see you checked hoping it wasn’t yours!
Pirate Notation

- A cruel and unusual punishment for reviewers

\[ C_r - RA_r - r_r = \text{sum}( \forall l > r \left( r_l \cdot \text{ceil}(C_r, R_l) \right) ) \]

- \( C_r \) is the completion time of task \( r \) relative to its release time
- \( RA_r \) is the time for which task \( r \) is delayed due to Resource Accesses
- \( r_r \) is the runtime of task \( r \)
- \( R_l \) is the Release interval of task \( l \)
A Standard Notation

- All experienced the pleasure of reading interesting, insightful, well-structured papers with clear step-by-step analysis, that uses precise terminology, and a concise, consistent and well thought-out notation [8]

[8] It would be unfair to pick out any one paper for praise but I see you checked this time hoping it was yours!

- Alan contributed greatly
  - through the volume and quality of his published research (450+ publications)
  - Number of people reading his work (~15,000 citations)
  - Number of PhD students he’s supervised and nurtured into independent researchers

- Shaped a de-facto standard terminology and notation adopted by many in the real-time community
A Standard Notation

In honour of Alan’s 0x3C birthday and his enduring contribution to real-time systems research, we hope that this de-facto standard notation will from now on be referred to as:

Burns Standard Notation

and its use become so widespread that in a few years it will be hard to find a new paper on real-time scheduling that does not use it.
Burns Standard Notation

- An easy notation to use, understand and extend

\[ R_i = B_i + C_i + \sum_{k \in hp(i)} \left( \frac{R_i}{T_k} \right) C_k \]

- \( R_i \)  Response time of task \( \tau_i \)
- \( B_i \)  Blocking time for task \( \tau_i \)
- \( C_i \)  Computation time of task \( \tau_i \)
- \( T_k \)  minimum inter-arrival time of task \( \tau_i \)
- \( hp(i) \) set of tasks with priorities higher than that of task \( \tau_i \)
Burns Standard Notation

- **Guidelines** for using and extending Burns Standard Notation appear in the paper, along with the most commonly used examples.

Please do use

Burns Standard Notation

Don’t use

Pirate Notation