

1077-92-2576

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Sleep-wake and circadian (internal time keeping system) states provide direct and indirect control of nearly all body functions, including human performance and hormone pulsatility. There has been a slow adoption of these mathematical models in applied problems (schedule design and individual hormone analysis) due to differences in the underlying problem specification (i.e. different type of schedules) and individual differences in the dynamics of each system (i.e. group models are not appropriate). To overcome these challenges, we integrate problem specification methods used in computer science (formal language theory) with traditional modeling approaches to define new robust and efficient algorithms for incorporating sleep and circadian principles to the study of applied problems where these systems are strong determinants of important outcomes. The integration of formal language theory and mathematical modeling will be motivated by my research in designing crew schedules for NASA and analyzing individual cortisol pulsatility. (Received September 22, 2011)