If you wish to accept your nomination to stand for election to the Research and Scholarship Committee of the Faculty Senate please supply the following information and return the completed form by email to the Faculty Senate office at fsenate@central.uh.edu by 12:00 p.m. Friday, March 31, 2017.

**Note:** The Faculty Senate is a working organization. To run for the Research & Scholarship Committee, you must be able to attend its meetings held monthly from 1:00 – 3:00 p.m. on Friday. Does your schedule allow you to attend? __X__ Yes _____ No
The Faculty Senate meets monthly from 12:15 – 2:00 p.m. on Wednesday. Does your schedule allow you to attend? _X_ Yes __ No

**CANDIDATE NAME:** Albert M. K. Cheng____
**COLLEGE:** NSM_____________
**DEPARTMENT:** Computer Science____
**CENTER/INSTITUTE:** Director, Real-Time Systems Laboratory
**EMAIL:** cheng@cs.uh.edu____

<table>
<thead>
<tr>
<th>Research And Scholarship</th>
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<tbody>
<tr>
<td>Peer-reviewed publications (career total)</td>
<td>225</td>
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<td>Peer-reviewed publications (last five years)</td>
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<td>Externally funded research grants (last 5 years)</td>
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<td>Internally funded research grants (last 5 years)</td>
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Undergraduate and/or graduate research programs in which you are actively involved: NSF-REU ____
____ I am the recipient of the 2015 University of Houston's **Lifetime Faculty Award for Mentoring Undergraduate Research** for “Exceptional efforts in demonstrating a lasting commitment to undergraduate research.”

This information sheet will be available on the secure voting site for review by faculty eligible to vote in your college on for this Faculty Senate position.
Please copy and paste the citation information for up to five of your most significant peer-reviewed publications:
(coppy and paste here)


Please copy and paste the citation information for up to five of your most significant funded research projects (external and/or internal):
(coppy and paste here)

Award Abstract #1219082
SHF: Small: Real-Time Scheduling and Analysis of Functional Reactive Systems

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ABSTRACT

The use of sophisticated digital systems to control complex physical components in real-time has grown at a rapid pace. Examples include automobile adaptive braking, industrial robotic assembly, medical pacemakers, autonomous vehicular travel, remote surgery, physical manipulation of nano-structures, and space exploration. Since all these applications interact directly with the physical world and often have humans in the loop, their physical safety must be ensured. The correctness of these safety-critical systems depends not only on the actions they generate, but also on the time at which these actions occur. This project develops
response time analysis techniques and scheduling algorithms for embedded control systems implemented as functional reactive programs (FRP's), which are mathematical functions. The controller may consist of a single control component or a network of distributed control components, each running on single or multi-core processors. The response time of the embedded controller has a direct impact on the safety of the entire physical system, but accurate response time analysis of FRP's remains a largely unexplored problem. While there are limited domain-specific studies that provide basic schedulability analysis using approximate bounds on the response time of the transactional model used in implementing functional reactive systems, they do not provide the exact timing characterization needed to guarantee satisfaction of the timing constraints imposed on the execution of the embedded controller. Thus this work develops a framework for accurate response time analysis, scheduling, and thermal-aware/power-conserving methods for these FRP-implemented controllers to improve their performance and enhance their safety.

This project evaluates the impact of this framework on physical system safety and performance using two applications that will require integrating the results of all the research activities: automotive systems and avionics. Determining actual response times of embedded controllers implemented as FRP's will be a technical milestone. Verifiably showing how these scheduling techniques enhance physical system safety and performance will be another. By improving the safety and performance of embedded control systems while reducing the cost of their implementation in domains such as aerospace, medicine, communication, automotive, nano-fabrication, industrial processing, and space exploration, the project has broad societal impact. This project educates diverse undergraduate and graduate students to perform research in a top-tier urban university whose graduates often join local energy-related/high-tech industries, NASA's Johnson Space Center, and the world-renowned Texas Medical Center. Novel techniques discovered will be incorporated into the undergraduate and graduate courses in embedded/real-time systems and operating systems. Project results will be included in the next edition of the PI's popular textbook titled "Real-Time Systems: Scheduling, Analysis, and Verification" (Wiley) and in a new textbook titled "Embedded Programming." The planned research activities will generate a variety of research papers and hardware/software tools addressing the aspects of the project. Implemented tools will be readily available for download.

SELECTED PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH


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**Award Abstract #0720856**

Collaborative Research: CSR/EHS Building Physically Safe Embedded Systems

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<td><strong>Award Instrument:</strong> Continuing grant</td>
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<td><strong>Program Manager:</strong> M. Mimi McClure</td>
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<td>CNS Division Of Computer and Network Systems</td>
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<td>CSE Direct For Computer &amp; Info Scie &amp; Enginr</td>
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ABSTRACT

Some of the most exciting cyber technologies on the research horizon involve sophisticated digital systems that interact with the physical world. Examples include remote surgery, physical manipulation of nano-structures, autonomous (ground and air) vehicular travel, and space and terrestrial exploration. Because such applications interact directly with the physical world, it is imperative their physical safety be assured. This project is developing a comprehensive formal framework for producing controllers for cyber-physical systems, with machine checkable proofs of their physical safety. The project brings together ideas from control theory, language design, program verification, program generation, software engineering, and real-time and embedded systems to build a framework that can be applied to challenging applications. The framework promotes an efficient, rigorous engineering process for producing embedded controllers, incorporating explicit models not only of the controller itself, but also of the physical context in which it operates, the required stability conditions, the platform on which it will run, and the associated real-time constraints. The results of the project are being demonstrated and evaluated in the context of a tele-surgery application. This application is currently being developed at the Mechatronics and Haptic Interfaces Lab in the Mechanical Engineering Department at Rice University.
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Please copy and paste pertinent information **for up to five** of any other scholarly research activities relevant to your academic discipline:

*(copy and paste here)*

Outstanding Leadership Award and Outstanding Leadership Award as Track Chair of the 11th IEEE International Conference on Embedded Software and Systems (ICESS), August 2014.

Program Chair, First ESWeek Workshop on Declarative Embedded and Cyber-Physical Systems (DECPS), Seoul, South Korea, October 15-20, 2017.

Program Chair, First CPSWeek Workshop on Declarative Cyber-Physical Systems (DCPS), Vienna, April 12, 2016.

Program Chair, First Workshop on Declarative Programming for Real-Time and Cyber-Physical Systems (DPRTCPS), San Antonio, Texas, December 1, 2015.

Chair of Program Committee, International Symposium on Software Engineering and Applications (SEA), Marina del Rey, California, USA, October 26-28, 2015; Austria, April 12, 2016.

Please insert a portrait picture of yourself if you so wish.

*(insert portrait picture here, JPEF format preferred)*
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