Nominate an IEEE Fellow Today!

IEEE Fellow is the highest grade of membership of the IEEE. It honors members with an outstanding record of technical achievements, contributing importantly to the advancement or application of engineering, science, and technology, and brings significant value to society.

Around this time (late November), the new class of IEEE Fellows is announced. Hopefully, the list contains many names familiar to you. If not, then perhaps it is a good idea to nominate someone yourself! Anyone can be a nominator (no need to be an IEEE Fellow, or even an IEEE Member). The nomination deadline is 1 March, and all required information (and an "electronic" nomination kit) can be obtained from www.ieee.org/fellows. Please note that the nominee must be an IEEE Senior Member or IEEE Life Senior Member in good standing, who has been a member for five years or more preceding 1 January of the elevation year. Self-nominations are not permitted.

The IEEE and the IEEE Signal Processing Society (SPS) would like to put emphasis on

- underrepresented regions (e.g., Latin America, China, India)
- underrepresented categories (technical leader, educator, application engineer), as described below.

SOME TIPS FOR NOMINATORS

Each year, the SPS receives about 60 nominations, and the IEEE a total of around 800. About 300 of the 800 are successful. While all pertinent information can be obtained from public IEEE Web sites (see in particular http://www.ieee.org/documents/fellow_operations_manual.pdf), we would like to give some tips to improve the chances that a nomination will be successful.

It helps to understand the elaborate review process. Nominations first obtain a technical evaluation by a relevant Society Fellow Reference Committee. This results in a rank ordering (numerical grade) and brief essays (150–200 words) regarding the following questions:

1) *What are the technical contributions?* These can also be the development or application of products, systems, facilities, services or software. List no more than two, and focus on outstanding, innovative, and creative contributions.

2) *What is the evidence supporting the claims?* These are usually published papers, patents, standards, developed courses, and textbooks. Further evidence can be awards and the number of citations to publications, but can also be news reports, Web sites, etc. that discuss the work of the candidate.

3) *What is the importance of the contribution?* What is its lasting impact on society?

The essays, rank ordering, and score go to the IEEE-Level Fellow Committee. The committee is partitioned into small groups, and the nomination forms are randomly distributed in the groups. Each nomination is then scored on four categories. The Society score and rank-ordering is one category, but it counts for only 25% of the total. The main category is technical accomplishment (40%). Since the jury groups are certainly nonexperts, they will base themselves mostly on the Society Committee essays, so these play an important role. The remaining categories are the attached reference letters from five to eight IEEE Fellows (15%), professional activities (10%), and years in the profession (10%).

From this process, it is important to realize that the majority of reviewers are nonexperts on the work of a nominee. Nomination forms should be written with this in mind. Focus on clear, tangible contributions and evidence, and do not forget to discuss their impact on society. Clear essays by the Society Committees are very important as well, so help the committee members by making the required input for these essays readily (and compactly) available in the nomination form.

The Society Committees do not see the reference letters, as these go directly to the IEEE-Level Fellow Committee. Thus, these letters should be written to impress nonexperts, and the stature of the referee should be briefly pointed out as well.

Finally, while many of us are familiar with nominations related to outstanding academic contributions (these go into the category "research engineer/scientist"), there are three other submission categories with equal recognition:

- *Educator*: e.g., for writing an accepted and widely used pioneering textbook, or for the development of a new curriculum or courses that are innovative or unique (with lasting impact on engineering education)
- *Application Engineer/Practitioner*: for product, process, or standards development, for significant technical contributions in the design and evolution into manufacturing of products or systems

(continued on page 18)

Digital Object Identifier 10.1109/MSP.2013.2278127
Date of publication: 15 October 2013

[FIG3] **The Crab Nebula with the Crab Pulsar at its center. The Crab Pulsar is a neutron star, remnant of supernova recorded in the year 1054 that pulsates with a 33-ms period. (Photo courtesy of NASA, Space Telescope Science Institute, and the European Space Agency.)**

Spacecraft navigation today is both costly and time-consuming. Radio signals traveling from Earth at the speed of light take hours, days, or even longer to reach distant probes, effectively preventing human controllers from issuing course maneuver commands that demand rapid action. Ensuring reliable communication with far distant probes also requires the construction and maintenance of ground stations, often in remote locations, that use large and expensive antennas.

The new approach, called XNAV (for X-ray navigation), uses the signals emitted by pulsars to automate spacecraft navigation. A pulsar (Figure 3) is a neutron star that emits beams of radiation that sweep across space like a lighthouse beacon. The signals are so regular that when first detected by astronomers in the 1960s, some thought they might be signals transmitted by an alien civilization. "These (pulsars) are very stable clocks, so they can be used for quite accurate time reference," Pye says. "It's a bit like having a global positioning system (GPS) in space."

Like a conventional GPS receiver, which uses signals from four or more orbiting satellite to determine a user's exact location on Earth, a spacecraft navigating via XNAV could access signals from several different pulsars to calculate its precise location coordinates. "The spacecraft can determine its position in three dimensions, using the time delays of the pulses relative to a known reference set of times," Pye says.

Pye notes that XNAV is a potentially better and cheaper navigation technology than radio instructions sent from Earth. "The spacecraft can be made autonomous, or at least semiautonomous, so that you don't need expensive intervention from the ground," he says. Additionally, because pulsar signals can be access by the spacecraft from virtually any direction, location precision is significantly enhanced. "From Earth you're somewhat limited in your ability to determine the position of the spacecraft, and which way it's moving, because your line of sight is fixed," Pye explains.

Fortunately, there's no shortage of pulsars available for space navigation. "There are catalogs of pulsars, and certainly the ones that are bright enough to be of interest to our study are fairly well documented," Pye says. "We know fairly precisely where in the sky they are, and what their pulse characteristics are."

NPL and Leicester researchers are currently investigating the design of instrumentation that could be used by a pulsar-steered spacecraft as well as developing the necessary application algorithms. "We're designing, at least in concept, an end-to-end system that you could build into an interplanetary spacecraft and then use to navigate in interplanetary space," Pye says.

Results from the investigation are currently being prepared for submission to the European Space Agency (ESA). The ESA, after evaluating cost and performance criteria, may decide to advise incorporating the technology into future space probes.

Signal processing, in the generic sense, is at the core of the entire system, Pye says. "We have to process the signals that come in to get them into pulse trains," he explains. "We then have to process those pulse trains to arrive at a navigation solution."

AUTHOR

John Edwards (jedwards@johnedwardsmedia.com) is a technology writer based in the Phoenix area. [SP]

- *Technical Leader*: responsible for a managerial, team, or company-wide effort using technical innovation, and resulting in outstanding performance, economic enhancements, or other advantages to benefit society.

In each case, the contributions are to be judged on the basis of uniqueness, innovation, and wide acceptance. For the latter categories, it is important that the nominator points out clearly what the individual's technical contribution was to a group effort. In addition, you should add what were the specific technical contributions that the nominee made, which made the achievement possible.

Please submit your nomination no later than 1 March 2014. Again, the online nomination form can be found at http://elektra.ieee.org/fellows/fellowno.nsf. Questions on the IEEE Fellow nomination process should be sent to fellows@ieee.org.

There are many deserving members in the IEEE Signal Processing Society. We encourage you to help them get the recognition that comes with being an IEEE Fellow.

John Treichler
SPS Vice President-Awards and Membership
Alle-Jan van der Veen
Chair, SPS Fellow Reference Committee
[SP]