Penguins' hunting strategies inspire researchers looking into car software

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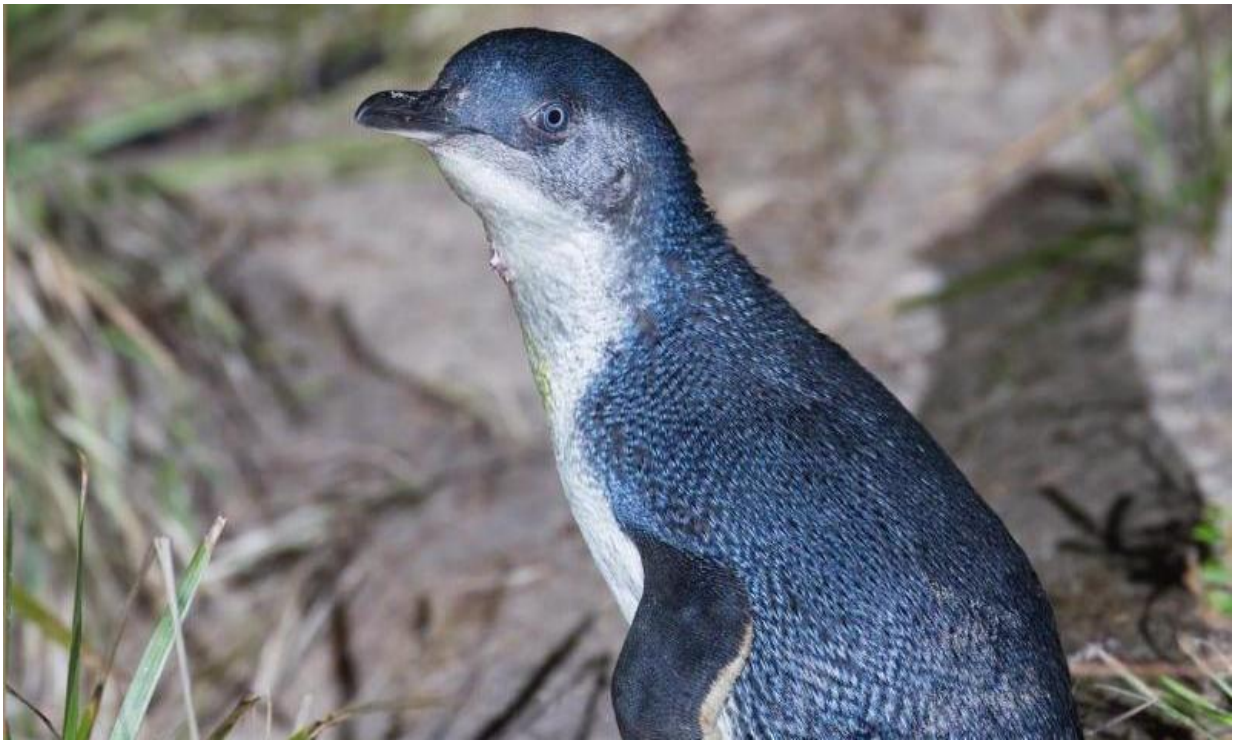

Little Penguin (Eudyptula minor), Bruny Island, Tasmania, Australia. Credit: JJ Harrison/Wikipedia

(Tech Xplore)—There was a time when techies hearing the word penguin promptly assumed you were talking about Linux. This week the word penguin promptly intimates something is going on with researchers and biomimicry focused on, literally, the penguin.

Seems like smart car developers have been looking at the penguin for finding ways to ensure "the safe organization of code," said *Alphr*.

The idea of completely going hands-free on self driving cars is still making people feel nervous about what is going on with that digital array of software activities. Quoted by the BBC, Nick Cook from Intercede, a software firm working with carmakers on safe in-car software, said security would become a priority as cars got smarter—and using data from other cars, traffic lights and online sources. What if? Really, what if?

Back to car safety, penguins and software. Namely, the penguin vis a vis smart cars is the research focus of Professor Yiannis Papadopoulos, a computer scientist at the University of Hull. The BBC reported that under examination has been a penguin-inspired testing system.

He found their efficiency in hunting strategies remarkable—considering their key need for finding food. What was the secret sauce in their strategy? *Alphr* described it as "the communal action penguins take during hunting, electing to forage in groups and synchronise their dives to catch fish."

Also, said *Alphr*, "registering the density of various shoals, penguins reconfigure their groups to ensure more efficient energy expenditure during hunting expeditions."

Prof. Papadopoulos is drawing parallels between their strategies and the task of determining the integrity of software components needed to attain cars' safety requirements.

"Integrity" in what way? BBC said that "Integrity in this sense means ensuring the software does what is intended, handles data well, and does not introduce errors or crash."

A paper has been written about this topic, "Can aquatic flightless birds allocate Automotive Safety requirements?" There are six authors, having affiliations either with the University of Hull in the UK or two universities in Algeria.

The authors noted in their abstract that "Many emerging safety standards use the concept of Safety Integrity Levels (SILs) for guiding designers on how to specify system safety requirements and then allocate these requirements to elements of the system architecture."

The authors said they were proposing a new approach "in which the allocation of ASILs [automotive SILs] is performed by a new nature-inspired metaheuristic known as Penguins Search Optimisation Algorithm (PeSOA)."

In the BBC report, Mike Ahmadi, global director of critical systems security at Synopsys, said modern car manufacturing methods made optimization necessary.

"When you look at a car today, it's essentially something that's put together from a vast and extended supply chain," he said. "There's about a million lines of code in the average car today and there's far more in connected cars."

"While existing manual testing is able to test the code that are in today's cars, the penguin-based system is able to do a far better job at finding faults and optimising the code being used – just like penguins do in the real world," said Oliver Smith in *The Memo*.

More information: Can aquatic flightless birds allocate Automotive Safety requirements? Intelligent Computing and Information Systems (ICICIS), 2015 IEEE Seventh International Conference on, DOI: 10.1109/IntelCIS.2015.7397214 ,

ieeexplore.ieee.org/document/7397214/

Abstract
Many emerging safety standards use the concept of Safety Integrity Levels (SILs) for guiding designers on how to specify system safety requirements and then allocate these requirements to elements of the system architecture. These standards include the new automotive safety standard ISO 26262 in which SILs are called automotive SILs (or ASILs) and these will be used to illustrate the application of the techniques presented in this paper. In this paper, we propose a new approach in which the allocation of ASILs is performed by a new nature-inspired metaheuristic known as Penguins Search Optimisation Algorithm (PeSOA). PeSOA mimics the collaborative hunting strategy of penguins, using the metaphor of oxygen reserves as a search intensification operator. This allows the penguins to preserve energy, consuming it only in areas of the search space that are rich in good solutions. The performance of the approach is evaluated by applying it to a benchmark hybrid braking system case study, demonstrating performance that is an improvement to those reported in the literature.