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STMicroelectronics helps Panasonic Cycle Technology bring AI to e-assisted bikes for affordable safety boost

- *The new tire pressure monitoring system[1] improves safety and user experiences*
- *ST's software ecosystem tool, STM32Cube.AI, accelerates development of the edge AI function operating on the STM32 microcontroller*

Tokyo, Japan, April 3, 2024 – STMicroelectronics (NYSE: STM), a global semiconductor leader serving customers across the spectrum of electronics applications, has announced that Panasonic Cycle Technology, Co. Ltd. (Panasonic) has adopted the STM32F3 microcontroller (MCU) and edge AI development tool, STM32Cube.AI, for their TiMO A e-assisted bike. ST's edge AI solutions provide a tire pressure monitoring system (TPMS) that leverages an advanced AI function to improve rider safety and convenience.

Panasonic is a leading producer of e-assisted bikes in Japan and offers a wide variety of products for various uses to the Japanese market. Their electric assist bicycle for school commuting, TiMO A, runs an AI application on the STM32F3 MCU to infer the tire air pressures without using pressure sensors. Based on information from the motor and the bicycle speed sensor, the system generates a warning to inflate the tires if necessary. ST's edge AI development tool, STM32Cube.AI, enabled Panasonic to implement this edge AI function while fitting into STM32F3 embedded memory space. This new function simplifies tire air-pressure maintenance, which enhances rider safety and prolongs the life of tires and other cycle components. It also helps to reduce the cost and design work, as there is no need for additional hardware such as an air pressure sensor.

"We develop and manufacture e-assisted bikes with the mission of delivering environmentally friendly, safe, and comfortable transportation, accessible to all," said Mr. Hiroyuki KAMO, Manager, Software Development Section, Development Department of Panasonic Cycle Technology. *"ST's STM32F3 MCU provides cost competitiveness and optimal functions and performance for e-assisted bikes. By combining the STM32F3 MCU with STM32Cube.AI, we were able to implement the innovative AI function without the need to change hardware. We will continue to increase the range of models with AI functions and strive to fulfill our mission by leveraging ST's edge AI solutions."*

"ST has been actively working on the global proliferation of edge AI in both hardware and software, providing edge AI solutions to a wide range of products including industrial and consumer equipment," said Marc Dupaquier, Managing Director Artificial Intelligence

[1] Function to estimate tire air pressure based on motor speed and data from the speed sensor and display on the LCD switch a recommendation to inflate the tires.

Solutions, STMicroelectronics. *"This collaboration marks a key step in our efforts, and we are delighted to have contributed to the first implementation of this AI function in Panasonic's e-assisted bike. We will continue to propose AI use cases and solutions for diverse markets, anywhere we can help to augment our life."*

ST will showcase edge AI solutions, including the STM32 MCU and a variety of AI development tools, at the AI Expo at Tokyo Big Sight (May 22-24, 2024). The e-assisted bike and the motor unit (cutaway sample) from Panasonic Cycle Technology, which feature the STM32F3 MCU and STM32Cube.AI, are also scheduled to be displayed at this expo.

How it works

The STM32F3 MCU adopted for the TIMO A is based on the Arm® Cortex®-M4 (with a maximum operating frequency of 72 MHz) and features a 128KB Flash, along with various high-performance analog and digital peripherals optimal for motor control. In addition to the new inflation warning function, the MCU determines the electric assistance level and controls the motor.

It leverages STM32Cube.AI to reduce the size of the neural network (NN) model and optimize memory allocation throughout the development of this AI function. STM32Cube.AI is ST's free edge AI development tool that converts NN models learned by general AI frameworks into code for the STM32 MCU and optimizes these models. The tool optimized the NN model developed by Panasonic Cycle Technology for the STM32F3 MCU quickly and easily, and implemented it in the flash memory, which has limited capacity.

ST offers a comprehensive edge AI ecosystem for spreading edge AI to devices used in a wide range of scenarios. The ecosystem includes STM32Cube.AI and also the NanoEdge AI Studio autoML tool. Both tools are part of the soon to be available ST Edge AI Suite. All of them are available free of charge. For details, please visit the following webpages:

- Edge AI development tool, STM32Cube.AI
- Automatic machine learning library generator, NanoEdge AI Studio
- Integrated suite of development software and tools, ST Edge AI Suite announcement
- AI use cases

About STMicroelectronics

At ST, we are over 50,000 creators and makers of semiconductor technologies mastering the semiconductor supply chain with state-of-the-art manufacturing facilities. An integrated device manufacturer, we work with more than 200,000 customers and thousands of partners to design and build products, solutions, and ecosystems that address their challenges and opportunities, and the need to support a more sustainable world. Our technologies enable smarter mobility, more efficient power and energy management, and the wide-scale deployment of cloud-connected autonomous things. We are committed to achieving our goal to become carbon neutral on scope 1 and 2 and partially scope 3 by 2027. Further information can be found at www.st.com.

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