CAN Newsletter Online

COVID-19

Corona pandemic and CAN

The new virus goes around the world. CAN is not the right medicine against it, but CAN networks are used in medical equipment helping indirectly in the fight against the Covid-19 disease.

CAN can just help a little against the Covid-19 disease (Source: Adobe Stock)

The Covid-19 disease requires worldwide intensive-care beds and respiratory devices. In Germany, there are about 28 000 intensive-care beds and 20 000 respiratory devices in the hospitals. Perhaps, there are required more. Some of the intensive-care beds are equipped with embedded CAN networks using the CANopen application layer. Hill-Rom and Stryker, two U.S. companies, produce such beds.

There are also respirators, which implement embedded CAN networks. Such devices are necessary for serious ill corona patients. Best are extracorporeal membrane oxygenation (ECMO) devices, also known as extracorporeal life support (ECLS). They could save the life of corona patients.

One of the limiting resources is corona test equipment, which can run automated tests on the Sars-CoV-2 virus. Just a few days ago, Roche (Switzerland) got approval by the U.S. FDA (Food and Drug Association) for its Cobas 6800/8800 molecular testing systems. It is also available in European countries accepting the CE mark.

Another limited resource is medical staff. In particular, when nurses and other service staff are infected with the Sars-CoV-2 virus, there might be not sufficient personnel. Service robots could help, but there are just prototypes and single devices installed in hospitals. Some of them are based on CAN networks. In the future, there should be larger fleets of service robots available.

The intensive care ambulance uses CAN networks to control the medical equipment (Source: WAS)

Of course, CAN is doing also its duty in ambulances, rescue helicopters, hospital elevators, and other logistical equipment including automatic hospital sliding doors. The 500 Batriatic/Intensive-care ambulance by WAS (Germany) provides all necessary intensive care equipment, which is controlled by a CAN-connected display.

Intensive care beds often provide an embedded CAN network (Source: Research Reports)

Intensive care unit

The intensive care unit (ICU) is a special department in hospital taking care on patients with severe or life-threatening illnesses, such as Covid-19 patients with heavy lung infections. The intensive-care beds provide sensor units monitoring visual signs, aggregating them, before transmitting them via CAN to the bedside monitor. Some patient beds are also using CAN networks for controlling the motion of the different bed parts. Stryker uses CAN communication in its beds to allow for touch screen control functions, which eliminates the use of any pendant. The unit consists of a sleep surface, a control box located under the mattress at the foot end and a color touch screen that can be mounted onto side-rails or the footboard.

Hill-Rom, another intensive-care bed supplier, also uses CAN networks in its products. CAN connects the display board with the so-called algorithm board and the rest of the mattress system. The algorithm board provides speed control for the blower, which is used primarily for mattress service cooling.

ECMO devices

ECMO devices remove blood from the person's body and artificially remove the carbon dioxide and oxygenating red blood cells. Beginning of this year, Chinese physicians used these devices as an adjunct support for patients presenting with acute viral pneumonia related to the Covid-19 infection when, even after ventilation, the blood oxygenation levels remain too low. Several heart-lung machine suppliers have installed embedded CAN networks. The products by Livanova (UK) are based on a non-PC host controller in conjunction with a CAN network.

Automated coronavirus tester

Up to now, testing on the new coronavirus is time consuming and tra molecular testing systems to detect the Sars-CoV-2 virus. The U.S. Food and Drug Administration (FDA) has issued an Emergency Use Authorization (EUA). It is intended for the qualitative detection of the virus that causes Covid-19 disease. Hospitals and reference laboratories can run the test on Roche's automated Cobas 6800 and 8800 systems. The systems using embedded CAN networks provide test results in three and half hours. The 8-hour throughput is 384 results for the Cobas 6800 and 960 results for the Cobas 8800.

The Cobas molecular testing systems are approved for detecting the novel coronavirus (Source: Roche)

The S5 heart-lung machine comes with an integrated CAN network (Source: Livanova)

"Providing quality, high-volume testing capabilities will allow us to respond effectively to what the World Health Organization has characterized as a pandemic. It is important to quickly and reliably detect whether a patient is infected with Sars-CoV-2," said Thomas Schinecker, CEO of Roche Diagnostics. "Over the last weeks, our emergency response teams have been working hard to bring this test to the patients. CE-mark certification and the FDA's granting of EUA supports our commitment to give more patients access to reliable diagnostics which are crucial to combat this serious disease."

Roche participated in the development of the CANopen profile for laboratory automation. The CiA 434 set of device profiles specifies a master/slave-based communication between a laboratory automation master (LAM) and several laboratory automation slaves (LAS). Beside the general definitions (part 1), device profiles for diluter, dispenser, and pump units (part 2) as well as for heating, cooling, and shaking units (part 3) are specified. The scalable LAS device modeling is applicable for small and simple applications as well as for very complex ones.

Service robots for hospital

According to the International Federation of Robotics World Robotics 2018 Service Robots report, medical robot sales increased 73 % in 2017 over 2016, accounting for 2,7 % of all professional service robot sales. Moving forward, 2018 sales are projected at 4 360 units, a 49-% increase from 2017, and roughly 22 100 robots are estimated to be sold between 2019 and 2021. This is of course not enough, when the novel coronavirus infects the medical service personnel.

The diverse applications of medical robots today include telepresence robots for remote caregiving and disinfectant robots to reduce hospital acquired infections. Mobile medical robots are also being used for delivery of medication and other sensitive materials in a hospital setting. "Medical robots are diverse in their form and function but all serve to improve the quality and accuracy of healthcare delivery," stated the Robotic Industries Association. "The market is projected to undergo strong growth as new medical processes find effective automation solutions and healthcare facilities justify the investment in medical robots."

Especially in epidemic situations, service robots can deliver meals for medical staff and patients. This can avoid cross-infection, can reduce the pressure of medical staff, and can save medical protective supplies.

The Care-O-Bot4 service robot can also be used in hospitals; it comprises embedded CAN networks for different purposes (Source: IPA-Fraunhofer)

To make medical service robots cost-effective, standardization is necessary. For the control system, the open-source Aseba framework has been developed. It is based on the open-source Robot Operating System (ROS) and embedded CAN networks. ROS supports the CiA 402 profile for motion controllers.

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