

Application Solutions Case Study Remote Manipulation and Handling Systems

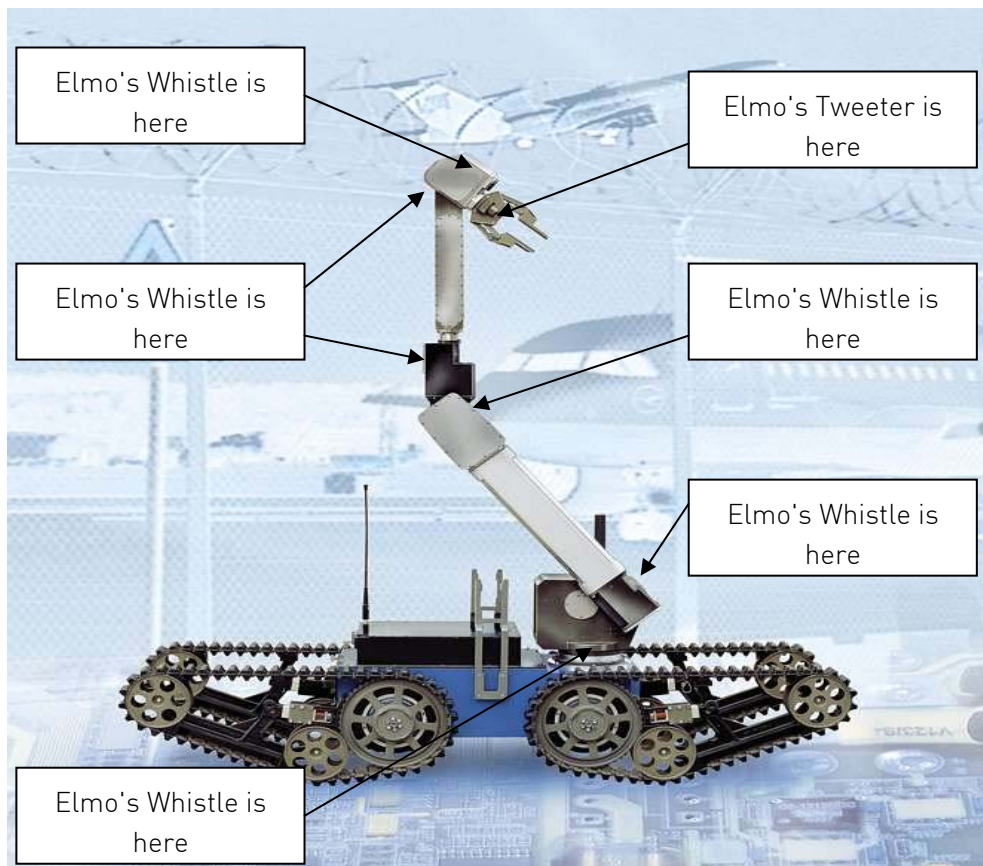
Product Names – Whistle/Tweeter



Machine Description

The teleMAX bomb disposal robot has been specially adapted for operations that have to be carried out in narrow spaces, such as on aircraft, underground trains or buses. Anywhere where the larger model, tEODor, cannot operate, teleMAX ensures that the vital distance is maintained between the bomb disposal engineer and the bomb.

Elmo's Whistle and Tweeter servo drives are a very practical choice, as then can be mounted within the joints of the robotic arm.



The Challenge

Besides control bandwidth, efficiency and smoothness, the weight of the controller was a very important factor when selecting the drive. Reducing the weight by even a single gram was important. The entire vehicle could have a maximum weight of 80 kg, with the battery and motors accounting for most of the weight.

The physical size of the robot and manipulator arm had to be kept as small as possible, since the manipulator is used in confined spaces such as airplanes, trains, etc.

Both aims could be realized with the integration of Elmo Motion Control's servo drives into the joints (modular, de-centralized architecture, less wiring, and less EMI through shortened motor wires).

Other important considerations were:

- The 24 VDC battery supply requires drives that can support a high current.
- CANopen communication for fast, synchronized movement.
- The battery application required high efficiency, with an operating time of about two hours.
- Smooth movements of the manipulator, as movement with focus are needed.
- High control loop bandwidth is required.

The Elmo Solution

The Tweeter and Whistle were found to be the lightest and most efficient servo controllers with the most intelligence. Since Elmo's controllers have a lot of on-board intelligence, they were found to be perfect for such a critical application.

Other advantages of the Elmo Motion Control servo drives are the generous peak current, which is twice the nominal current and is supplied over a period of 3 seconds. This function is useful when the manipulator needs to be "forced" beyond its rated range. After the 3 second period, the drive reverts to the nominal current. Peak current is available again once the drive has sufficiently cooled down. This allows the user to finish the operation in a step-wise manner, without having to stop or switch off the manipulator.

The Efficiency Solution

The manipulator can be in use for up to 2 hours, which required very large and bulky batteries. The high efficiency of the Elmo drives meant that the size and weight of the batteries could be reduced, making the entire manipulator lighter and more efficient. For example, a smaller actuator could now be used, which further reduced the weight and lowered product costs. A further positive effect was that there was no longer any need for cooling fans or heatsinks.

CANopen Network Abilities

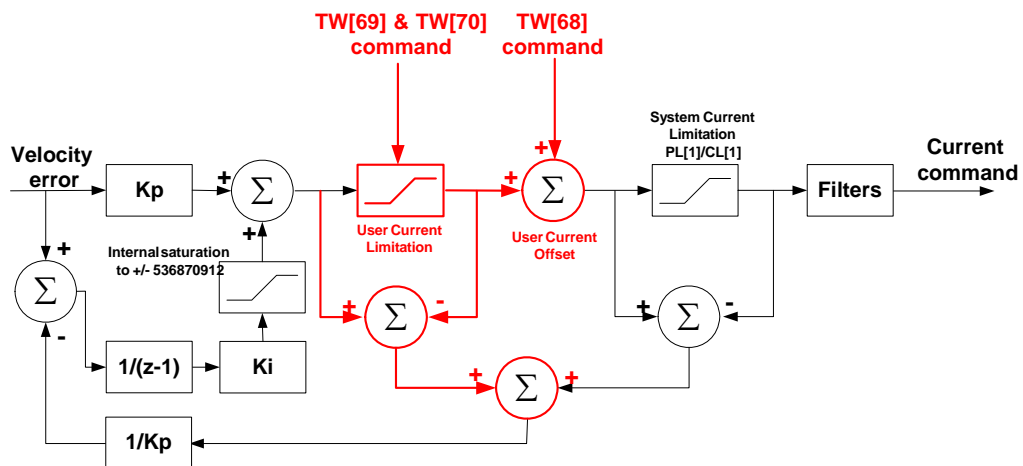
Network capabilities were mandatory. The drives' abilities to solve and/or monitor special tasks locally, at the drive level, allow the traffic on the CanOpen network to be kept to a minimum. This also significantly reduced the load on the upper controller. PDOs (Process Data Object) triggered by the user program were used to send data asynchronously and autonomously without any CAN-Master polling.

Temperature

Elmo's new SimplIQ Whistle and Tweeter servo drives have the ability to monitor and use the internal drive heatsink temperature via the user program. In addition to the common over-temperature switch-off protection, the drive can send its actual heatsink temperature via the CANopen network to the controller, depending on a programmable threshold and/or time condition. If the CAN Master allows a performance reduction, the drive is able to reduce the maximum current "on-the-fly" autonomously and set an indicator flag if required.

Programming and "On-the fly" Parameter Setting Abilities

Most limits can be changed on-the-fly while the motor is on. Depending on the pre-calculated path, torque components of other axes that cause interference can be compensated for with a direct torque feed forward command via the CANopen network to the drive, independent of the actual operation mode.



Why Elmo:

- Advanced motion and servo control
- Distributed networking
- High density
- High reliability
- High efficiency
- Easy to use: Reduction of Complexity
- Compact Size

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