

Case Study

Intuitive control system for unmanned manipulation use cases



BACKGROUND

The robotics ecosystem is rapidly evolving, with the range of applications for unmanned systems (UxV) and number of control systems for ground and airborne platforms dramatically growing over the last two decades.

The advancements in robotics and in particular UxV are opening up the field beyond military to enterprise-level use cases as well as assistive technologies.

To address these changing and evolving market needs, Tomahawk Robotics partnered with Kinova to provide a software-based control solution for Kinova's [Gen2 and Gen3 Ultra lightweight robots](#), to enable rapid and efficient deployment of robotic systems for a broad set of manipulation use cases.



THE CHALLENGE

The application of unmanned system technologies are extremely varied but there are common threads that tie together disparate industries and individuals. The primary value is “usefulness.” For too long, many robotic applications have been nothing more than expensive remote controlled “toys.”

Many unmanned systems are being used for very similar purposes with common technology subsystems. Unfortunately, from an operator’s perspective each system can appear completely unique with its own training regime.

A future-proof solution is required that is extensible across multiple domains of UxV systems and allows end users to tailor their robotic solution effectively for their specific use case.



KEY OBJECTIVES

1. Create an intuitive, unified human-machine interface (HMI) for robotic control.
2. Create a system that can be leveraged across different platforms and payloads with scalable autonomy and multi-domain capabilities.



THE SOLUTION

Tomahawk uses a number of technology advancements such as edge computing, low-cost capable sensors and the internet-of-things (IoT) to enable intuitive, effective and efficient robotic control. Their [Kinesis™](#) robotic control software does just that, by enabling the rapid deployment of robotic systems and empowering users to improve the safety and efficiency of their operations.

To control manipulators such as Kinova's Gen2 and Gen3 robotic arms in their [KINOVA® Ultra lightweight series](#), Tomahawk's Kinesis utilizes ROS, a common framework that's favored by developers working with robotic systems due to its open-source nature and ability to facilitate and simplify network communications, independent of hardware and other programs.





THE SOLUTION

Customers also have the ability to control Kinova's robotic arms using natural hand motion inputs with Tomahawk Robotics' [Mimic™](#) spatial controller. This enables intuitive, predictable control of the robotic arm that functions as an extension of the user's hand.

With Mimic, a worker can operate this system with minimal training to address identified problems. At the click of a button, the same controls are used to seamlessly switch from operating the vehicle to the manipulator. This custom-tailored yet affordable solution can provide a considerable ROI with an expedited integration process and significantly reduced training.





THE RESULTS

By combining the capabilities of Kinova and Tomahawk Robotics, users have the ability to more effectively manage or integrate Kinova manipulation technologies with different robotic platforms and payloads. These capabilities were key to support Tomahawk's efforts with US and International Military Customers as well as work with US National Labs.

The result is a timely, cost effective, tailored solution that addresses the target use case, at an appropriate price point.

For example, affixing a Kinova Gen3 robot atop a UGV running Kinesis provides highly effective remote inspection/surveillance or manipulation capabilities. The solution has been effective for Tomahawk's customers both in the oil and gas as well as the security and defense verticals who are using dexterous manipulation systems to execute a range of tasks that include operations such as identifying unexploded munitions or monitoring valves at an oil and gas well site.



We've been extremely pleased with Kinova's manipulation systems. They are low weight and provide a good balance of speed and strength. From an integration perspective, having a compact, integrated controller is a significant plus. I would also highlight the benefits of a flexible, feature-rich ROS API. Overall, superb technology.



- Brad Truesdell,
CEO at Tomahawk Robotics

USE CASES



OIL AND GAS

Using Kinova's Gen 2 and Gen 3 robots, Tomahawk developed software to integrate Kinesis for their Oil and Gas customers to conduct data collection/monitoring at remote well sites.



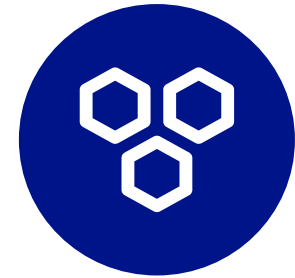
US MILITARY

Having the ability to test, demonstrate and deploy Kinesis and Kinova robots was essential to execute manipulation tasks. Kinesis would not be suitable for the broad set of DOD use cases for remote systems if it was unable to provide dexterous manipulation.



INTERNATIONAL MILITARY

Having the ability to use a high degree of free manipulation systems with Kinesis and Kinova robots allowed us to successfully prove the architecture was sufficient to enable robotic command and control across different robotic systems.



US NATIONAL LAB

Tomahawk has been working with one of the US National Labs to deploy Kinesis as a multi-domain robotic command and control solution, using Kinova robots to address the required highly dexterous manipulation tasks.

ABOUT KINOVA

Kinova is a global leader in innovation robotics. Founded in 2006 in Boisbriand, Quebec, Canada, Kinova's mission was initially to empower individuals with upper-body limitations through assistive robotics. Over a decade later, the company has evolved its solutions and product suite to service new markets — helping researchers, medical professionals, governments, businesses and educational institutions achieve their innovation goals through strategic partnerships and collaborative efforts.

[There's no need too small.](#)
[No task too great.](#)

ABOUT TOMAHAWK ROBOTICS

Tomahawk Robotics is a leading innovator of unmanned systems control solutions, we are driving enterprise adoption of robotics by reducing cost, optimizing system performance and improving ease of use through intuitive, user-centric design. This customer focused approach is captured in the Kinesis product line which addresses the many challenges of operating multi-domain robotic systems beyond line of sight. From desktop to mobile, Kinesis delivers a truly collaborative, one-to-many, control system for remote robotic systems enabling users to seamlessly manipulate their environment from across the room or around the world.

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