Technology 02

Sustainable Digital Twin
Holds the Key to Digital Transformation

Digital twin holds the key to sustainable social change (DX)

City that never

Simultaneous resolution of multiple stakeholders' issues

Infrastructure maintenance /

Environmental preservation

Travel promotion /

Avoidance of close contact

DX

Safe and efficient work

Optimization of collaborative work between humans and machines

Improvement of productivity

Improvement of safety

Digital twin

Remote

Real-time

Optimization

Accurate and fair analysis

Modeling

Reproducing the real world in digital space in a timely manner

Prescription

with explainability and conviction

Real world

Trust & Green

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Stronger sensing to adapt to the changing real world

To capture the changing "current" real world and optimize and respond right away

Continuously and exhaustively collect diverse information

Acquire various data frequently without being on the spot **Remote**

Immediately respond to changes in society

Understand what the data means from the moment of its acquisition **Real-time**

Remote

Digital twin

Real-time

Optimization
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Digital twin seamlessly connects to the real world remotely and in real-time

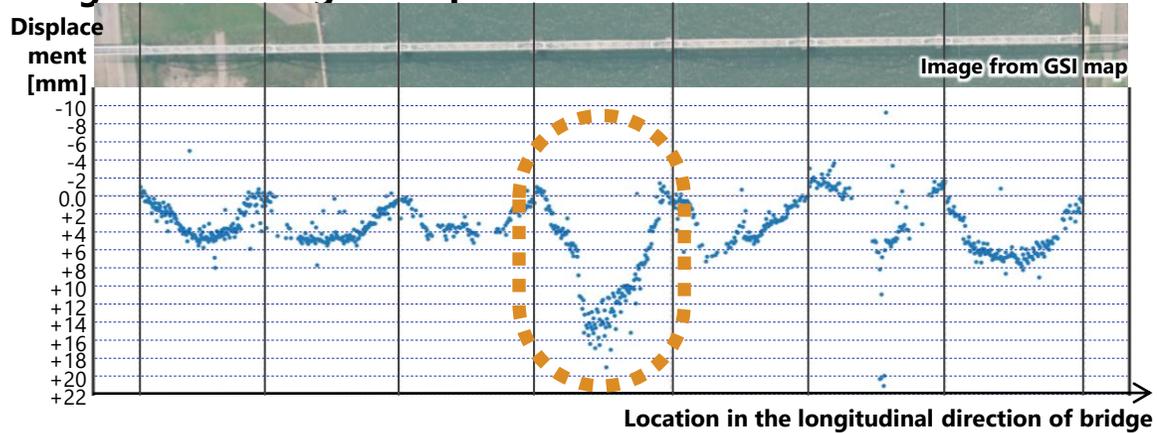\Orchestrating a brighter world   NEC
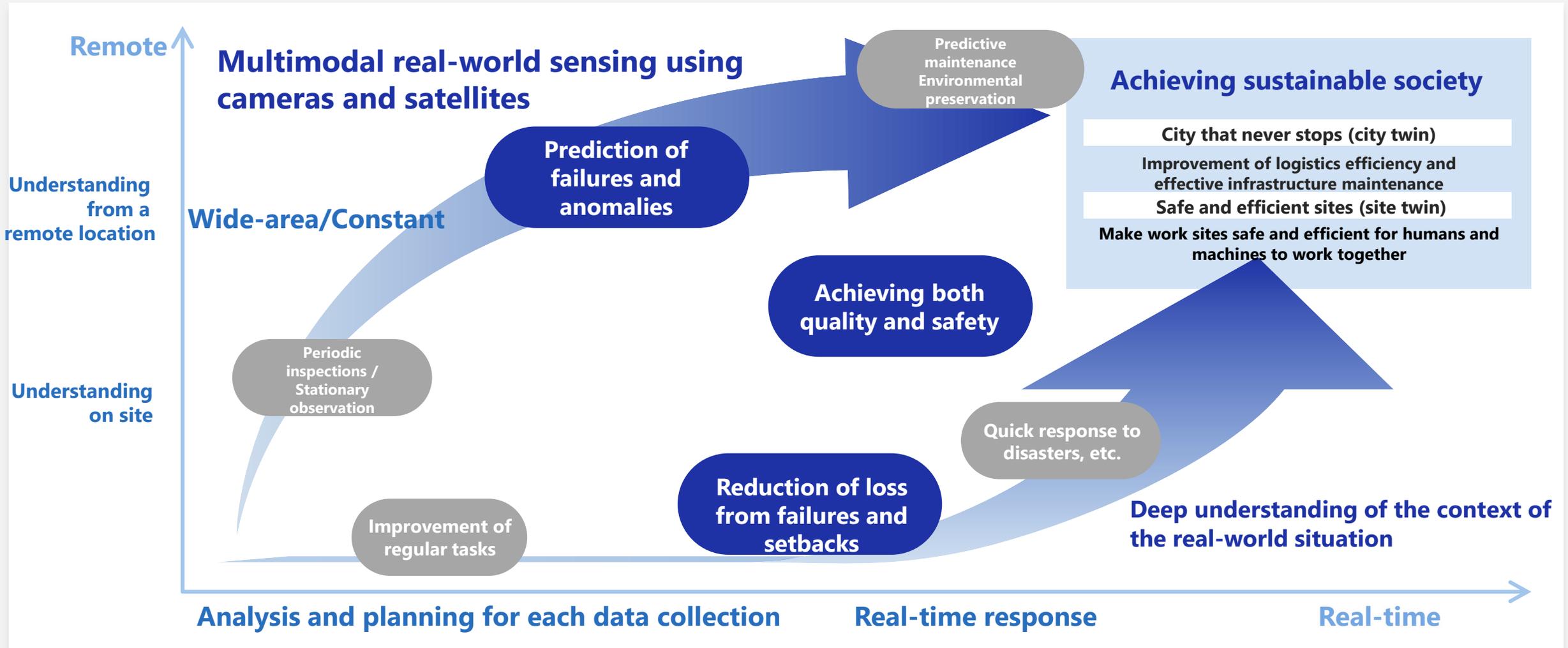
Efficient bridge health monitoring using satellite SAR* and AI

* SAR: Synthetic Aperture Radar

Periodic health monitoring from the sky of bridges that are difficult to visually inspect close-up

Early detection of serious damage that can lead to collapse

- **Exhaustively capture and intuitively visualize pre-collapse damages in bridges built during the past high economic growth period**

Displacement [mm]

Image from GSI map

-10
-8
-6
-4
-2
0.0
+2
+4
+6
+8
+10
+12
+14
+16
+18
+20
+22

Location in the longitudinal direction of bridge

Collectively detect damages in multiple bridges that are otherwise difficult to detect visually

Determine the priority of inspections

Resolve the shortage of workers

| **Future prospect** | Make predictive maintenance of infrastructure—previously difficult to detect damages in—possible by drawing on the strengths in space business |
| | Promote DX of infrastructure facilities management |

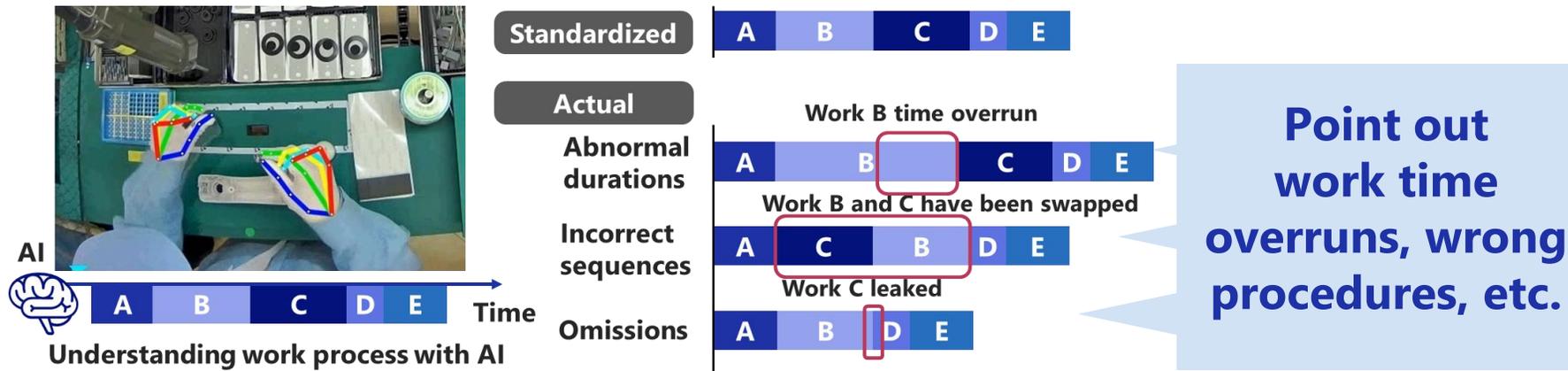\Orchestrating a brighter world   **NEC**

Identifying occupational behavior by capturing hand and finger movements

Real-time understanding of detailed work based on hand and finger movements

Early detection of problems reduces defective products and reworking losses

■ **Understand work time and procedure with high accuracy based on the combination of hand/finger (bones) and tool/parts (images)**

AI

A B C D E Time

Understanding work process with AI

| Standardized | A | B | C | D | E |

Actual

Abnormal durations

Work B time overrun

| A | B | | C | D | E |

Incorrect sequences

Work B and C have been swapped

| A | C | B | D | E |

Omissions

Work C leaked

| A | B | D | E |

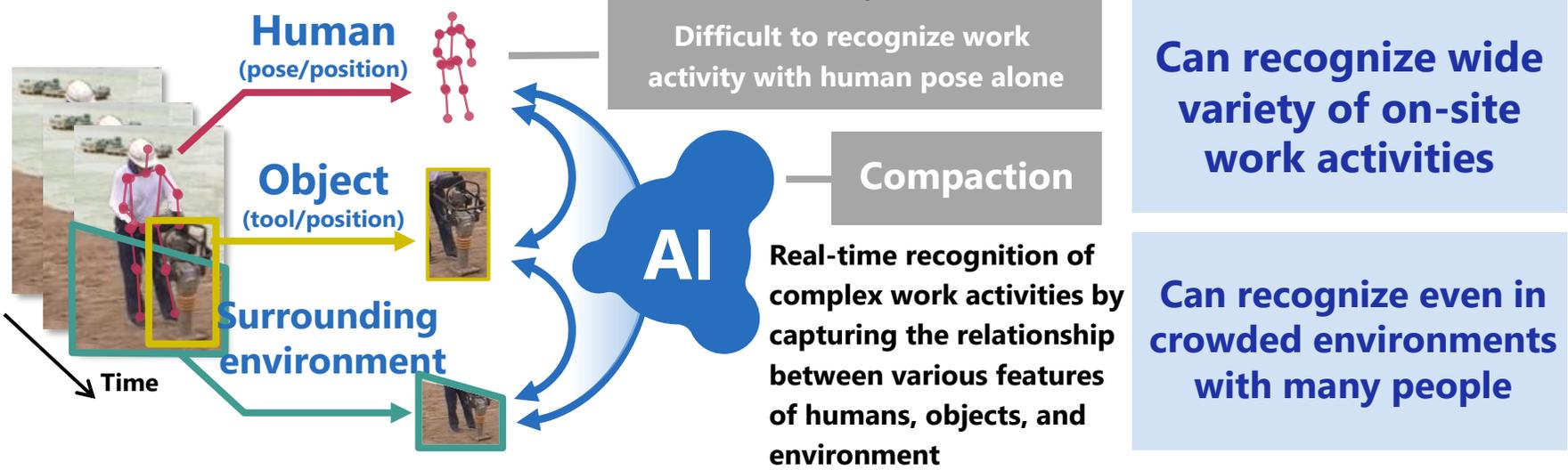**Point out work time overruns, wrong procedures, etc.**

Future prospect

Achieve both productivity innovation and safety through making production lines more efficient as well as enabling industrial accident prediction and quick responses

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Recognizing the work activities of multiple individuals

Digitalizing a wide variety of work activities of multiple individuals

Enabling quality maintenance and safety check from a remote location

■ **Capture the relationship between data of different context, i.e. humans, objects, and surrounding environment, to understand complex human activity**

Human (pose/position)

Object (tool/position)

Surrounding environment

Time

AI

Difficult to recognize work activity with human pose alone

Compaction

Real-time recognition of complex work activities by capturing the relationship between various features of humans, objects, and environment

Can recognize wide variety of on-site work activities

Can recognize even in crowded environments with many people

| Future prospect | Remote management of safety, quality, and efficiency by using a digital twin of the work-site |

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