Workspace and Industry 4.0

The platform to harness the fourth industrial revolution

CSIRO's Data61 Analytics & Decision Sciences Program

www.data61.csiro.au

Digital Twin

Connected to real-time data, a digital twin is a live, multiscale model replicating the state and behaviour of a physical object for use in predictive and synthetic modelling.

Big Data

Digitisation of physical items generates massive amounts of raw data as transactional records and point clouds.
Sophisticated algorithms are needed to clean and fuse the data.

Security

Secure environments are needed to protect data and IP. Access control, authentication protocols and provable implementation correctness enable guarantees.

Simulation

Computational resources are expensive, so the answer to a specific question requires expertise and experiment, to focus the computational budget on getting the right information.

Robotics

Autonomous robots can work effectively in dangerous locations.
Collaborative robots
can work closely with people, and even learn from them.

Augmented Reality

Visual overlays allow comparison with the ideal digital twin for training and quality control.
Well-designed visualisation supports communication and tactical decision-making.

Additive Manufacturing

Also known as 3D printing, additive manufacturing enables both rapid prototyping and low-cost custom manufacture.

Workspace is a proven Scientific workflow and application development platform addressing many of the challenges presented by digitalisation and Industry 4.0. Manufacturing processes often take the form of a workflow, where devices and data are combined with feature detection, situational awareness and optimisation algorithms to enable decentralised decision making and automation.
Workspace's capabilities as a diagnosis and planning system allow the creation and adaption of high performing implementations for deployment and use in commercial and industrial settings.

Analytics

Modern data science tools such as R and python give easy access to advanced algorithms, and enable repeatable data-led decision-making.

Machine Learning

Artificial Intelligence through training on large datasets enables efficient identification and categorisation of complex data.

Technologies

Internet Of Things

Low –cost sensors and network protocols combine to enable ever increasing information, distributed processing and autonomous decision-making.

Manufacturing

Integration of tactical planning and live data for situational awareness enables optimal responses to operational change.

Energy

IoT can support load management in heatwaves, by enabling distributed resource load-shedding in the same way as heavy plant industries.

Agriculture

Extending precision agriculture by integrating localized weather predictions with live soil data to predict crop maturity and optimize harvesting.

Industries

The fourth industrial revolution is affecting all industries.
Workspace's design principles of interactivity, visualisation, scalability, and ease of use in a modular framework make it an ideal platform to explore the possibilities of digitalisation.

Transportation and Logistics

Provide traceability under real world assumptions, not assuming complete or correct records of the events along a supply chain.

Biosecurity

Digitised manufacturing process will support transparency and oversight for risk management.

Healthcare

Tracking people and equipment through hospitals will increase flexibility in scheduling and improve patient experience.

Mining

Autonomous vehicles could communicate their actual usage conditions and wear status, enabling more accurate timing of maintenance.

FOR FURTHER INFORMATION

CSIRO's Data61

e workspace@csiro.au
e lachlan.hetherton@data61.csiro.au
e damien.watkins@data61.csiro.au
https://research.csiro.au/workspace/

Workspace is a powerful cross-platform workflow framework designed with two groups of people in mind:

- Users who want to create and share scientific workflows in one coherent, easy-to-use environment where much of the "heavy lifting" has already been developed and proven over a number of years.
- Developers who want to make their software available as commercial products, plugins or components that can be freely mixed with capabilities from collaborators.

The plugin-based Workspace framework addresses the needs of both groups – it has been designed in a flexible way to promote the collaboration and reuse of software between researchers in different scientific domains.

Workspace has grown out of Commonwealth Scientific and Industrial Research Organisation's (CSIRO) Data61 business unit, and has been in development since 2007. Originally designed to construct workflows for scientists in the computational fluid dynamics space, Workspace recognises the importance of interactivity, visualisation, scalability, and ease-of-use in a scientific workflow.