

Tech Offer Write-up

Title (capitalise each new word)

“Agile Framework” For Autonomous System Development And Deployment

Technology Overview

A software stack known as “Agile Framework” for autonomous system development and deployment. The agile framework serves as a software container/ launchpad for various autonomous technology-related software modules. Which includes localization and mapping, navigation and control, planning, perception, sensor fusion, HMI, etc.

The agile framework also provides a suite of digital-twin simulation and modelling tools for developers to test and validate algorithms prior to deployment on real hardware. It is dockerized for quick and seamless deployment. Developer and user can quickly build up an autonomous system using this stack, like assembling a set of LEGOS.

The system can be experimented using simulation models and deploy to the real robot using Docker.

*A brief summary or description of the invention - What is the problem solved by this technology?
Who is going to buy this technology? How is this IP addressing a need/problem in the marketplace?*

Keywords

Autonomous System, Autonomous Robot, Software Stack, Docker

Specify some keywords that can help others to quickly search for your technology.

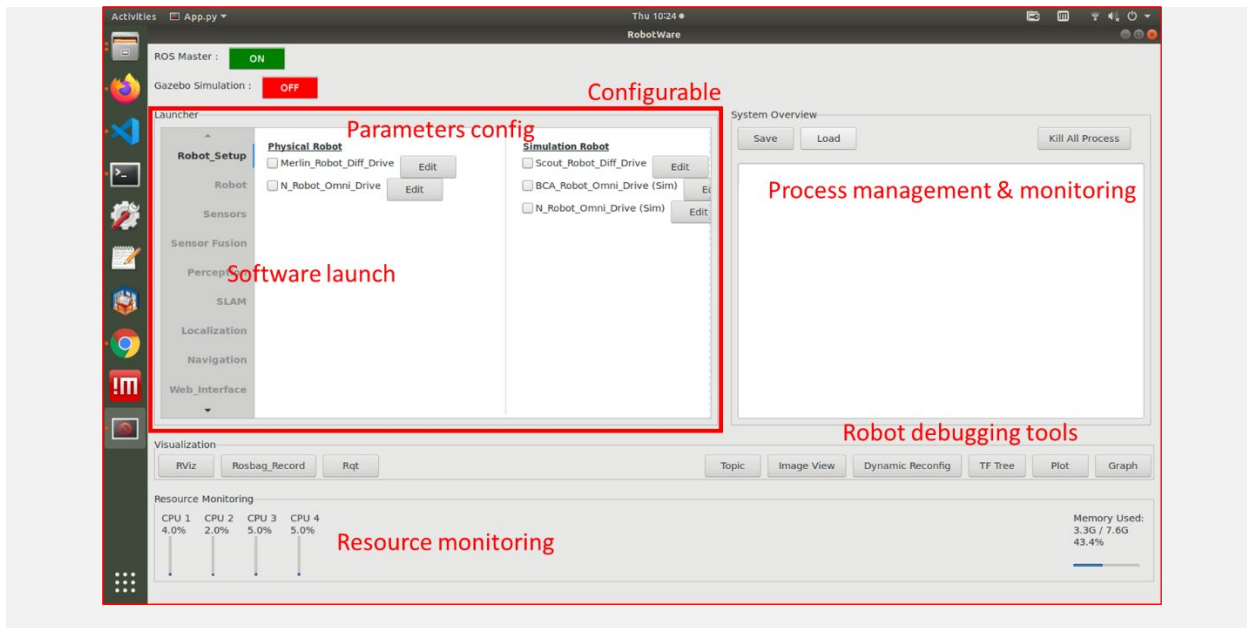
Technology Readiness Level (TRL)

Level 8

Refer to [Annex A](#) - Technology Readiness Level Reference Table for details.

Technical Features & Specifications

- Agile Framework: A software “container” that serves as a launchpad for various autonomous system/ technology software modules, including but not limited to robot/ sensor driver interface, robot platform control module, localization and mapping, navigation and path planning, perception, mission planning, etc.
- Extensible and reconfigurable: *.yaml file configuration
- Process management (spawn and kill) and monitoring in one view
- Resource management: memory usage, CPU loading, etc.
- Dockerized



What does the technology consist of? E.g. Video camera, software algorithm
Who is/are the ideal collaboration partner(s) in the value chain? E.g. medical institutions, device manufacturers

Potential Applications

- Autonomous system/robot development
- Autonomous system software deployment
- Engineering education: Robotics, autonomous system, drone, etc.

In which industry can this technology be deployed? What applications do you foresee that this technology can be applied in? What products can be marketed based on this technology?

Market Potential (Optional)

What is the approximate market size for this technology? What makes this technology attractive to the market?

Unique Value Proposition

Though there is a high demand of autonomous system from different sectors, developers are facing challenges in translating an innovative use case to an autonomous system product. These challenges include prolonged product development cycle (long time-to-market), high product R&D cost, resource-intensive testing and deployment procedure, decoupled user-developer development process, etc.

An agile framework for autonomous system development and deployment has been developed to address these challenges. Essentially, the agile framework is a software “container” that serves as a launchpad for various autonomous system/technology software modules, including robot/ sensor driver interface, platform control, localization and mapping, navigation and path planning, perception, mission planning, etc. The framework is extensible and reconfigurable through yaml file. Developer can reconfigure the framework to deploy it on different autonomous platforms. The software also incorporates a

process management (spawn and kill) tool and allows the developer to monitor the entire autonomous system software in one view.

A resource management tool is also integrated into the framework. Developer can manage run-time resources such as CPU loading, memory usage, etc. The framework is also dockerized and its image can be deployed on any platform seamlessly. A suite of digital twin modelling and simulation tools are also integrated in the stack. These tools are used to model autonomous robot in different simulation environment. For example, developer can spawn an AGV in a simulated factory floor, or an autonomous patrol robot in a simulated shopping mall. This allows developer to quickly evaluate software algorithms without deploying the code on real hardware. This approach saves lots of development time and reduces development risk.

The agile framework allows the developer to quickly bootstrap the development of the autonomous system, valid in simulation and deploy to the real hardware using docker. It's a one-stop solution for autonomous system software development.

*How is this technology an improvement over the current "State-of-the-Art"?
What is the Unique Value Proposition (UVP) in comparison to the current "State-of-the-Art"?*

Technology Categories

Autonomous System

E.g. Chemicals; Electronics; Energy; Environment; Clean Air & Water; Foods; Green Building; Healthcare; Infocomm; Life Sciences; Logistics; Manufacturing; Materials; Personal Care; Waste Management & Recycling

Preferred Business Model:

- R&D Collaboration Licensing IP Acquisition
- Test-Bedding

Ideal Collaboration Partner:

Robotics, Autonomous Vehicle, Software Engineering

1. The Construct: cloud-based solution focusing on robotics education (<https://www.theconstructsim.com/>)
2. Autoware: Similar Concept but focusing on autonomous vehicle (<https://autoware.org/>)

Indicate the top 3 competitors of your technology and describe your UVP over theirs.

Others:

Please provide any additional information about this Tech Offer, or any information that you want to include in the TechInnovation website here.

Please indicate if you would like to pitch this technology at Crowdpitching segment on 1 Nov 2023:

Yes

Annex A: Technology Readiness Level (TRL) Reference Table

TRL	Physical Sciences & Engr	Healthcare (Pharmaceutical)	Healthcare (Medtech)	Healthcare (Diagnostics)	Simplified
1	Basic principles observed	Basic principles observed	Basic principles observed	Basic principles observed	Proof-of-Concept
2	Technology concept formulated	Technology concept formulated	Technology concept formulated	Technology concept formulated	Proof-of-Concept
3	Experimental proof of concept	Experimental proof of concept in vitro and in vivo research models	Experimental proof of concept in vitro and in vivo research models	Experimental proof of concept in vitro	Proof-of-Concept
4	Technology validated in lab	Proof of concept demonstrated in defined laboratory/animal models	Proof of concept demonstrated in defined laboratory/animal models	Analytical validation	Prototype in Lab
5	Technology validated in relevant environment	Non-clinical and pre-clinical research studies, & initial demonstration of feasibility and efficacy	Product Development Plan		
6	Technology demonstrated in relevant environment	Phase 1 clinical trials	Phase 1 clinical trials		
7	System prototype demonstration in operational environment	Phase 2 clinical trials	Clinical safety and effectiveness trials in operational environment	Clinical validation in 1 site	Prototype in Live Environment
8	System complete and qualified	Phase 3 clinical trials	Overall risk-benefit Trials		
9	Actual system proven in operational environment	Pharmaceutical can be distributed or marketed	Medical device can be distributed or marketed	Clinical validation in multi-site	Ready-to-Market

Return to [TRL section](#)