Open-source 3D Robot simulator with web interface helps industries to implement digital twin models.

Summary

Profile type

Technology offer

Company's country

Switzerland

POD reference

TOCH20230411005

Profile status

PUBLISHED

Type of partnership

Research and development cooperation agreement

Commercial agreement with technical assistance

Targeted countries

• World

Contact Person

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Term of validity

11 Apr 2023

10 Apr 2024

Last update

11 Apr 2023

General Information

Short summary

A Swiss company is developing a realistic robot simulator which can be used to simulate various digital twin scenarios involving mobile robots, robotics arms, drones, autonomous vehicles, industrial processes, etc. Sensors and actuators can be modeled, such as cameras, lidars, laser range-finder, etc. Robots are controlled by intelligent programs processing sensor data with AI algorithms. The software is fully open-source, runs on the desktop and features a cloud-based 3D web interface.

Full description

The SME developed the Webots software, an open source and multi-platform desktop application used to simulate robots. It provides a complete development environment to model, program and simulate robots.
It has been designed for a professional use, and it is widely used in industry, education and research. The SME maintains Webots as its main product continuously since 1998. The software was originally developed at EPFL, Lausanne, Switzerland.
Webots can be used to create robot prototypes, develop, test and validate AI and control algorithms, teach robotics to students, etc.
It allows users to design easily complete robotics simulations using the large Webots asset library which includes robots, sensors, actuators, objects and materials. Importing existing CAD models (from Blender or from Universal Robot Description Format - URDF) as well as OpenStreeMap maps is supported. A modern graphical user interface allows users to edit their simulation and robot controllers, saving time in the development of robotics project.
Users can create a wide variety of simulations including two-wheeled table robots, industrial arms, bipeds, multi-legs

robots, modular robots, automobiles, flying drones, autonomous underwater vehicles, tracked robots, aerospace vehicles, etc. They can set-up indoor or outdoor interactive environments. Such digital twin models can be used to create virtual prototypes corresponding to a real system and test various improvements in simulation. If the improvements tested in simulation turn out to provide some benefit, they could be implemented in the real system. The digital twin prototyping approach provides several advantages, including a better communication about the system capabilities, a quicker and cheaper exploration of the possible system improvements and a more efficient development workflow involving continuous integration in the loop.
Technical information
The Webots core is based on the combination of a modern graphical user interface (based on the Qt library), a physics engine (based on a fork of the Open Dynamics Engine - ODE) and an 3D rendering engine based on the OpenGL 3.3 library. It runs on Windows, Linux and macOS. Webots simulations can be exported as movies, interactive HTML scenes or animations or even be streamed to the web in 3D. Robot may be programmed in different languages such as C, C++, Python, Java, MATLAB or ROS with a simple API covering all the basic robotics needs.
Webots offer a web interface demonstrated at https://webots.cloud to run simulations in the cloud, playback 3D animations and showcase scenes and objects.

Advantages and innovations

Thanks to the tools developed by the SME, users can:
1. Benefit from a high quality free and open-source technology to simulate robotics system.
2. Easily export simulations, 3D animations and 3D models to the web for sharing them with colleagues, partners, customers and the wide public.
3. Benefit from the expertise of the Swiss SME which is actively supporting the Webots software and provides consulting and custom developments for its customers.
4. Leverage on the contributions of the Webots user community which is sharing models for robots, sensors, actuators, objects, environments, benchmarks, controller programs, etc.
5. Organize robotics challenges and programming competitions easily from https://webots.cloud/competition

Technical specification or expertise sought

Stage of development

Already on the market

IPR Status

IPR granted

Sustainable Development goals

- **Goal 9: Industry, Innovation and Infrastructure**
- **Goal 4: Quality Education**

Partner Sought

Expected role of the partner

The partner sought should have interest in using a digital twin model of a robotic system in their processes.

The specific area of activity of the partner:
The area of activity of the partner could be any, given there is a need for a digital twin model of a robotic system.

The tasks to be performed by the partner sought:
The partner should define the specifications of the digital twin model, use/integrate the digital twin in their processes and report any feedback about it. There is no need for the partner to buy a license as the software stack is fully open-source. The R&D can be implemented by the partner with the help of the Swiss SME.

Type of partnership

Research and development cooperation agreement

Commercial agreement with technical assistance

Type and size of the partner

- **Big company**
- **University**
- **R&D Institution**
- **SME 50 - 249**
- **SME 11-49**

Dissemination

Technology keywords

- **02001 - Design and Modelling / Prototypes**
- **11005 - Infrastructures for social sciences and humanities**
- **01003016 - Simulation**
- **01003024 - Cloud Technologies**
- **01001001 - Automation, Robotics Control Systems**

Market keywords

- **08002004 - Robotics**
- **02007006 - Other system software**
- **02007023 - Web semantics**
- **02007010 - Education software**
- **02007024 - Programming services/systems engineering**

Targeted countries

- **World**

Sector groups involved

- **Digital**