KUKA

Mobile robotics_**KUKA Navigation Solution**

EN

Autonomous. Intelligent. Hardware-independent.

With KUKA Navigation Solution, we have created an intelligent navigation solution based on SLAM methodology for self-navigating vehicles in the mobile robotics sector. It contains all the components for the autonomous navigation of a vehicle, integrated on a modular basis, including active path detection and software for simultaneously commanding and controlling multiple vehicles in swarms.

_Freely scalable, modular setup

_Autonomous navigation based on SLAM

_Includes fleet management system

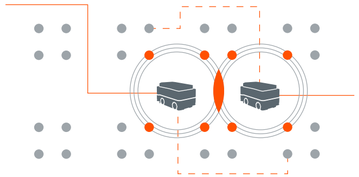
 +   = your solution

Mobile KUKA platform

Nav-Box & navigation software

KUKA Navigation Solution
Maximum autonomy for mobile robots and platforms

Intelligent orientation, positioning, response. KUKA Navigation Solution knows the destination and the best way to get there – every time. It reacts to obstacles and changes in real time, and it manages and coordinates all known vehicles in the system. Its software harmonizes job planning and execution, also interacting with process control systems – fully in line with Industrie 4.0.



Simple, intuitive and graph-based navigation

Autonomous navigation.
KUKA Navigation Solution opens up a wide range of potential applications for mobile robot systems. It enables the fully autonomous motion of mobile platforms – with absolutely no risk of collision and without the need for artificial markings in their environment. The KUKA Navigation Solution software acquires the data of the safety laser scanners and wheel sensors and uses them to create a corresponding map of the surroundings by means of the SLAM method (Simultaneous Localization and Mapping). The platform can then localize itself using this map. The system responds to changes in the environment – which occur frequently in a flexible logistics system. Furthermore, the autonomous path planning has been expanded. Use of virtual paths makes it possible to move the platform exclusively along defined routes. It nonetheless retains its maximum flexibility at all times.

Maximum flexibility and usability.
KUKA offers an Eclipse-based development environment that can be used to program applications in Java. The user-friendly software interface with its short setup times improves usability and simplifies programming. The modular Java API with suitable interfaces for the requirements of mobile robotics allows the integration of third-party software. Thanks to the system architecture of the Nav-Box, existing platform fleets can be simply updated and other platforms can be added to or removed from the existing system.

Hardware-independent software.
The hardware-independent navigation software can be used for different platform kinematic systems. It can handle any motion principles, including holonomic vehicles with Mechanum wheels, such as the KUKA omniMove. Setting of the machine parameters is carried out via a standardized interface. For individual customer requirements, the modular software has suitable interfaces for different user levels. Adaptation of the final application is simplified for system integrators by means of interfaces to the vehicle software and to the programming interface of the application.

±1 mm

Utmost precision.
The KUKA Navigation Solution offers the following options for high-precision positioning of your mobile platform in its environment:

- Fine localization for precise determination of the vehicle position relative to the object or in an environment,
- Fine positioning for increased positioning accuracy,
- CAD-based object recognition and tracking, e.g. for picking up loads.

Freely scalable, modular setup.
With the Nav-Box, KUKA is presenting its navigation solution for fleet management with autonomously navigating vehicles. The combination of industrial PC for installation in an unmanned transport system and the corresponding navigation software adds up to a solution that is as flexible as it is mobile. Additional features, such as “object recognition and tracking” and “relative positioning”, enable coordinated planning and execution of jobs and ensure data consistency between all vehicles.

KUKA Navigation Solution
Technical specifications

Fleet Management

- **Fleet planning, traffic management and job scheduling.** Software on a central computer with interfaces to the logistics and material flow system. Material planning, higher-level planning and scheduling.
- **Vehicle Coordination System (VCS) / programming interface.** Software on a central computer for vehicle management, maintenance, data management and programming. Interface to the individual vehicles.

Vehicle Navigation

- **Mapping**
  Consistency, robustness, scalability and domain independence
- **Localization**
  Robustness and accuracy without adapting the environment
- **Path planning**
  Any level of autonomy, depending on application and customer requirements
- **Object recognition & tracking**
  Navigation relative to the workpiece, safeguarding of logistics process
- **3D sensor interface**
  Sensor data integration for recognition of obstacles to increase machine safety
- **KUKA Nav-Box hardware**
  Standardized industrial PC hardware with software interfaces for independent vehicle operation

Industrie 4.0

Prepared for transformation of the worlds of production

Smart Production, Internet of Things or Industrie 4.0. Even if the names and terms used vary from one country to another, they all share the same goal: the creation of elementary competitive advantages – at both company level and in global competition.

Work on the factory of the future is thus in full swing worldwide. This involves intelligent, networked industrial production and logistics processes on the basis of cyber-physical production systems (CPPS). Or, to put it simply: factories that, by means of advanced networking, respond intelligently to changing tasks and continuously reconfigure themselves. The factory of tomorrow should be able to organize and continuously optimize its production processes, thereby counteracting the consequences of another development: demographic change. New solutions are called for because of falling birth rates and increasingly aged populations in modern industrial societies. Without the “smart factory”, it will be simply impossible to achieve a productivity increase on this scale at the same time as effectively husbanding our existing natural resources.

In order to make new working environments both highly productive and ergonomically beneficial for the labor force, KUKA is developing central key technologies: collaborative robots, mobile assistance systems, autonomously controlled vehicles and intelligently networked automation solutions that support humans in the work setting, easing the workload in a variety of ways.

In collaboration with experts from diverse sectors, KUKA is now already implementing highly flexible, digitized manufacturing processes that will open up new opportunities in a competitive environment and lastingly change the way we work and produce.

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