Jungheinrich Indoor Positioning

Application for IFOY Award 2017

Category Special of the Year

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Management Summary

Industrial trucks are increasingly gaining importance as part of the warehouse information network. In order to save costs and ensure efficient operation of the truck fleets, while simultaneously increasing warehouse safety, many businesses are starting to use digital solutions.
Jungheinrich Indoor Positioning is an intelligent system for the easy localization of forklift trucks inside the warehouse – with low expenses and installation effort. The Indoor Positioning's customer benefit is manifold and ranges from an increase of transparency and safety in the warehouse to a rise in productivity of the entire truck fleet.

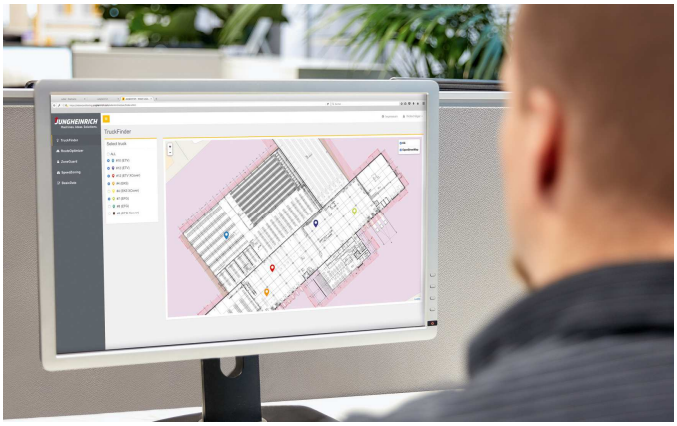

Image 1: User interface of the Jungheinrich Indoor Positioning web application

Position-based reports and analyses of the trucks' movements can be viewed live as well as retrospectively via the web application. For that purpose, each truck is fitted with a smartphone provided by Jungheinrich, which in connection with several Bluetooth transmitters, so-called beacons, that are mounted throughout the warehouse continuously calculates the truck's position and directly sends the data to a server. Via the Indoor Positioning web application, current truck locations can be determined any time, while the collected position data can be analyzed in numerous ways. This not only saves time but also creates a solid basis for the warehouse management to ensure fast decisions and optimum processes in the warehouse.

1. Innovation and Novelty Value

In order to satisfy customer requirements for low installation efforts and small expenses as well as time savings, Jungheinrich Indoor Positioning reliably determines the trucks' positions with a location accuracy of approx. three meters.

Image 2: Visualization of the beacon radio signals in the warehouse.

Indoor Positioning can be used in racking warehouses as well as in warehouse areas utilized for various purposes. In addition, the tool's hardware and software components can be used regardless of truck model or series, in order to digitize and professionalize warehouse logistics processes. In terms of indoor positioning systems, Jungheinrich as well as its competitors already offer various solutions – mainly driver assistance systems or systems for supporting automated or semi-automatic solutions.
In contrast, Indoor Positioning is aimed at a new target group, the warehouse management. Indoor Positioning is intended as a tracking solution, which provides warehouse managers as well as shift and team supervisors or business analysts with comprehensive data and analyses via the web application, enabling them to recognize optimization potential and enhance efficiency as well as safety in the warehouse. This includes: retrieving current truck location

data, optimizing transport routes and warehouse processes, defining speed zones or controlling specific warehouse areas and increasing truck availability.

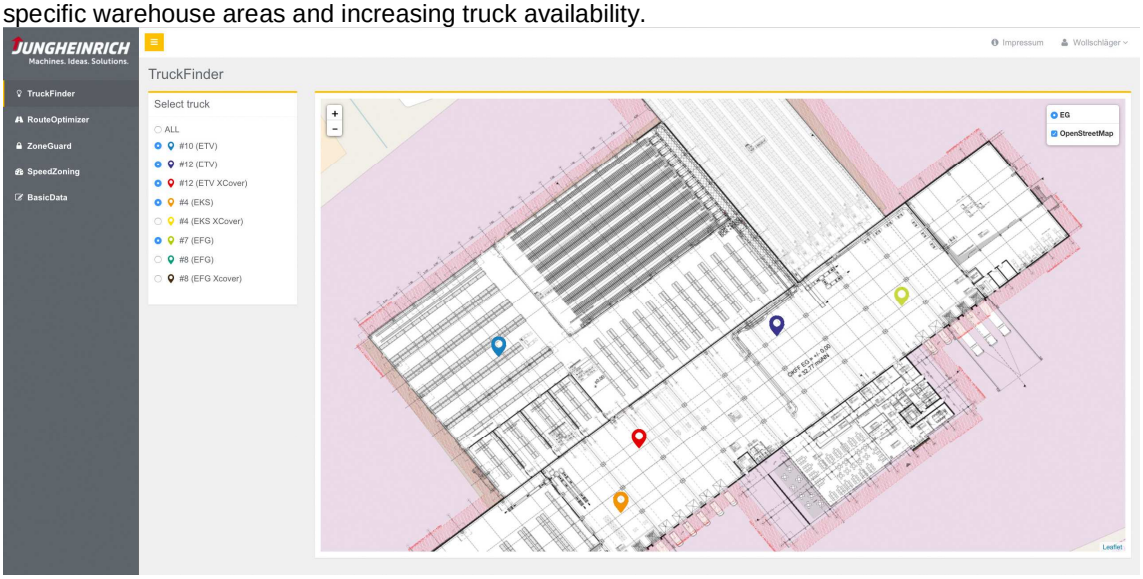

Image 3: Display of current truck position in the web application, module TruckFinder.

For the customer, existing positioning solutions usually involve significant installation efforts and costs, as the utilized technology is expensive and not fit for use for all truck types. By comparison, Jungheinrich Indoor Positioning is a (technically) simple and cost-effective solution for use with any forklift truck type, which merely needs a power supply from the vehicle. Moreover, the Jungheinrich Indoor Positioning's web application comprises additional functions, such as the ZoneGuard for preventing unauthorized truck use, a feature that up to now has not been part of any competing product. This emphasizes the tool's uniqueness.

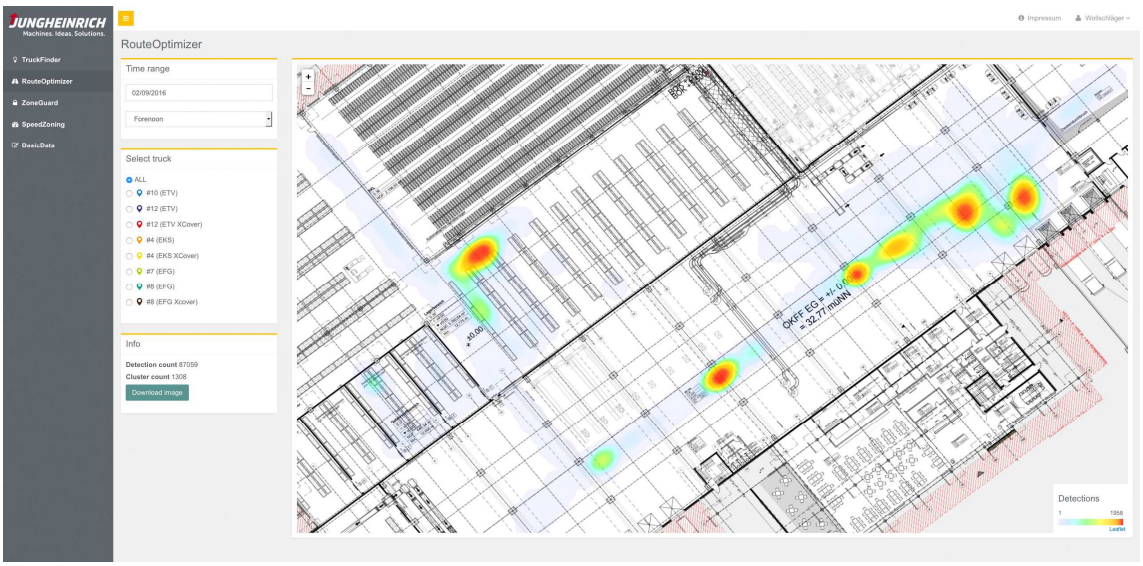

Image 4: Visualization of the trucks' movement inside the warehouse, module RouteOptimizer. The heatmap helps recognize which routes are used by most trucks, thus revealing the potential for optimizing transport routes.

1.1. Indoor Positioning – The Technology

In recent years, many customers have become familiar with positioning solutions in the private domain and increasingly expect to encounter similar solutions in their professional logistics environment. In the

consumer sector, a few indoor positioning solutions already exist that e.g. enable personal navigation at airports or in large shopping centers. In cooperation with Fraunhofer IIS, Jungheinrich adapted and enhanced an existing solution from the consumer sector to create Indoor Positioning.
Jungheinrich Indoor Positioning's technology is based on the awiloc® location technology by the Fraunhofer IIS. With awiloc®, Fraunhofer IIS developed a solution for determining an item's position by using the characteristic field strength distribution of existing wireless networks.

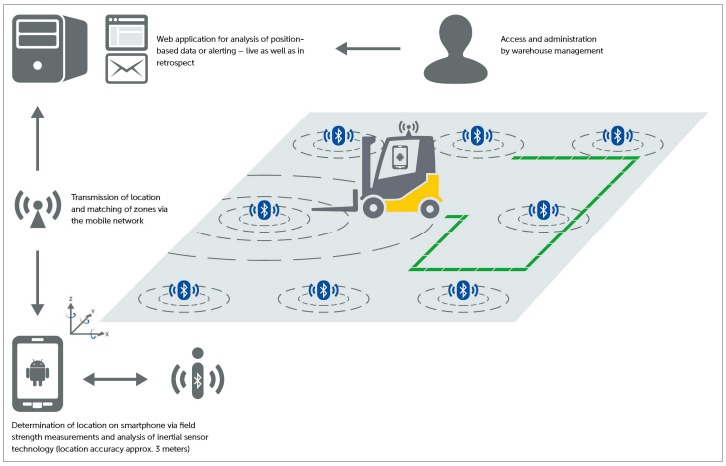

Image 5: Jungheinrich Indoor Positioning – Technological basis and infrastructure.

Mounted on the truck with a special fixture, the smartphones independently determine their location using bluetooth wireless signals. The collected location data is instantly transmitted via the mobile network, so that data can be viewed and analyzed live or retrospectively via the web application. The transmitted data is hosted on Jungheinrich servers and complies with the highest current security standards. This ensures the controlled handling of customer data according to the safety regulations of the German Federal Data Protection Act.

2. Customer Benefit

To meet heterogeneous customer demands, Jungheinrich has defined four use cases, hereinafter called modules, for the Jungheinrich Indoor Positioning system:

Module	Use Case	Customer Benefit	USP
TRUCK FINDER	Large and/or complex warehouse areas (difficult overview of truck locations) Simple localization of trucks	**Time savings:** Fast overview of truck location, e.g. to find trucks or for technical support	Low(er) installation efforts and expenses
ZONE GUARD	Unauthorized truck use in certain warehouse zones and outdoor areas Limited fields of application of certain trucks necessary, e.g. incoming goods, dispatch etc. Danger of frequent misappropriation of trucks, e.g. many inbound and outbound deliveries	**Higher truck availability and lowering of truck loss ratio:** Alerting of unauthorized truck use and prior to truck loss	Central and (short-term) definition of new and adjustment of existing warehouse zones, alert prior to truck loss
ROUTE OPTIMIZER	Missing (visual) overview of routes/processes in the warehouse E.g. for accident prevention through identification of heavily used zones	**Increase of efficiency and safety:** route optimization, improvement of warehouse and customer processes and recognition of potential danger areas	Visualization of movement data
SPEED ZONING	Complex warehouse areas, e.g. many intersections, accident black spots, strong pedestrian traffic, ramps etc. Establishment of (temporary, short-term) speed limits, e.g. across oil, boxes	**Enhancement of warehouse safety and reduction of accident expenses:** Definition of speed zones, display of a warning symbol via smartphone display	Central and (short-term) definition of new and adjustment of existing speed zones

3. Sustainability

By enhancing warehouse efficiency and safety, Jungheinrich Indoor Positioning not only has a direct customer benefit but also supports the sustainable use of the customer's resources. Especially, the module RouteOptimizer contributes to the optimization of routes and the improvement of warehouse and customer processes. In the medium and long-term, it also leads to the more efficient use of resources in the warehouse, e.g. by reducing energy costs and carbon emissions through more efficient material flows. In addition, warehouse safety is enhanced by using SpeedZone. This module prevents accidents, reduces accident expenses and ensures the more effective and sustainable use of resources.

The hardware selection complies with the Jungheinrich environmental regulations, which are part of the internal environment and energy policy that Jungheinrich is committed to. These require, for example, the renunciation of ecologically harmful plastic additives as well as the easy and non-destructive dismantling of wear parts.

4. Marketability of the Solution

The product's future viability and market relevance draws on the continuous customer feedback and the active product development closely oriented at the market. For this reason, universal customer needs were identified, analyzed and divided in comprehensible use cases or modules (TruckFinder, ZoneGuard, RouteOptimizer, SpeedZoning). The key focus of the four modules lies on sustainably relevant analysis and reporting options for permanent and immediate optimization of processes.

In customer operations, these product and market assumptions were confirmed and substantiated. The highly positive customer feedback, especially in regard to the low hardware costs and minimal installation efforts, instigated the approval of serial development and production in the second half of 2016. Conclusively and after consulting with the initial users of the product, the defined modules do not require highly accurate location technology. Instead, Jungheinrich Indoor Positioning focuses on management functions and analysis as well as a cost-effective and simple installation. Among others, the hardware components of the Jungheinrich Indoor Positioning tool are based, as previously described, on existing standard hardware.

Serial product rollout in 2017 is planned for the D-A-CH countries, followed by the international rollout in Europe in 2018. Further product versions and features are already in planning and will be implemented in steps, such as the expansion of analysis and alert functions, truck integration and controlling (via connection to the truck, CAN-Bus) or the data exchange with other Jungheinrich products (e.g. ISM Online) .

During the entire course of the project, the customer demands were the central element of our product strategy, lastingly impacting the development of modules and technical components. Thus, market relevance is ensured by the continuous customer feedback and the active and iterative approach of the entire project.

Indoor Positioning – The unique forklift tracking system by Jungheinrich for more efficiency and safety in the warehouse.