

FiFi Transport Robot: Easy Control by Gestures

Gesture-controlled Transport Vehicle Makes Logistics Work Easy

Scientists of the Karlsruhe Institute of Technology (KIT) developed a transport vehicle for in-house movement which can be controlled by natural gestures: "FiFi" takes in its environment by means of a 3D-camera, follows its operator like a well-trained dog, recognizes gestures, and executes commands. By simplifying goods transport, FiFi makes processes more efficient and work easier for the operators.

Relaxed on-line ordering from one's couch means physical exertion on the part of the mail order company. When the order has been received, a staff member collects the goods ordered by pushing a handcart over distances of up to 25 kilometers a day. "FiFi," the transport robot controlled by

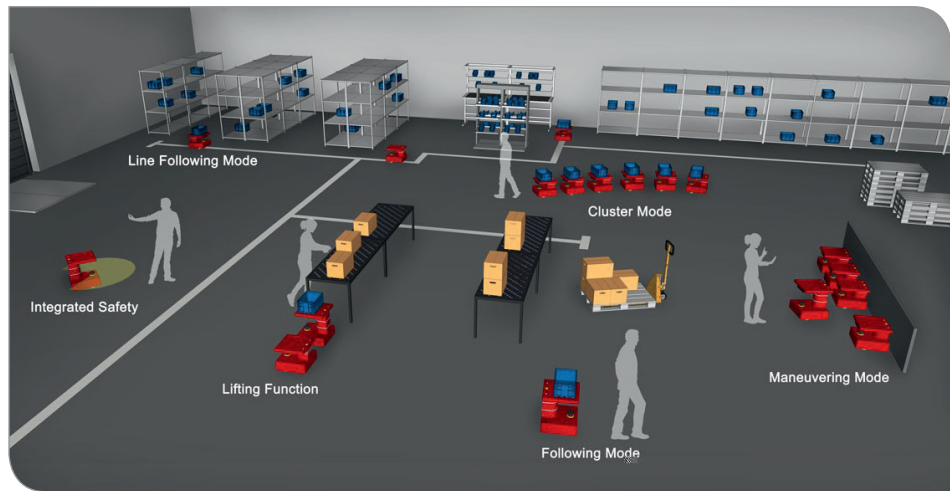
gestures, makes the operator's life easier: A 3D-camera captures the motions and gestures of the operator and converts them into travel movements. FiFi carries heavy loads without touching them and follows the operator like a well-trained dog.

Movements of material and goods within companies are still carried out manually in most cases, such as storage bays for automotive spare parts, on-line dealers of consumer goods, libraries, or deliveries between departments of companies. It is for these intra-logistics processes that scientists of the Institute for Materials Handling and Logistics (IFL) of the KIT developed the FiFi assistance system.



FiFi at work in logistics

FiFi is a driverless electric transport vehicle equipped with a camera system. FiFi has the advantage over conventional solutions of being controlled by natural gestures. In this mode, operators have no direct contact with the vehicle.



Modes of operation and functions of FiFi

In the **tracking mode** it is mainly person recognition which is activated. FiFi follows a moving operator by keeping a constant distance from the person. The operator is free to move without minding FiFi and perform other activities.

The **shunting mode** allows precise positioning, e.g., to load or deliver cargo items. In this case, it is not persons but gestures which are recognized. The hands of the operator serve as a reference.

The **line following mode** can be employed for longer transport distances without any interaction with the operator. When the operator switches FiFi to an optical track, FiFi automatically follows that track by means of a tracking camera.

When transporting larger volumes of goods, several vehicles can simultaneously follow one operator in the **cluster mode**. In this case, the first vehicle follows the operator in the tracking mode while all the next vehicles follow the first one.

The **hybrid mode** is a combination of the tracking mode and the line following mode. FiFi follows the line at a constant distance from the operator.

The **lifting function** allows ergonomic lifting of the crates carried. In this operation, the vehicle is to adapt automatically to the size of the operator. In addition, the operator can position the lift to the desired level by means of a gesture.

Integrated **safety** is necessary because FiFi, as a result of following persons and direct interaction, is continuously in contact with persons.

In principle, FiFi can be used for many processes in in-house logistics – from goods acceptance to assembling consignments, packaging, and goods delivery. FiFi has already proved its capabilities in the pilot mode. The KIT scientists optimized the system together with BÄR Automation for a variety of uses and are currently testing it in industrial plants.

Data and Facts:

- Transport weight:
 - 30 kg (small vehicle),
 - 300 kg (large vehicle)
- Traveling speed: 1.3 m/s
- 3D camera system: Microsoft Kinect

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