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FRAUNHOFER INSTITUTE FOR MATERIAL FLOW AND LOGISTICS IML

LOCATIVE



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LOW COST AUTOMATED GUIDED VEHICLE

The Fraunhofer IML has developed a new prototype of a material handling system - the Low Cost Automated Guided Vehicle »LOCATIVE«. The acquisition costs are very low. The Automated Guided Vehicles are designed according to a modular principle – and not only in the construction various elements can be integrated. Therefore the vehicle is an ideal experimental subject for research and teaching.

The »LOCATIVE« is flexible...

...regarding construction

By means of a self-supporting, simple structured chassis the casing of the »LOCATIVE« can be constructed as an injection molding component or as a deep-drawing component. For the production of the casing of the prototype a Rapid Prototyping process (SLS – Selective Laser Sintering) has been used. The first base class consists of an aluminum-welded construction. It can be replaced by an injection molding component in a next stage. The »LOCATIVE« is equipped with a load handling device with dimensions of 30 x 40 centimeters and therefore it is designed for small load carriers. Since the components of the AGV are replaceable, base plates of different sizes can be installed.

...regarding movement

The drive concept is based on a so called tricycle kinematics with differential drive and an oscillating axle with castor wheels, which ensures a permanent road-contact of the driving wheels and the castor wheels.

Furthermore, in addition to the straight line and the cornering, a rotation around the center of the drive axle is possible.

...regarding control

Controlled by a 32-Bit-Microcontroller, the LOCATIVE can cope with all simple transportation assignments of the Cellular Facility Logistics.

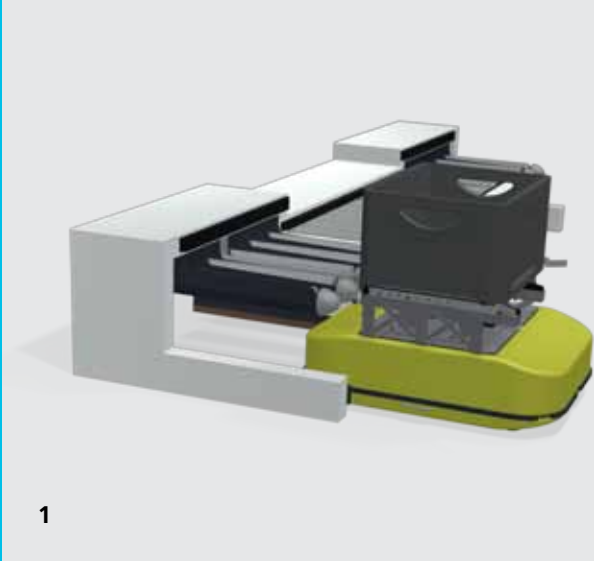
Infrared-sensors measure the distance to objects of the environment and as a result collisions are avoided. The control is expandable and operates both with and without a real-time operating system.

...regarding communication

The communication can be realized by means of extension modules through various wireless connections. From Wi-Fi over to Bluetooth till ZigBee – based on all conceivable architectures (Star, Tree or Mesh).

...regarding navigation

Its robust optical system enables the Automated Guided Vehicle to follow the guideline whose color is contrasting to the environment; nevertheless other navigation and positioning systems can be connected, too – by bus or by means of digital or analog input and output modules.



...regarding energy supply

The »LOCATIVE« offers the advantage that it can use different accumulators as energy source: Lithium-Polymer (LiPo), Lithium-Iron-Phosphate (LiFePO₄), lead-gel-accumulators or double-layer capacitors (UltraCaps or PowerCaps) can be integrated in the vehicle depending on the period of use, the idle time and the charging cycles. According to requirements, opportunity charges at the working stations with rapid-charging systems or an economic charge over the night can be undertaken.

1 LOCATIVE – Low Cost Automated Guided Vehicle

2 LOCATIVE with the installed Kamm-LCD-load carrying device of the Fraunhofer IML and a bin.

...regarding the use

The »LOCATIVE« is especially suitable for low or average distances. The high flexibility of its construction makes it adaptable to the different operational processes as well – and therefore interesting for an industrial use. As a consequence it can for example supply production and assembly workstations. The simple track guiding systems enable fast changes in topology and offer in this way additionally a high flexibility regarding the order of machines and workstations.

Nevertheless the vehicle should mainly serve the research: The low acquisition costs allow scientific organizations and developers of Automated Guided Transport Systems to acquire a multitude of the vehicles – and consequently to explore the field of Cellular Facility Logistics economically.

Technical data of the prototype

- Max. of 12 kg payload
- Up to 1 m/s driving speed
- Differential drive with brushless DC-motors and 4Q motor controller
- 15 Ah/384 Wh lithium phosphate iron accumulator
- Efficient 32-Bit microcontroller
- Freely programmable input and output components
- Optical tracking
- Analog IR-laser distance sensors

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