

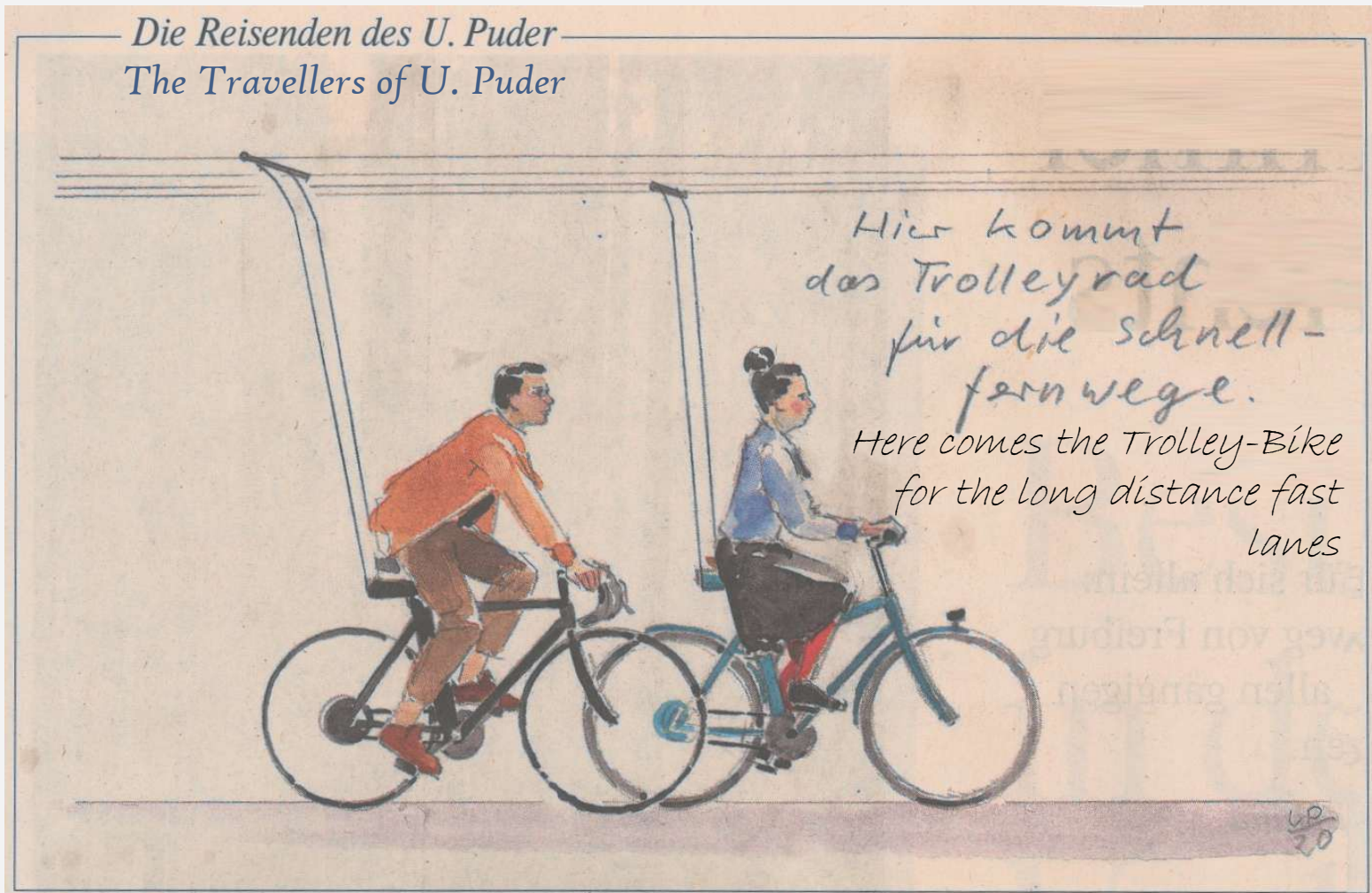
LATEST RESULTS OF AUTOMATED RECONTACTING TECHNOLOGY

Recontacting to the overhead wires „everywhere“

Dr. Jan Messerschmidt, LibroDuct GmbH & Co. KG

Thursday, November 12, 2020

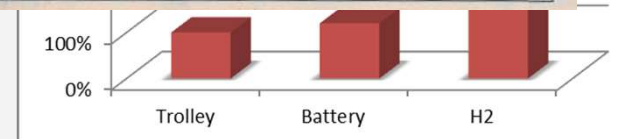
CHALLENGE 2050



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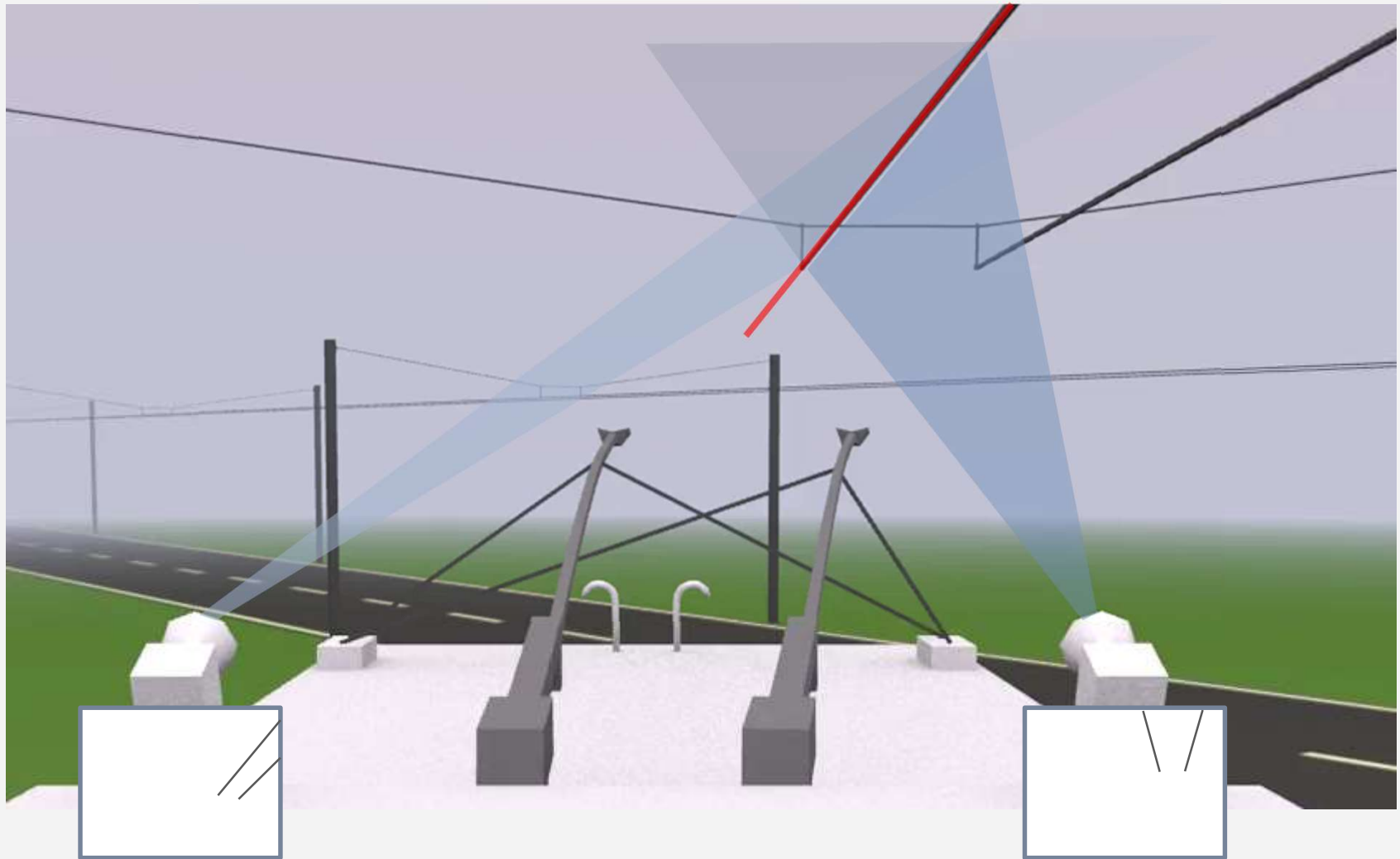


WHAT IS THE LIBRODUCT APPROACH?

- Automatic recontacting of the trolley poles to the overhead wires
- During stand still (current state) and while in motion (our vision)
- Recontacting everywhere
 - even when the bus is not in line with the overhead wires
 - without funnels or any special infrastructure.



STEREO OPTICAL PATTERN RECOGNITION



ELECTRIC BUSES (EBUS) IN PUBLIC TRANSPORT

- **(Hybrid) motor buses**
 - ➖ Dependency on fossil fuels
- **Hydrogen-powered buses**
 - ➖ Cost, storage/transport issues

- **Battery-powered buses**

- ➕ Recharging during operation

- **Trolley buses**

- ➕ Flexibility



FEATURES OF LibroDuct

- Conventional trolleybus pole and wire
- Flexibility / cost reduction (trolleybuses)
- Just-in-time conductive recharging (battery buses)
- Partial catenary (e.g. only at bus stops and steep inclines)
- Fully automatic disconnecting from and reconnection to the overhead wires at stops and during travel without driver interaction
- Innovative control system (international patents)
 - ✓ Stereo-optical pattern recognition
 - ✓ Target tracking
 - ✓ Energy management.



CHALLENGES

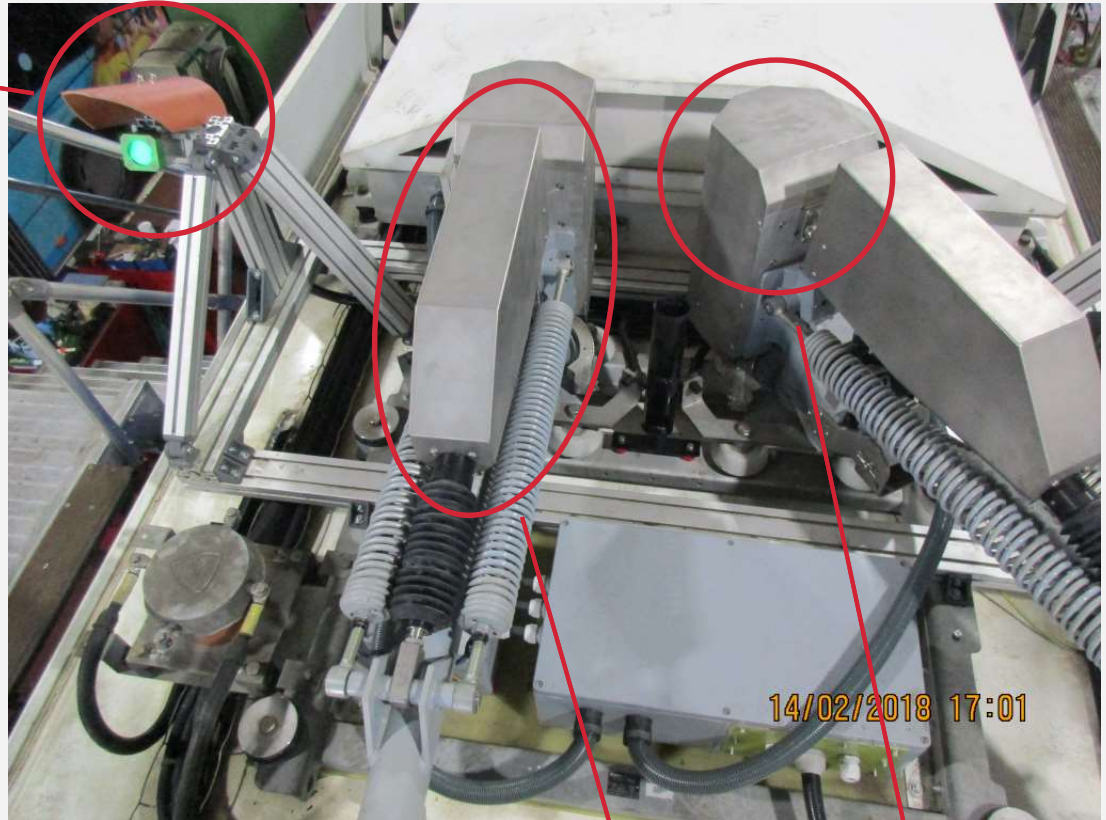
- Pattern recognition
 - Overhead wires
 - Poles and contact shoes
- Movement of the rods
- Control
 - Compensation of the positioning errors
 - Vibration behavior
- IT integration
 - GUI
 - Interfaces to “external” systems
 - Other communication
 - Resilience
- ...



 **LibroD**®

WINGED SHOES AND OTHER COMPONENTS

Camera



Rotation Actuator

Elevation Actuator



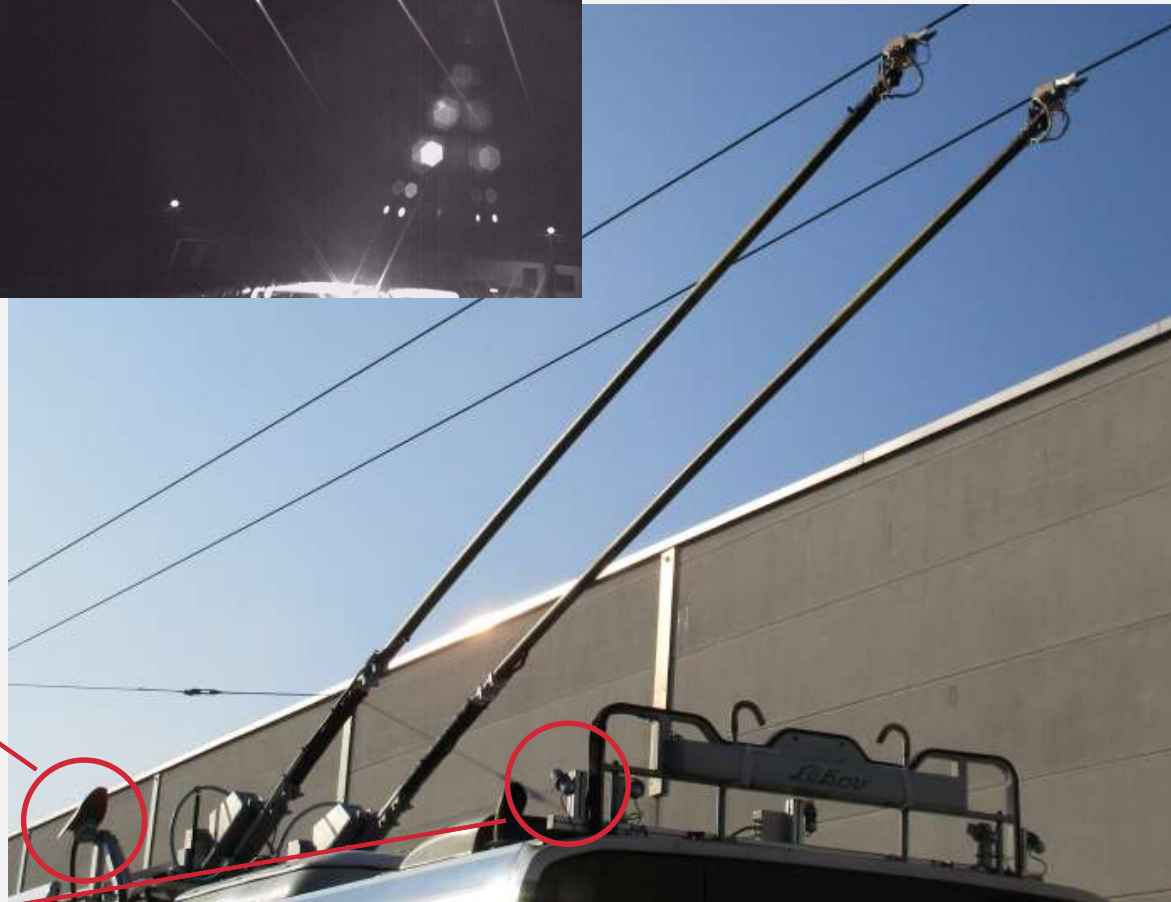
OPTICAL RECOGNITION



At Night

Camera

Light



TESTS IN EBERSWALDE 2018/SZEGED 2019



- First real-life tests
- The software works as expected
- The hardware still had to be improved

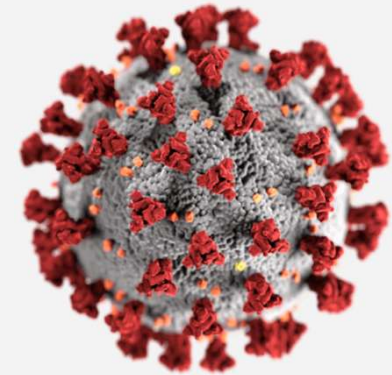


LIBRODUCT IN PRACTICAL TEST USE

Connecting to the overhead wires is
done with pushbutton ease

TESTS / DEMONSTRATIONS IN 2020

- Planned were Eberswalde and Solingen
- Due to the pandemic postponed to 2021
- Now with our equipment on a trailer
- For immediate demonstration in your network



BENEFITS OF LibroDuct

- Enhanced flexibility
 - ✓ Expanded area of operation
 - ✓ Improved aesthetic appeal
 - ✓ Unlimited operation times
- Proven and tested components
- Cost reduction
 - ✓ No wire switches (“frogs”) / crossings / slip funnels
 - ✓ Commonly used wires across lanes
 - ✓ Reduced wear & tear
 - ✓ Smaller battery capacity
- Enhanced comfort and safety.



Thank you for your attention!





LibroDuct GmbH & Co. KG

Pascalschacht 1
66125 Saarbrücken
Deutschland

Telefon: +49 (6897) 935-0
Telefax: +49 (6897) 935-100
Web: www.libroduct.com
E-Mail: ebus@libroduct.com

