

Tech-Arena for Young Ideas:

**ENHANCED FLEXIBILITY BY FULLY
AUTOMATIC RECONTACTING
TO THE OVERHEAD WIRE**

Software Beats Hardware - the LibroDuct System

Dr. Jan Messerschmidt, LibroDuct GmbH & Co. KG

Szeged 40 year anniversary conference, 29 April 2019

IDEA: FLEXIBILITY THANKS TO AUTOMATED WIRE CONTACTING AND DISENGAGEMENT



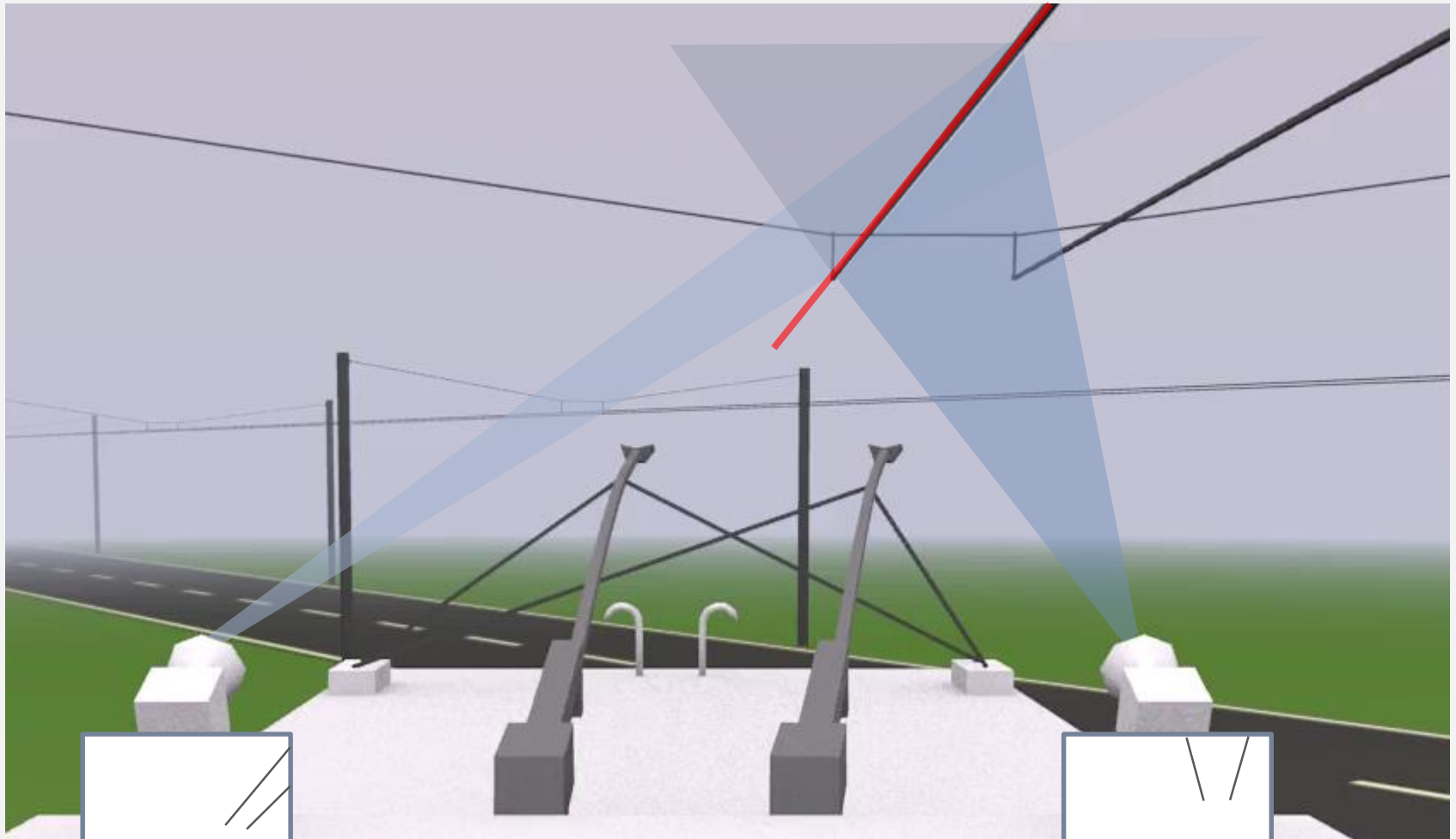
**Only 1 set of overhead wires,
even with oncoming traffic**

IDEA: FLEXIBILITY THANKS TO AUTOMATED WIRE CONTACTING AND DISENGAGEMENT



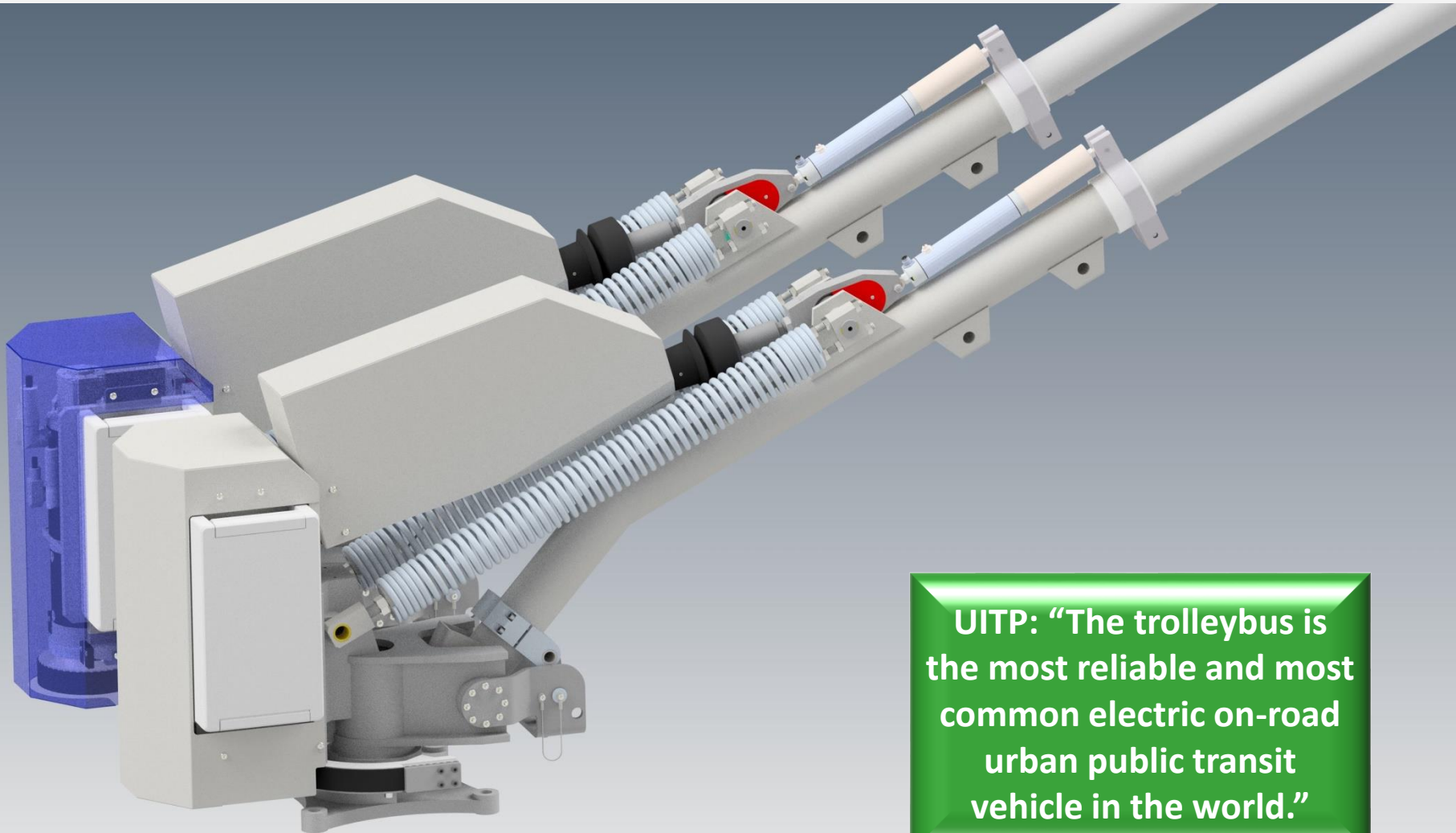
Turnoff – no switch

STEREO-OPTICAL PATTERN RECOGNITION



Wires as seen by the two cameras

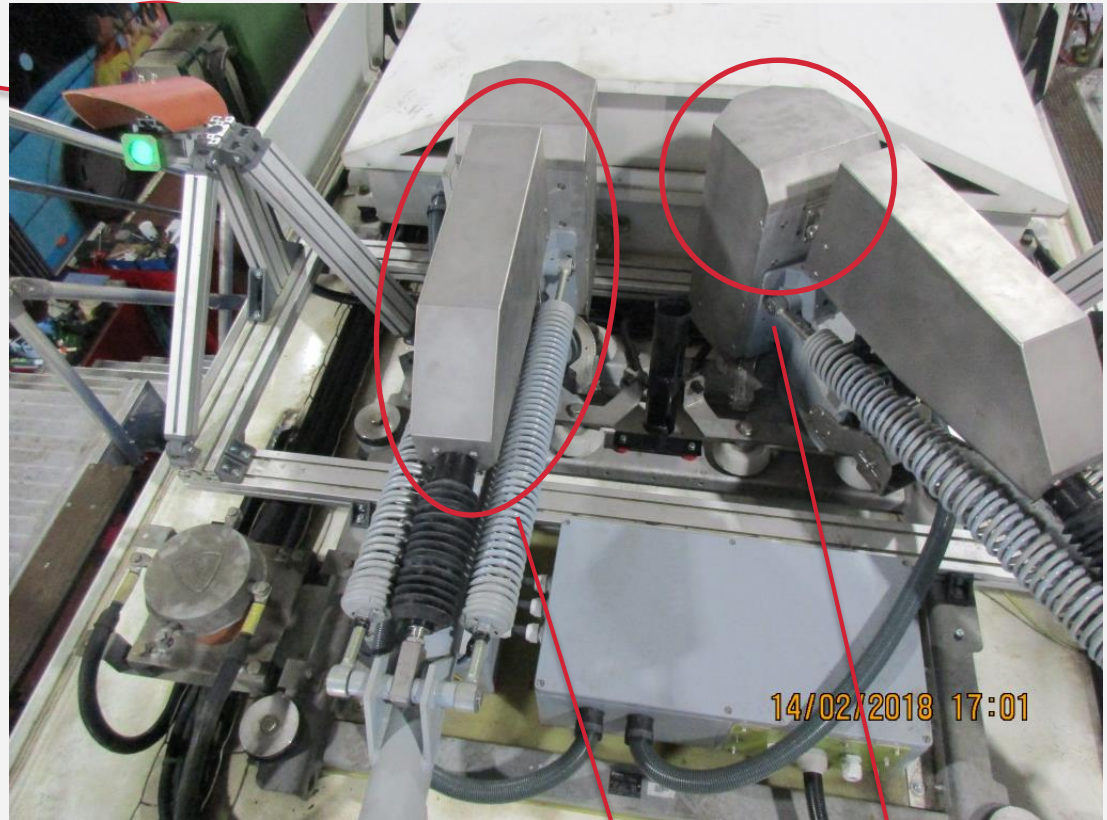
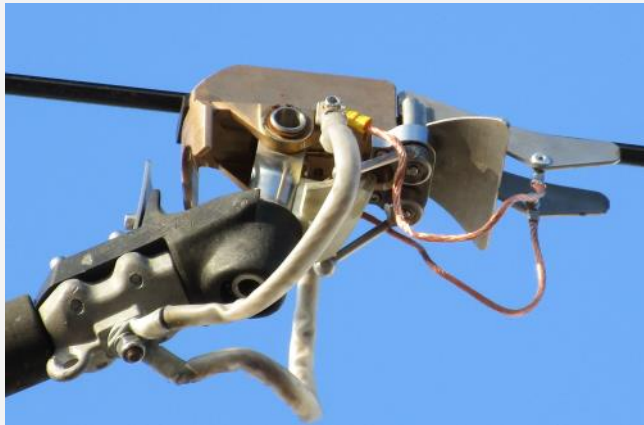
ACTUATOR / SENSOR BASE UNITS



UITP: "The trolleybus is the most reliable and most common electric on-road urban public transit vehicle in the world."

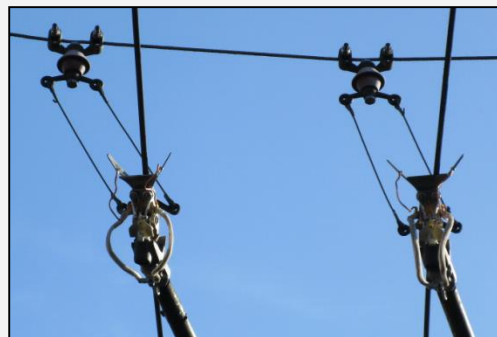
WINGED SHOES AND OTHER COMPONENTS

Camera



Rotation Actuator

Elevation Actuator



OPTICAL PATTERN RECOGNITION



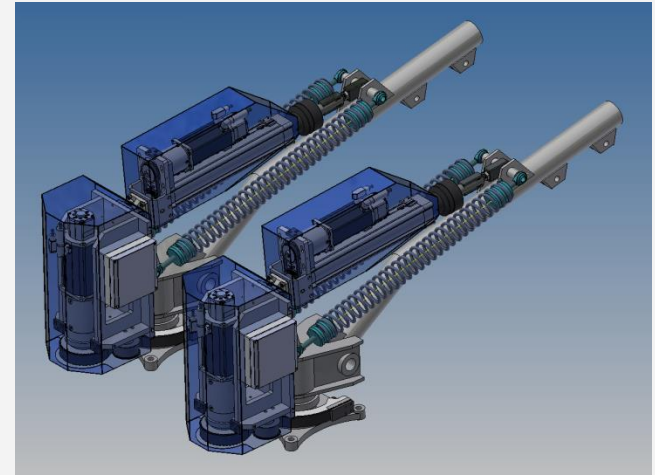
At Night

Camera

Spotlights

ADVANTAGES BY LibroDuct

- More Flexibility
 - ✓ Expanded range of use
 - ✓ More attractive visual appearance
 - ✓ Unlimited action time
- Proven Components
- Cost reduction
 - ✓ No switches / crossings / funnels
 - ✓ Commonly used overhead wires
 - ✓ Substantially less wear
 - ✓ Significantly less battery capacity required
- Increased convenience and safety.



Sponsored by:

trolley:2.0
for smart cities
trolley:motion
urban e-mobility

LibroDuct **IN COMPARISION**

- Proven, vendor-independent (hardware) components
- Conductive technique
 - Minimal loss of efficiency
 - No electro smog
 - No complex civil and underground engineering works needed
- In catenary mode no “detour” thanks to battery
 - Total efficiency gain of 10-40%
 - Improved ecological balance
 - Better economy
- Recontacting at bus stops and en route
 - Reduction of the stop time
 - No restricted operation

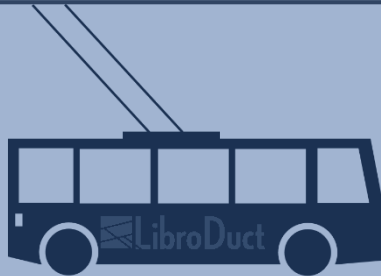
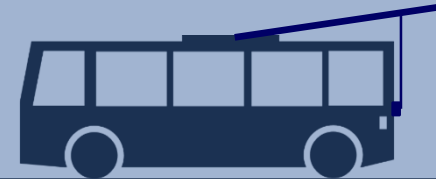


“ The trolleybus: the most efficient electric heavy duty public transit vehicle available today” (UITP 2015).

- Reduced infrastructure (costs)
 - No switches (“frogs”) and crossings
 - No slip funnels (“rooftops”)
 - Single lane guidance
 - Enables historical sites to be preserved thanks to battery operation
 - Ditto reversing track loops
- Generally simpler wire routing
- Recontact “anywhere”
- Better utilization of overhead lines
- Improved protection against dewireing
 - ⇒ More safety for driver and passengers



... vs. Conventional Trolleybus

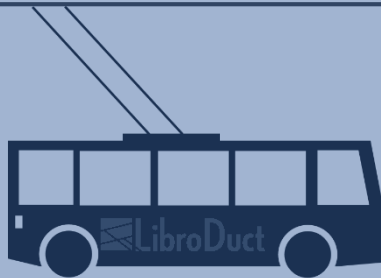
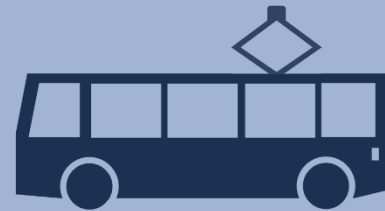


«We need from the Industry automatic trolleybus reconnection without „rooftops”».
(Dr. Zoltán Ádám Németh, SZKT, 22.11.18)

- No exact positioning required at bus stop
- Higher charging current depending on technology (up to 500 kW)
 - ⇒ Shorter residence time
- Proven components from multiple manufacturers
- Electrification of entire segments, e.g.
 - Uphill / downhill
 - High-frequency sections
 - ⇒ Longer contact time, no operating restrictions
- Full acceleration capacity enabled by overhead line at bus stops
- Smaller battery capacity required (space, weight, money savings)
- Higher efficiency ⇒ better economy / greener
- Recuperation energy completely usable.

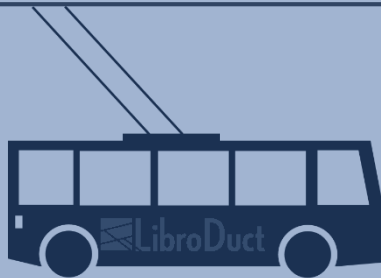
**Dynamic
Charging –
In Motion
Charging (IMC)**

... vs. Opportunity Charging E-Bus



- Significantly smaller battery capacity required
 - Space, weight, money savings
- Higher efficiency
- Proven components from multiple manufacturers
- Electrical heating also featured
- Able to tackle demanding topographies
- Electric power consumption distributed over day
 - ⇒ Less demand (charge).

... vs. Depot Charging E-Bus





**Contacting
at bus stops**



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