TECHNOLOGY OFFER

Adaptive Zero Power Gravity Compensation for Magnetic Levitation Systems

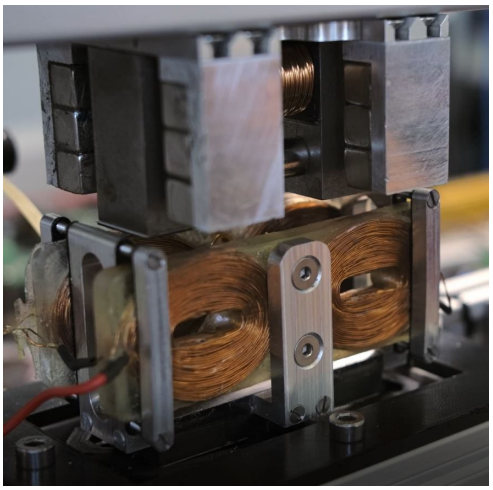
Many high precision machining and measurement applications require freely levitating samples or stages to minimize the influence of environmental vibrations and friction. We have developed a technology that enables high-tech gravity compensation systems being compact and adaptive with respect to varying effective load masses, offset positions and system orientations while having zero static power consumption.

BACKGROUND

State of the art gravity compensation systems are designed for static operation and predefined load masses. Passive systems are typically bulky and require significant infrastructure expenditures, such as compressed air supplies, or rely on passive permanent magnet assemblies. Active systems with adjustable levitation currents provide more flexibility but they have a high static power consumption and heat dissipation due to required offset currents, especially in the case of large masses. The use of permanent magnets can provide an offset force and enable a reduction of the power consumption, but the load and position are fixed, which is a limitation for many high precision machining and measurement applications.

TECHNOLOGY

The developed technology enables high-tech gravity compensation systems that overcome the disadvantages of existing systems. They are compact and adaptive with respect to varying effective load masses, while having zero static power con-sumption. The core of the invention is centered around an electropermanent magnet, which is combined with electromagnetic actuators that stabilize variable loads in desired positions. An automated adaptation of the generated offset force, enables dynamic changes of the load mass and position, while maintaining a static power consumption of zero.



Combining the advantages of electromagnetic levitation and adaptable electropermanent magnets, the invention is applicable for advanced vibration isolation systems and a wide range of precision positioning, machining and measurement applications.

ADVANTAGES

- Adaptive gravity compensation
- Zero static power consumption
- Automated tuning mechanism for varying loads and positions
- Compact design and scalability regarding load mass and positioning range
- High actuator force density

REFERENCE:
M035/2021

DEVELOPMENT STATUS:
Prototype setup available
TRL = 4

APPLICATIONS:
Magnetic levitation systems / bearing systems / vibration isolation systems / robot end effectors / high-precision scanners and positioners

KEYWORDS:
Electro-magnetic levitation; gravity compensation; electro-permanent magnets

IPR:
AT patent pending

OPTIONS:
R&D cooperation, Development partnership, License agreement

INVENTORS:
WERTJANZ Daniel
PECHHACKER Alexander
SCHITTER Georg
CSENCSICS Ernst

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CONTACT:

Angelika Valenta
TU Wien
Research and Transfer Support
T: +43.1.58801.41538

www.rt.tuwien.ac.at