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The functionality assessment of geodetic monitoring systems for analyzing structural elements

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Report on the project:

„The intelligent monitoring system of hazardous objects based on the automatic non-invasive measurements – IMSGeo" (POIR.01.01.01-00-0942/21)

Fundusze Europejskie Inteligentny Rozwój
Rzeczpospolita Polska
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Project achievements:

- A monitoring system automatically applying appropriate mathematical models for measuring displacements
- Possibility of using total stations from all leading manufacturers

The project scope

- **developing a universal, complementary solution for structural monitoring** based on the achievements of Warsaw University of Technology and Geoalpin Company (R&D department),
- **optimization, improvement, and verification** of the data processing technologies,
- **extension of possible surveying applications** using a reflectorless mode, and thus the implementation of surface scanning tools for structural monitoring,
- **creating a secure and reliable data visualization WEB-located platform** on the servers governed by Geoalpin, which is both a system controlling tool and data transmission module for a client using mobile, intuitive apps,
- **offering** a cheaper, more accurate, versatile, faster, and more straightforward **system for on-site using**

The main assumptions:

- The ability to work remotely with the newly designed system (cloud work) using mobile interfaces.
- The possibility of integrating automatic displacement measurements performed with physical sensors (physical monitoring, also called SHM – *Structural Health Monitoring*).
- Possibility of handling automatic measurements with geodetic instruments (robotic total stations, GNSS receivers).
- The ability to operate instruments from different manufacturers.
- Possibility of using reflectorless measurement technology (in the case of electronic total stations).
- Data adjustment prospects.

The main work packages:

- **Managing the instrumental issues** (construction of the recorder), including designing, programming, and **testing** the possibility of using **instruments from different manufacturers**.
- **Inventing and choosing data processing algorithms** adequate for tasks and implementations (multi-variant simulations including Monte Carlo, various adjustment models, and data validation procedures).
- **Developing a methodology** for integrating measurements using advanced numerical methods.
- **Examining the developed approach** on test objects (test field located in Łódź, Poland)

Answersing questions:

- Does the reduction of calculation capacity compensate for the high accuracy requirements for the network structure?
- What is the calculation method's impact on assessing the accuracy of the designated displacements?

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Thank you for listening

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