



XXVII FIG CONGRESS

11-15 SEPTEMBER 2022

Warsaw, Poland

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The automation of deflection measurements of engineering objects using a physical pendulum and mono photogrammetry

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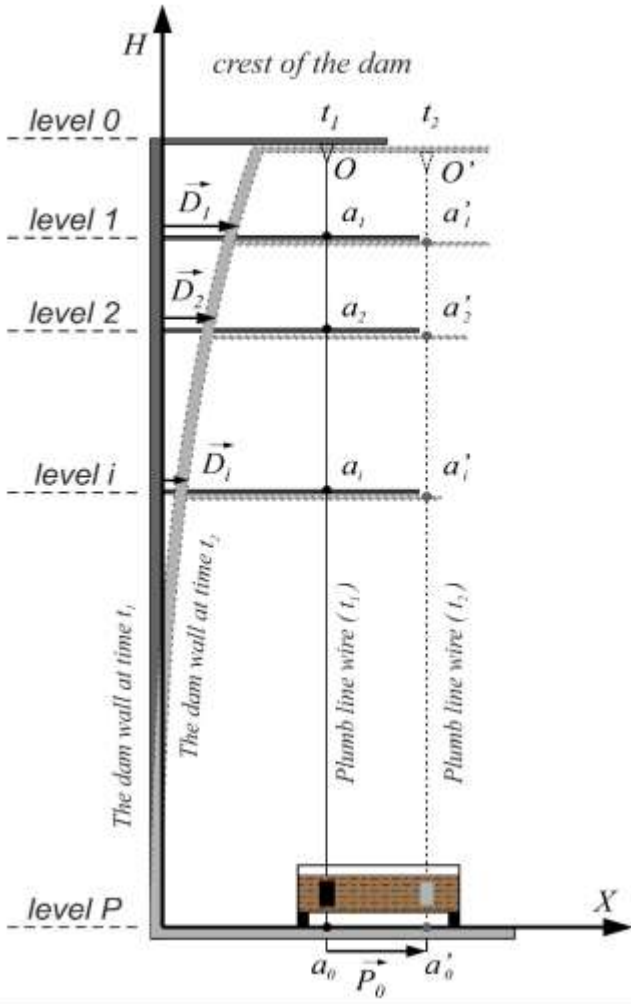
Project scope

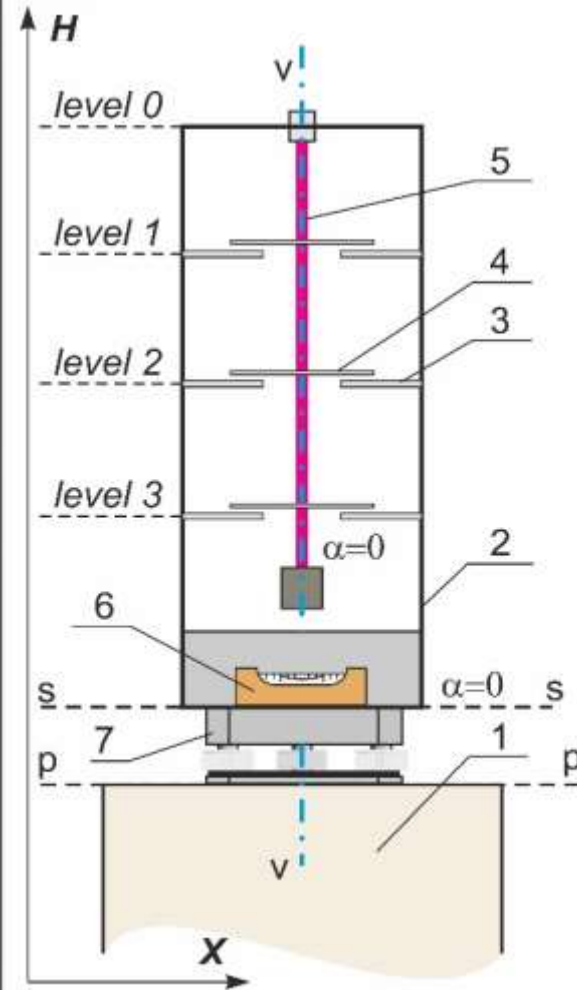


- The presentation demonstrates a **new designed instrument**, allowing for automatically registering changes in the object verticality.
- The main working principle relies on an **electronic camera recording** an image of the reference signals projected onto target plates attached to the instrument's structure.
- The evaluation of the results is based on the **image processing with any possible angle of inclination** relative to the reference plane using the principles of projective geometry commonly known in photogrammetry.

System assumptions

- The central element of the mechanical plumb is a string made of, e.g., stainless steel equipped with a weight adapted to its length and placed in a container filled with liquid
- Observations of the wire positions expressed in the X and Y directions are carried out using reading microscopes placed on unique supports perpendicular to each other
- The plumb is fixed at the hanging point, and the measuring tables are attached to the dam wall structure at certain levels
- Readings of the initial and current position of the vertical wire at individual observation levels are made with a telescope coupled with a micrometric division



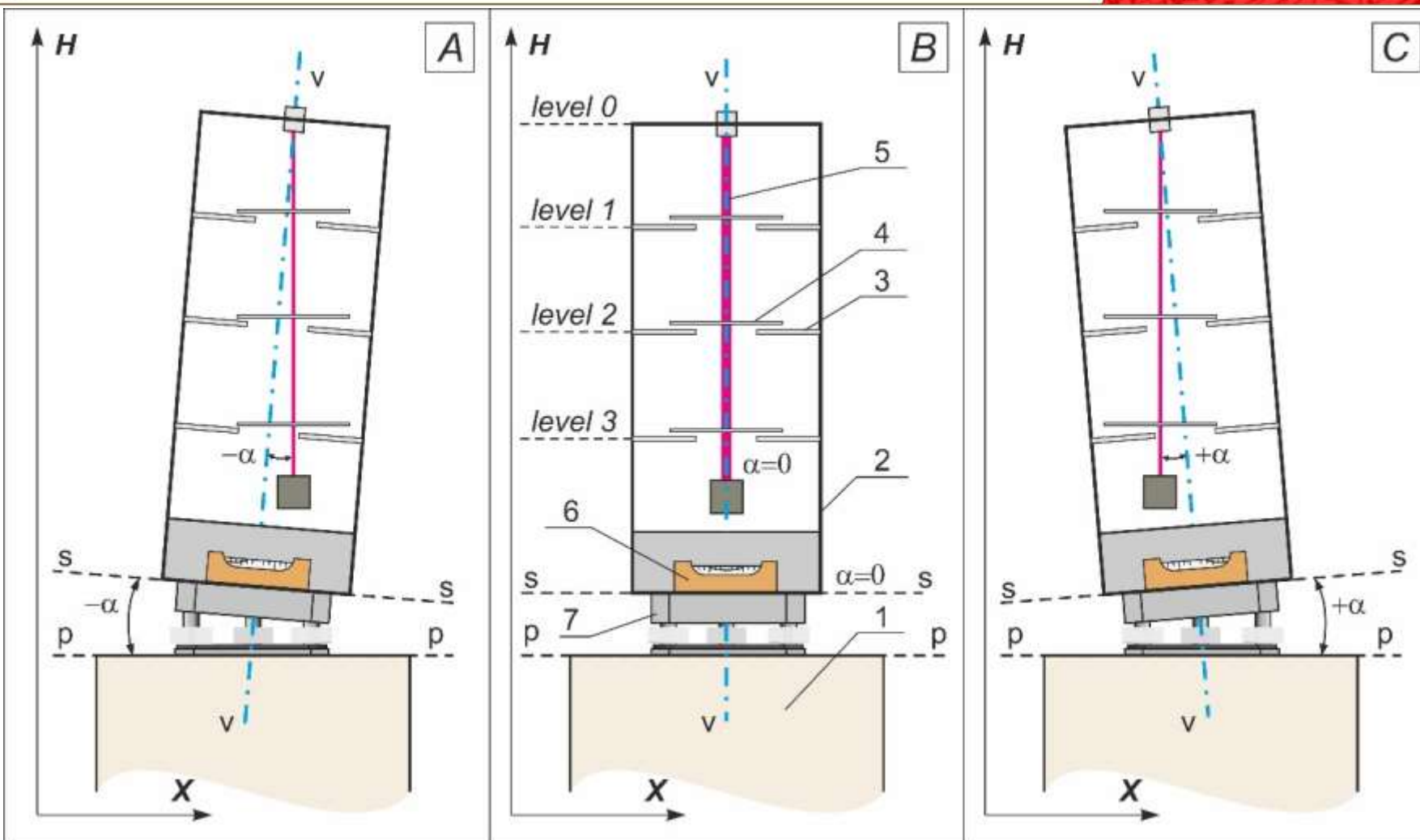


System elements

1. Test pillar
2. Model of the measuring shaft
3. Reference plate (reading table)
4. Control table (moving, attached to the vertical)
5. Mechanic plumb (strain)
6. Observation tabular level
7. Tribrach

Working principle

Preset angular
inclination with
a machine level
 $\alpha=0.05$ mm/m



Conclusions

- Mean measurement error of the model deflection ± 0.01 mm.
- Due to its relatively simple design and high offered accuracy, it can be widely used wherever there is a need for automated monitoring of structures in the low-cost version.





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Thank you for listening

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Please address your comments and questions to:

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