

Activities of surveillance for regarding the behaviour of hydraulic structures with GRID technologies

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Abstract

The papers aims to develop a modern national informatic system concerning the evaluation and verification of construction technologies regarding the monitoring of behaviour of the hydraulic structures of major importance in Romania. This papers proposes the transfer of GRID and other IT & C technologies (databases, VPN communication) to activities of surveillance regarding the behaviour of hydraulic structures with GRID technologies. Using last hour IT&C technologies, the goal will be creation of a decision support system able to lead to reduction of risk and mitigation of consequences of natural disasters and accidents, system that will supply, in need, in a rapid manner, scenarios to be followed. This decision support system, unitary at national level, will facilitate the conservation and sustainable management of the natural and artificial resources (more precisely of the works of major importance of Romania) and the decrease of risk during natural catastrophes. This papers is an answer to the society challenges and not only.

1. Introduction

In Romania there are preoccupations regarding the proposed theme of the paper. There is data stored in various formats, usually on magnetic support, locally, and on paper. However, there is no unitary system for storage, complex processing, and exploitation of information.

Around the world there are various functional and well organized systems that respond to the current requirements of the society.

This paper proposes that based on the international experience, as well as that accumulated by the authors in various projects, to create such a unitary, flexible,

easy to exploit, thus efficient system in Romania as well.

The paper proposes the transfer of GRID and other IT&C technologies (databases, VPN communications), into the integrated system for the surveillance of the behavior of hydraulic structures in order to increase the permanent research and development capacity of the information system.

The paper proposes the creation of a virtual organization for the integrated management and the processing of data regarding the behavior of hydraulic structures in Romania, an organization that would comprise of local, regional, national administrative institutions, while at the same time, creating a data communication network over RoEduNet (the communication network for the national education system).

The proposal for implementing GRID technologies appears due to the fact that sending, processing large amounts of data (in order of terabytes or petabytes) needs a large calculation and storage effort, and the answer of the system in warning or alert situations must be quick.

In fact, it may be said without exaggeration that the paper proposes the creation of a decision support system that will contribute to the rapid solving of accident or incident situations.

The development of GRID technologies in various areas is a current preoccupation in the European research arena and a high priority theme in FP7. This paper is well framed within these preoccupations.

The building of a virtual research organization is not an international first, this leading to a better management of knowledge and a better sharing of information.

To our knowledge there is no other ongoing research in Romania for implementing GRID technologies in the surveillance of hydraulic structures.

The development of a virtual research platform that uses GRID technologies in this area represents a viable solution for solving data processing and storage problems.

The beneficiaries of an eventual project proposed by this paper will be the research centers, administrative institutions as well as the public.

2. The objectives proposed by the paper

A. The creation of an informatics system for the surveillance of the behavior of hydraulic structures of major importance within Romania.

A.1. The acquisition of necessary information in order to prevent incidents, accidents, and cessions at hydraulic structures:

- in real time;
- with rapid primary and secondary processing;
- the identification of risk situations with warning and alert levels;
- allows for the quick mobilization for intervention.

A.2. Continuous monitoring and archiving of visual observation accounts and of measurements.

A.3. Contributions to the amelioration of design processes, construction processes (execution) and exploitation instructions.

B.1. The development of a virtual environmental research platform, the usage of GRID technologies, several IT&C technologies (database management systems, VPN communications) with the purposes of:

- a) applying the concept of local (within the county), regional and national sustainable development;
- b) creating real time warning systems that lead to more efficient risk management and proper coping with catastrophes.

B.2. The creation of a pilot station for the virtual organization and of a communications network that insures the connection among the interested organizations from the data and information transfer viewpoint.

B.3. The creation of a GRID node for the transfer and processing of measured data, as well as the implementation of the necessary afferent technologies.

B.4. The integration of GRID and other IT&C technologies within an informatics decision support system for preventing disasters.

3. The necessity of creating the project proposed by the paper

A justification may be considered for the proposed project. It's about the creation of a research and educational platform. Comparative studies can be done regarding the technologies and the methodologies used over time in the surveillance of hydraulic structures. There is, however, a pragmatic justification, that being the fact that the cost of the project is insignificant compared to eventual damage that may be foreseen and thus avoided after natural and/or artificial calamities.

Considering the international statistics, a very large catastrophe (the breaking of a dam) happens once a century. Such a catastrophe though brings with it immense damage

With the aid of this informatics platform the anticipation probabilities will be increased for timely emptying, operative measures (such as the timely evacuation of inhabitants, goods and animals). At a social level this is of great importance.

A permanent surveillance of a hydraulic structure during exploitation with the aid of this system will lead to a reduction damage risk through preventive measures and to a reduction in response times in case of emergency.

The goals will be:

- the combination of information afferent to the structure with the hydrological prognosis for measures regarding the preparation and verification of equipments;
- the unitary definition of the attention and alert stages, resulting in the rapid decision possibility within the informatics system with on-line connections going as far as the ministry;
- automated entry into degradation analyses of the evolution of certain parameters signals positive feedback processes.

The project will be objectified by creating a national technological platform for the surveillance of hydraulic structures of great importance.

A permanent connection between the beneficiaries (decision factors) and the executing partners will be done thus insuring a realtime connection between "expertise" and the "decision factors".

The expected results are:

- A synthesis of UCCH technologies;
- Unitary collection and processing of data from the UCCH system;

- The reduction of vulnerability and combating the consequences of natural disasters and accidents;
- The dissemination of these results among the UCCH specialists that are part of the exploitation of hydraulic structures.

During the first stage the databases of the major proprietors of hydraulic structures will be updated, and in the end it will expand to all the major structures.

4. Conclusions

It is obvious that we live in times where climate changes start to gradually affect our lives and not in a positive way.

The climatic phenomena of late have a negative impact on hydraulic structures thus requesting financial and structural decisions in order to eliminate risk at a greater measure.

The proposed project will provide a system suitable to prevent these risks

The creation of a unitary system that collects and processes the data from the measurements made at the hydraulic structures, leads, mostly, to the proper evaluation of the different situations that may occur.

From the technical point of view, designing a database with measurements provided by the hydraulic structures, leads to the creation of compatibilities between different data acquisition and processing systems so that the information flux among the responsible factors will be made easier within a standard format.

A national unitary system for the surveillance of the behavior of hydraulic structures will have an important economical impact because this kind of systems leads to risk reduction and avoiding natural calamities or distress. Also, an alarm system saves human lives and that is an important aspect during catastrophic events.

As for the social aspect, the project has a dissemination component developed for informing the entities involved in the surveillance of the hydraulic structures and, at the same time, informing the population about the benefits and the risks of the hydraulic structures..

10. References

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