Complex monitoring of built patrimony state – a discussion and alternative of a dedicated service

Prof.Dorin Isoc, No affiliation,
E-mail: Dorin.Isoc@yahoo.com

Motto:

The best is oftentimes the enemy of the good.

A motivation…

Is it possible to monitor the hard-inspectable state of buildings?

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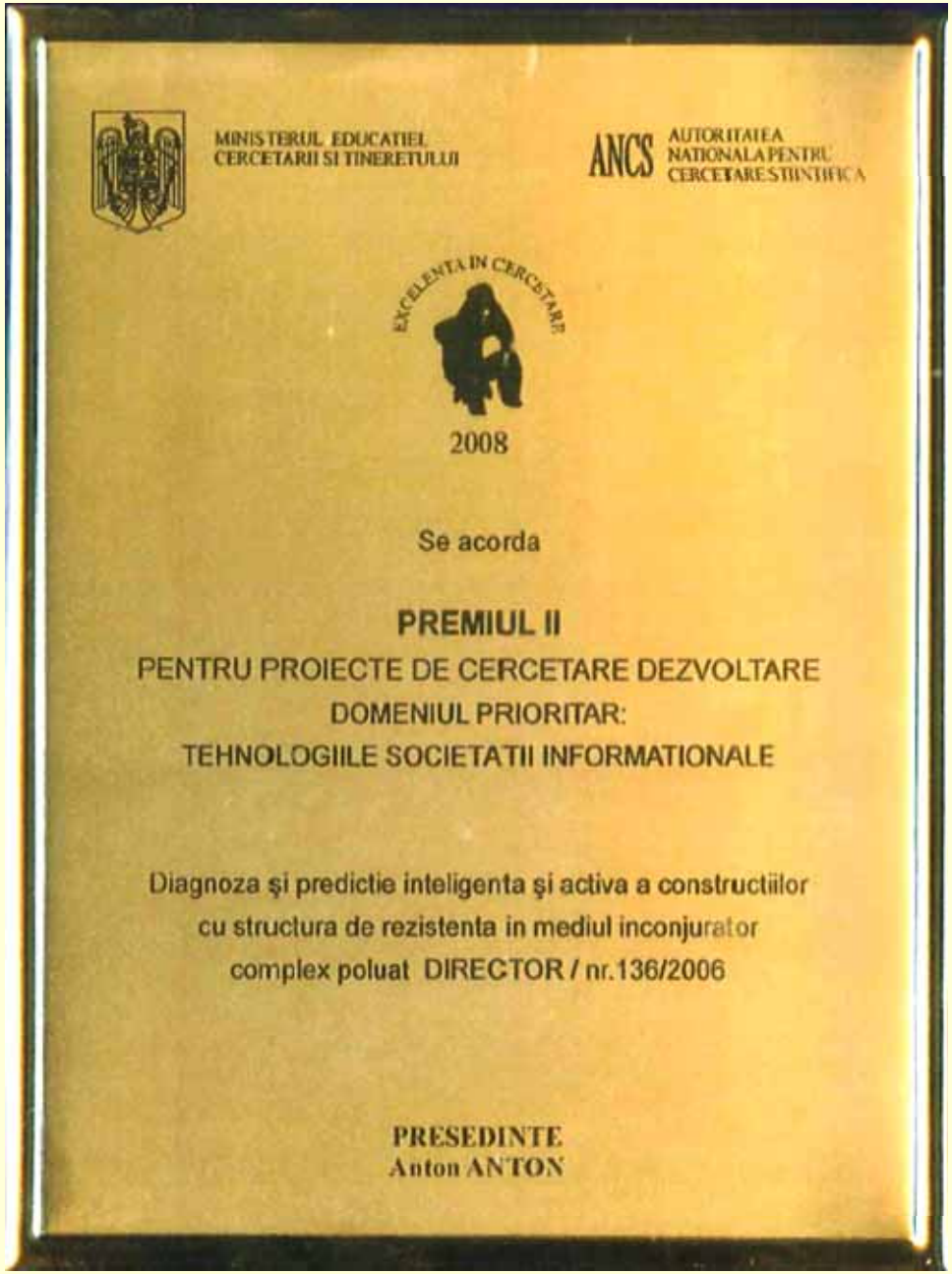

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Diagnoza şi predictie inteligenta şi activa a constructiilor cu structura de rezistenta in mediul inconjurator complex poluat DIRECTOR / nr.136/2006

PRESEDINTE
Anton ANTON

Guidance frame

- Problem statement…
- Predictive diagnosis – principles…
- Main faces…
- Concluding remarks and future developments…

Problem statement

To manage economically and technically in effective manner the degradation state of built patrimony and support the necessary decision-making.

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Predictive diagnosis - principles

Main hypothesis:

1. The fault state occurs accidentally (randomly).
2. The fault state evolves deterministically (predictable).

Consequence:

To diagnose a system we need an associated model, and from its evolution we conclude on the fault state occurrence and on its future evolution (prediction).

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Main faces (enemies)...

During their life, mainly the natural and artificial environment act against the buildings defines the degradation state.

Main faces (corrosion)…

The corrosion degrades the buildings. Synthetically, we have defined the corrosion aggressiveness as a compound factor obtained from measurements.

Case study: corrosivity degree…

Soil parameters		Scoring	Soil parameters		Scoring
Resistivity [ohms.cm]	<700	10	Redox potential (mV)	>100	0
	700-1000	8		50 – 100	3.5
	1000-1200	5		0 – 50	4
	1200-1500	2		<0	5
	1500-2000	1	Sulfides	Positive	3.5
	>2000	0		Traces	2
pH	0 – 2			Negative	0
	2 – 4	3	Moisture	Poor drainage continuously wet	2
	4 – 6.5	0		Fair drainage generally moist	1
	6.5 – 7.5	0		Good drainage generally dry	0
	7.5 – 8.5	0			
	>8.5	0			
Overall corrosivity degree					

Main faces (ways)…

Idea: monitoring the degradation state using a complex model.
Model forming: by knowledge using.
Knowledge: from technical specifications and reports, from inspection reports, from expertise reports, from continuous measurements.

Case study: a bridge model...

Coding	Constructive system	Model 1	Model 2
S1	Slab of reinforced concrete	X	X
S2	Beam of pre-stressed concrete	X	X
S2	Vaults of reinforced concrete	X	X
Electrical line supply type			
E	Electric line	X	X
NE	Non-electric line	X	X
Degradation type			
D1	Concrete degradation	X	X
D2	Reinforcement degradation	X	X
Degradation causes			
C1	Water infiltrations	X	X
C2	Inadequate concrete	X	X
Neighboring environment aggressiveness			
C	Integrated corrosivity factor		X
Reparations			
R1	First repairing	X	X
R2	Second repairing	X	X
R3	Third repairing	X	X

Main faces (outcomes)…

A new monitoring service supporting the economic and investment decision and based on:

- a database involving knowledge about buildings and environment.
- an input of changes in building state and environment;
- a dedicated inference machine (Case Based Reasoning).

...**Main faces** (outcomes)...

Outcomes:

- the similar degradation state of a given building by means a given reference building set.
- the possible scheduling time for the rehabilitation of a given building.

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Concluding remarks...

- the research emphasizes the power of different knowledge field connections→ the theory reduces to practice;
- the research integrates knowledge and generates power and money→ economical effectiveness.

...future developments

- extend the application of the bridges' monitoring.
- define next classes of buildings to be monitored and their main knowledge as material and technology.

***Dorin Isoc** is glad for the opportunity to present before you the speech with the title*

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and he is at your disposal to answer your questions !