

HIDRAULIČKI UDAR

GRAĐEVINSKI FAKULTET - BEOGRAD

Učesnici na projektu:

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Datum: 25/12/2007

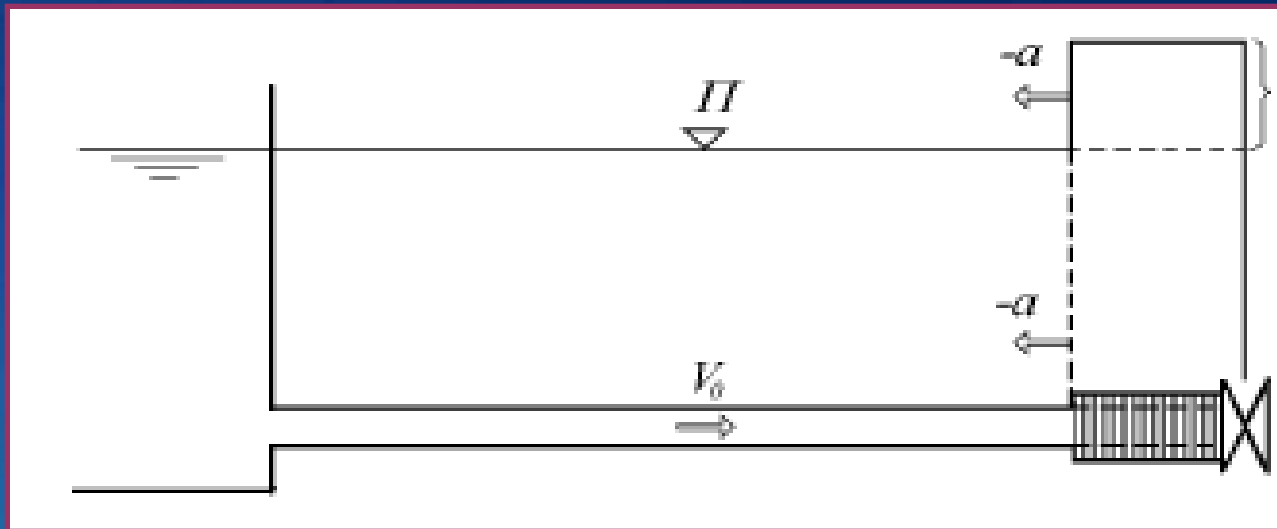
Šta je hidraulički udar?

Gde se može javiti?

Koje su moguće posledice?

Kako ga izbeći?

POZNATO!!!



Dinamička jednačina:

$$\frac{\partial V}{\partial t} + g \frac{\partial \Pi}{\partial x} + \frac{\lambda}{2D} V |V| = 0$$

$$\left. \begin{aligned} \frac{a}{g} \frac{dV}{dt} + \frac{\lambda a V |V|}{2gD} - V \sin \alpha &= 0 \\ \frac{dx}{dt} &= V + a \end{aligned} \right\} C^+$$

>>>

Jednačina kontinuiteta:

$$\frac{\partial \Pi}{\partial t} + V \frac{\partial \Pi}{\partial x} - V \sin \alpha + \frac{a^2}{g} \frac{\partial V}{\partial x} = 0$$

$$\left. \begin{aligned} -\frac{d\Pi}{dt} + \frac{a}{g} \frac{dV}{dt} + \frac{\lambda a V |V|}{2gD} + V \sin \alpha &= 0 \\ \frac{dx}{dt} &= V - a \end{aligned} \right\} C^-$$

Numeričko rešenje:

$$\Pi_i^{n+1} = \Pi_{i-1}^n - B(Q_i^{n+1} - Q_{i-1}^n) - MQ_{i-1}^n |Q_{i-1}^n| + \frac{\Delta t}{A} Q_{i-1}^n \sin \alpha$$

$$\Pi_i^{n+1} = \Pi_{i+1}^n + B(Q_i^{n+1} - Q_{i+1}^n) + MQ_{i+1}^n |Q_{i+1}^n| + \frac{\Delta t}{A} Q_{i+1}^n \sin \alpha$$

$$B = \frac{a}{gA}$$

$$M = \frac{\lambda \Delta x}{2gDA^2}$$

Na ovo se sve svodi:

$$\Pi_i^{n+1} = CP - BQ_i^{n+1}$$

$$\Pi_i^{n+1} = CM + BQ_i^{n+1}$$



$$\Pi_i^{n+1} = (CP + CM) / 2$$

Sva merenja vršena su pomoću:



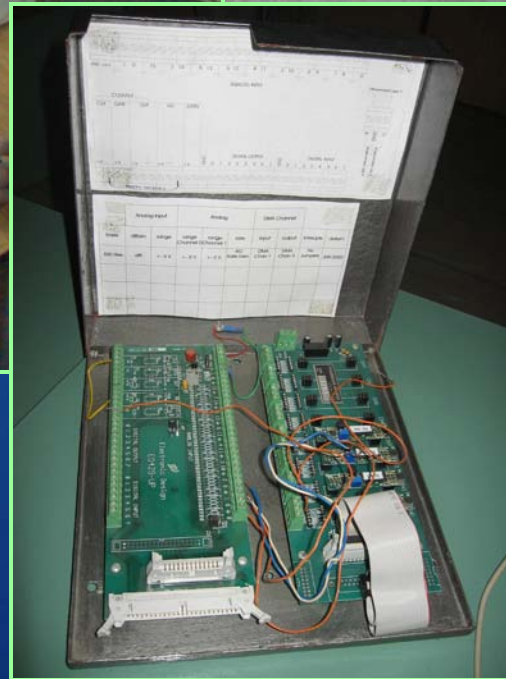
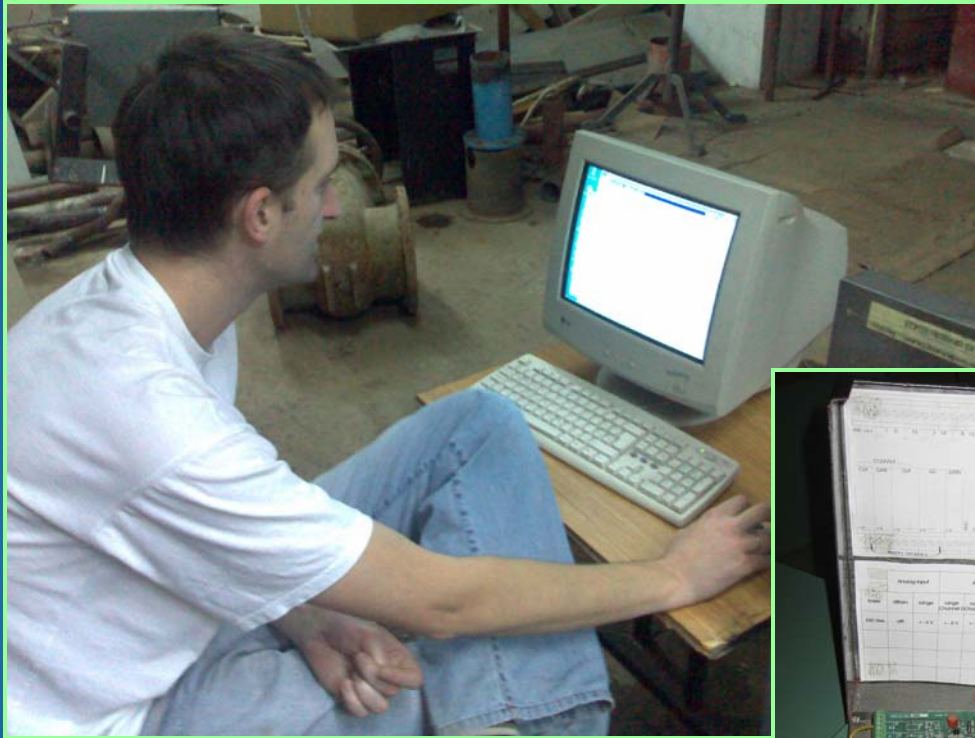
Kalibracija

- Na kalibracionom aparatu



- Na vodenom stubu

Hardverska podrška



Softverska podrška

Parametri akvizicije

Acquisition Parameters

Samples/Channel:

Sampling rate [counts]: Real Sampling Rate [ms]: 0.5

Counter rate [counts]: Real Counter Rate [ms]: 0.1

Counter Frequency [kHz]:

List Of Channels: Gain: Name of array:

<input type="checkbox"/> Channel 0	1	
<input type="checkbox"/> Channel 1	1	
<input checked="" type="checkbox"/> Channel 2	1	
<input type="checkbox"/> Channel 3	1	
<input checked="" type="checkbox"/> Channel 4	100	
<input type="checkbox"/> Channel 5	1	
<input checked="" type="checkbox"/> Channel 6	10	
<input checked="" type="checkbox"/> Channel 7	1000	

High Speed Acquisition
 Low Speed Acquisition

Akvizicija

Comment About Acquisition:

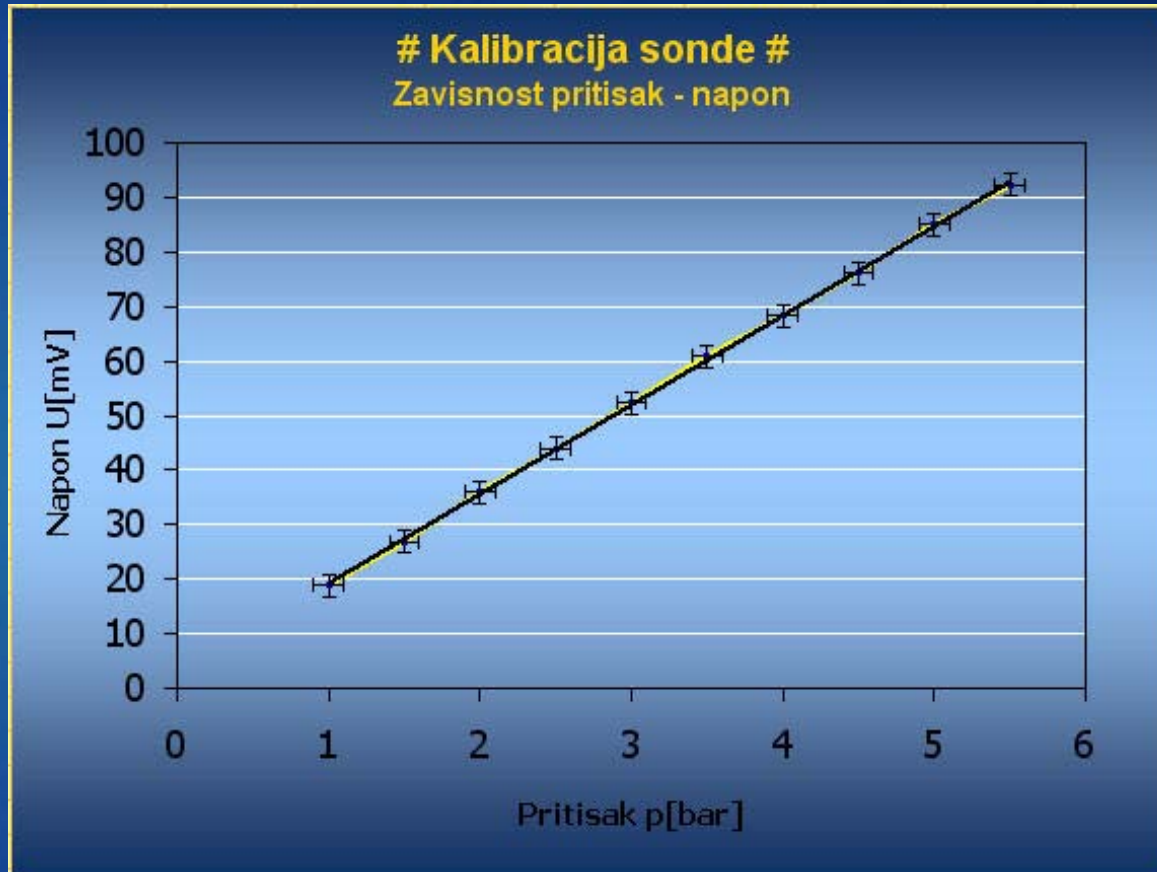
Previously entered comment...

Channel: 2, Channel: 4, Channel: 6, Channel: 7

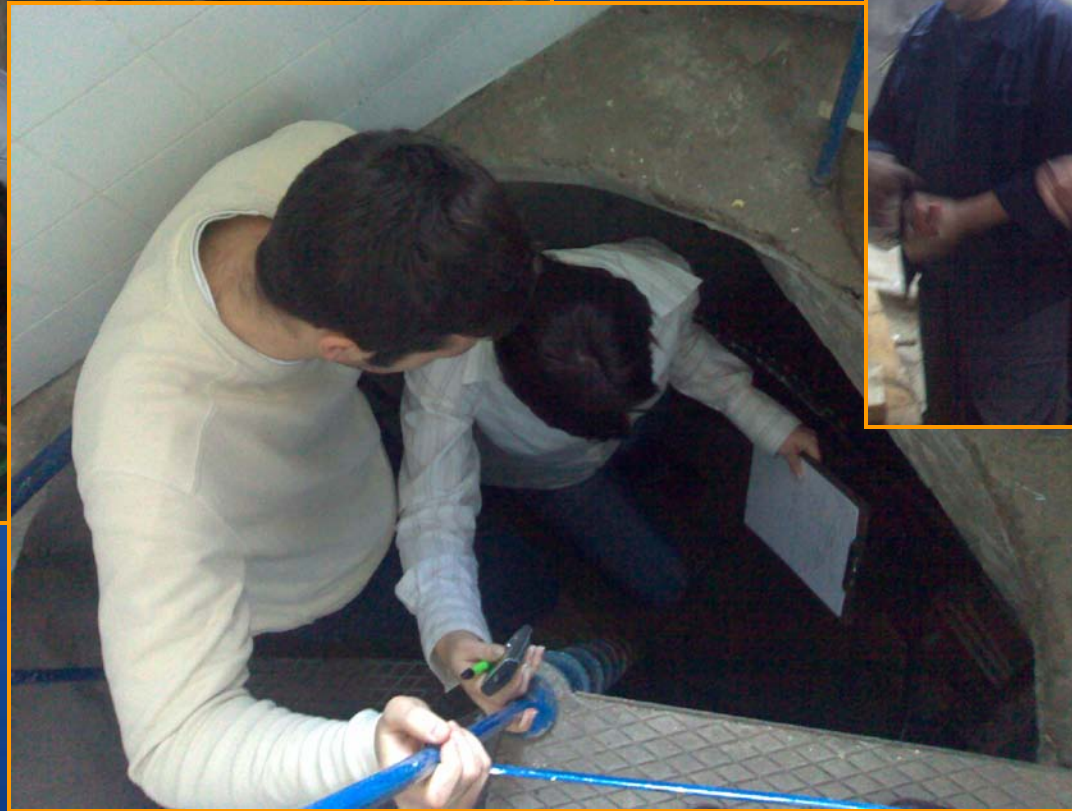
Interpolation:

Without Interpolation
 Put MIN Value
 Put MEAN Value
 Put MAX Value
 Put PREVIOUS Value
 Linear Interpolation

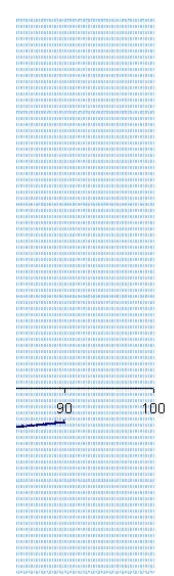
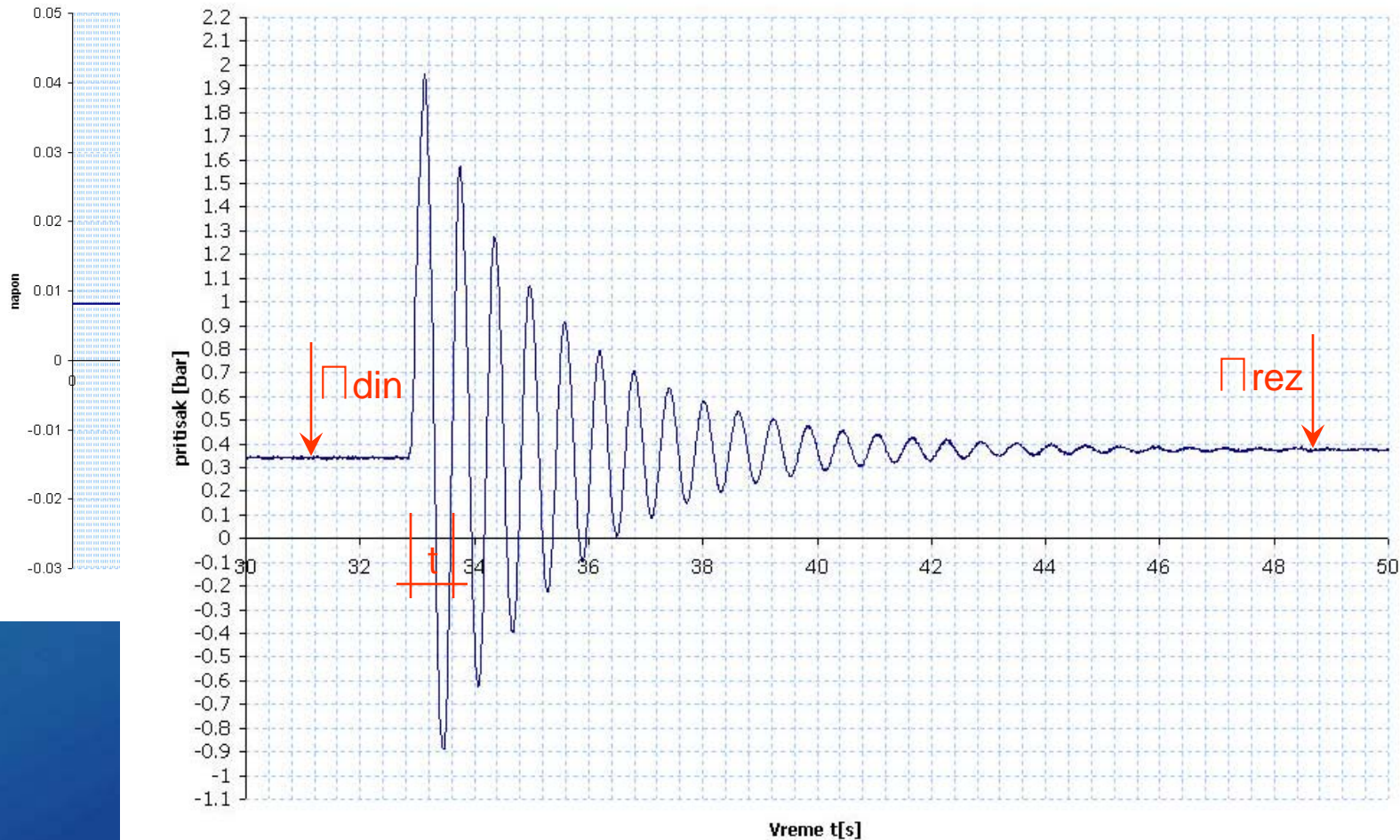
	A	B	C	D	E	F	G
1	AKVIZICIJA	odradjena	i	snimljena	dana	7.nov.07	
2	User	s	name:	Grupa	II		
3	Experiment	title:	Hidraulicki	uar			
4	Comment	about	experimen	Merenje	pritisaka	CH8	sondom
5	Broj	kanala	koji	se	skenira:	1	
6	Vrsta	prijema	podataka:	HighSpeed			
7	Zahtevana	frekvencija	COUNTER	[kHz]:	1		
8	Vreme	izmedju	istog	citanja	dva	uzastopna	kanala
9	Vreme	izmedju	dva	uzastopna	citanja	istog	kanala
10	Broj	podataka	u	paketu:	1000		
11	-----						
12		Channel	Pojacanje	Naslov			
13	-----						
14		0	100	h1	ch8		
15	-----						
16	-----						
17	-----						
18	Kopmentar	o	akviziciji:	No	Comment		
19	Vrsta	interpolacij	Nema	Interpolacije			
20	Podaci	dobijeni	akvizicijom:				
21	-----						
22		0					
23	-----						
24		1	0.008179	0.01			
25		2	0.008228	0.02			
26		3	0.008203	0.03			
27		4	0.008203	0.04			
28		5	0.008203	0.05			
29		6	0.00813	0.06			
30		7	0.008252	0.07			



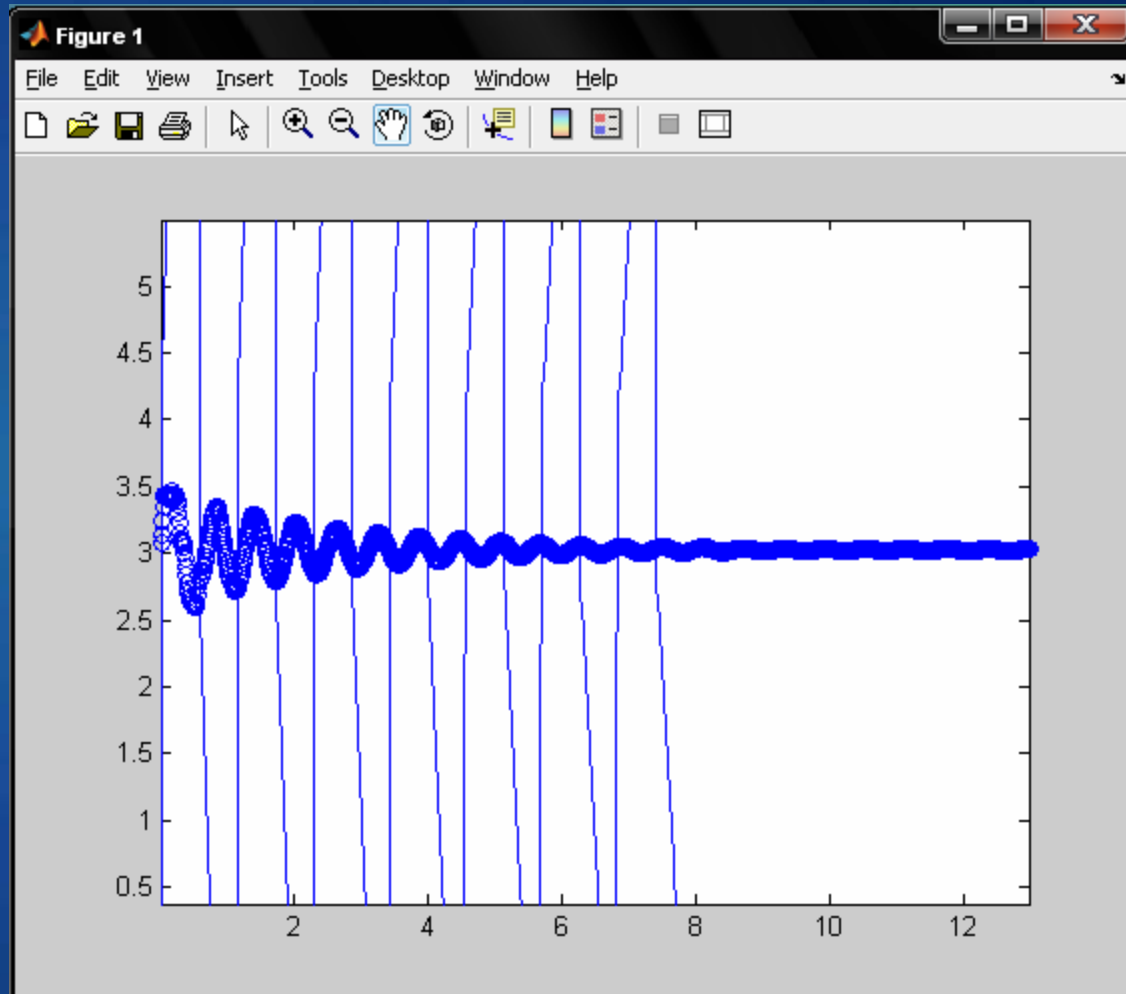
Merenja su izgledala ovako:



Konkretni rezultati:



Uporedjivanje:



◆ Srećni Novogodišnji i Božićni praznici

