Will FEniCS fly?

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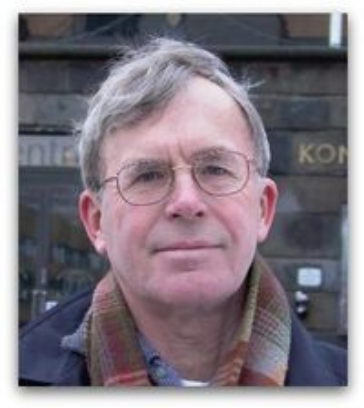
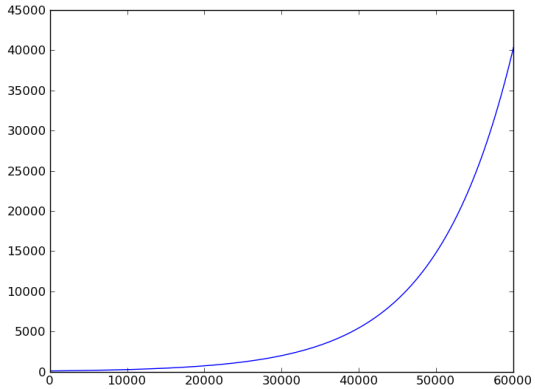
Background



2009

2010



2012

Zombie Apocalypse: CDC Denies Existence Of Zombies Despite Cannibal Incidents

Posted: 06/01/2012 11:15 am Updated: 06/01/2012 3:50 pm

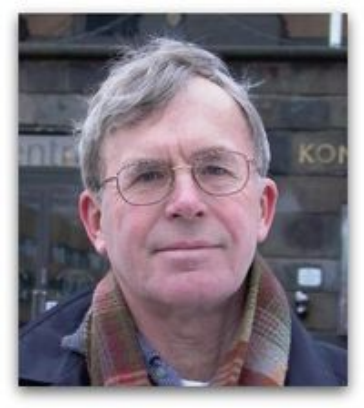
FOLLOW: Cannibalism, Zombies, Alexander Kinyua, Ronald Poppo, Rudy Eugene, Cdc, Cdc Denies Zombies, Cdc Zombie Apocalypse, Centers For Disease Control And Prevention, Weird Science, Zombie Apocalypse , Politics News

The horrific face-eating arrest in Miami and several other seemingly subhuman acts has many people wondering what's behind this flesh-munching wave of terror.

A zombie apocalypse, however, is not what we should be worried about, at least according to the federal government.

Over the years the Centers for Disease Control and Prevention has released a couple of tongue-in-cheek "zombie warnings," which really are just disaster-preparedness stunts. But on Thursday, the agency made it official: Zombies don't exist.

Background



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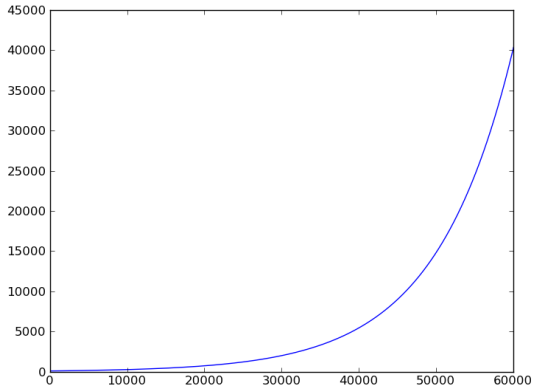


2012

Numerical model

Classification of people:

P (potential users that have never heard about FEniCS)
I (interested users that are aware of FEniCS)
E (evaluators testing FEniCS)
U (established users)
N (non-users – people that are aware of FEniCS but chose not to use it)

P, I, E, U, N are functions of time

The potentials

A meeting between a potential user (P) and either a user (U), enthusiast (E), or interested (I) likely turns the P to I. The meeting is modeled as:

$$-c_{PU}PU - c_{PE}PE - c_{PI}PI.$$

Marketing (announcement) on internet is modeled as

$$c_{MI}M_aP$$

Tutorials turn a fixed small number T of potentials to evaluators

$$c_{ME}T\delta(t_i)$$

Summing up:

$$P' = -c_{PU}PU - c_{PE}PE - c_{PI}PI - c_{MI}M_aP - c_{ME}T\delta(t_i).$$

The interested

The previously mentioned meeting/product term that was removed from potentials (P) is turned to interested (I)

$$c_{PU}PU + c_{PE}PE + c_{PI}PI$$

And the web announcements result in interested

$$c_{MI}M_aP$$

Furthermore, there is a leakage to evaluators (E) and non-users (N).
And we end up with:

$$I' = c_{PU}PU + c_{PE}PE + c_{PI}PI + c_{MI}M_aP - c_{IE}I - c_{IN}I$$

The Evaluators

We remember the leakage from the interested and tutorials, both increasing the number of evaluators (E)

$$c_{IE}I + c_{ME}T\delta(t_i)$$

There is a leakage to the users (U) and non-users (N), which we assume is proportional to the level of documentation (1 = excellent)

$$- c_{EU}DE - c_{EN}(1 - D)E$$

Summing up:

$$E' = c_{IE}I + c_{ME}T\delta(t_i) - c_{EU}DE - c_{EN}(1 - D)E,$$

The users and non-users

Users get an influx from the evaluators (proportional to D) but there is a leakage to non-users. Even with perfect documentation, there will be a leakage due to e.g. changed life situations for the users, so we end up with

$$U' = c_{EU} DE - c_{UN}(2 - D)U.$$

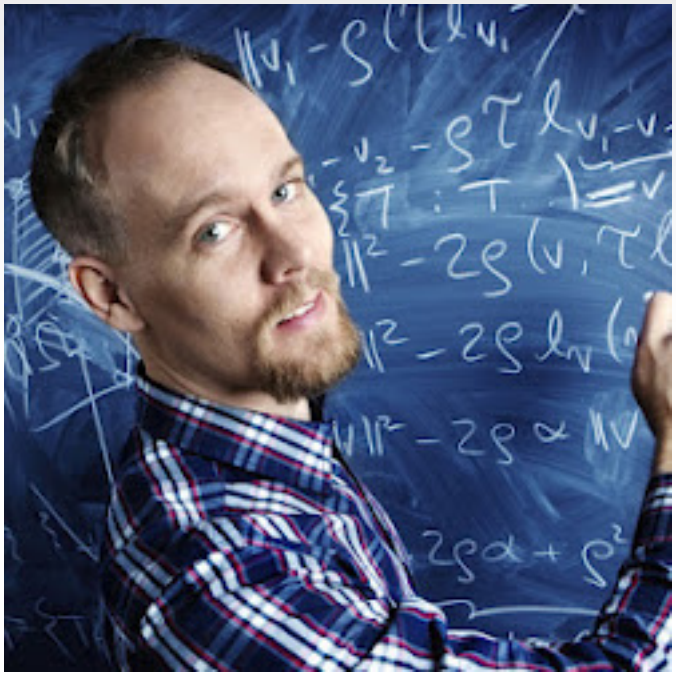
Mass conservation leads to the following equation for non-users:

$$N' = c_{UN}(2 - D)U + c_{EN}(1 - D)E + c_{IN} I - c_{NP} N - c_{NI} M_a N.$$

Complete model

$$
\begin{aligned}
P' &= -c_{PU}PU - c_{PE}PE - c_{PI}PI - c_{MI}M_aP - c_{ME}T\delta(t_i) + c_{NP}N, \\
I' &= c_{PU}PU + c_{PE}PE + c_{PI}PI + c_{MI}M_aP + c_{TI}T - \\
&\quad c_{IE}I - c_{IN}I + c_{NI}M_aN, \\
E' &= c_{IE}I + c_{ME}T\delta(t_i) - c_{EU}DE - c_{EN}(1-D)E, \\
U' &= c_{EU}DE - c_{UN}(2-D)U, \\
N' &= c_{UN}(2-D)U + c_{EN}(1-D)E + c_{IN}I - c_{NP}N - c_{NI}M_aN.
\end{aligned}
$$

Different scenarios



FEniCS software
2003

Isogeometric analysis
2005

Anders Logg

Simula Research Laboratory
Scientific Computing - Numerical Analysis
Verifisert e-postadresse på simula.no
Startside

Google scholar

Søk etter forfattere

Mine sitater - Hjelp

« Tilbake til listen | Eksporter

Tittel	The FEniCS Project
Forfattere	T Dupont, J Hoffman, C Johnson, R C Kirby, M G Larson, A Logg, L R Scott
Utgivelsesdato	2003
Journalnavn	Chalmers Finite Element Center Preprint Series
Utgave	21
Beskrivelse	Abstract The goal of the FEniCS project is to develop open-source software for the automation of Computational Mathematical Modeling (CMM). FEniCS is a joint project between the Toyota Technological Institute at Chicago, the University of Chicago, and Chalmers University of Technology. The vision

Totalt antall sitater: Sitert av 41

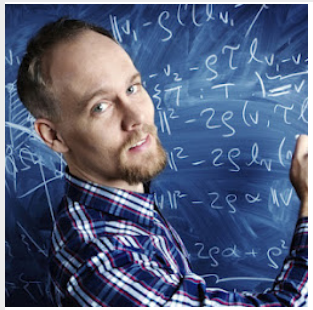
Sitater per år

Google Scholar-artikler

The FEniCS project
T Dupont, J Hoffman, C Johnson, R Kirby, M Larson... - 2003
Sitert av 31 - Beslektede artikler - Alle 3 versjoner

The fenics project *
A Logg, T Dupont, J Hoffman, C Johnson, RC Kirby... - URL: http://fenics. org, 2007
Sitert av 11 - Beslektede artikler - Alle 4 versjoner

« Tilbake til listen | Eksporter



Anders Logg

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Startside

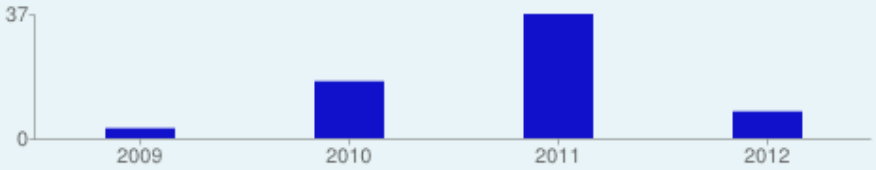
Google scholar

Søk etter forfattere

Mine sitater - Hjelp

« Tilbake til listen | Eksporter

Tittel	DOLFIN: Automated finite element computing [PDF] fra arxiv.org
Forfattere	Anders Logg, Garth N Wells
Utgivelsesdato	2010/4/1
Journalnavn	ACM Transactions on Mathematical Software (TOMS)
Volum	37
Utgave	2
Sider	20
Utgiver	ACM
Beskrivelse	Abstract We describe here a library aimed at automating the solution of partial differential equations using the finite element method. By employing novel techniques for automated code generation, the library combines a high level of expressiveness with efficient computation. Finite element variational forms may be expressed in near mathematical notation, from which low-level code is automatically generated, compiled, and seamlessly integrated with efficient implementations of computational meshes and high-performance ...

Totalt antall sitater	Sitert av 67
Sitater per år	
Google Scholar-artikler	DOLFIN: Automated finite element computing A Logg... - ACM Transactions on Mathematical Software (TOMS), 2010 Sitert av 67 - Beslektede artikler - Alle 16 versjoner

« Tilbake til listen | Eksporter

TJR Hughes

Professor of Aerospace Engineering and Engineering Mechanics, Computational and Applied Mathematics

Computational Mechanics - Finite Element Analysis - Isogeometric Analysis - Computational Fluid Dynamics - Travel

Verifisert e-postadresse på ices.utexas.edu

Google scholar

Søk etter forfattere

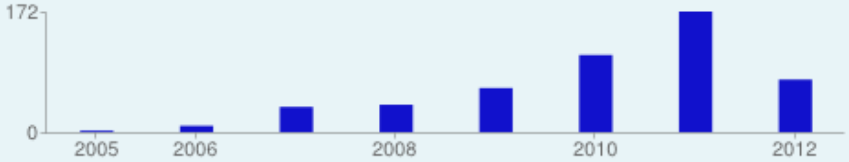
Mine sitater - Hjelp

« Tilbake til listen | Eksporter

Tittel	Isogeometric analysis: CAD, finite elements, NURBS, exact geometry and mesh refinement	[PDF] fra zcu.cz
Forfattere	Thomas JR Hughes, JA Cottrell, Y Bazilevs	
Utgivelsesdato	2005/10/1	
Journalnavn	Computer methods in applied mechanics and engineering	
Volum	194	
Utgave	39	
Sider	4135-4195	
Utgiver	North-Holland	
Beskrivelse	The concept of isogeometric analysis is proposed. Basis functions generated from NURBS (Non-Uniform Rational B-Splines) are employed to construct an exact geometric model. For purposes of analysis, the basis is refined and/or its order elevated without changing the geometry or its parameterization. Analogues of finite element h-and p-refinement schemes are presented and a new, more efficient, higher-order concept, k-refinement, is introduced. Refinements are easily implemented and exact geometry is maintained at all levels ...	

Totalt antall sitater: Sitert av 511

Sitater per år



Google Scholar-artikler

Isogeometric analysis: CAD, finite elements, NURBS, exact geometry and mesh refinement
TJR Hughes, JA Cottrell... - Computer methods in applied mechanics and ..., 2005
Sitert av 511 - Beslektede artikler - Alle 11 versjoner

« Tilbake til listen | Eksporter

The model

$$
\begin{aligned}
P' &= -c_{PU}PU - c_{PE}PE - c_{PI}PI - c_{MI}M_aP - c_{ME}T\delta(t_i) + c_{NP}N, \\
I' &= c_{PU}PU + c_{PE}PE + c_{PI}PI + c_{MI}M_aP + c_{TI}T - \\
&\quad c_{IE}I - c_{IN}I + c_{NI}M_aN, \\
E' &= c_{IE}I + c_{ME}T\delta(t_i) - c_{EU}DE - c_{EN}(1-D)E, \\
U' &= c_{EU}DE - c_{UN}(2-D)U, \\
N' &= c_{UN}(2-D)U + c_{EN}(1-D)E + c_{IN}I - c_{NP}N - c_{NI}M_aN.
\end{aligned}
$$

Parameter identification

Initial conditions:
P(0) = 50 000, I(0) = 100, E(0) = 10, U(0) = 50, N(0) = 30 000

Assume that in a week, 50 FEniCS users generate interest among 10 people in a population of 50,000. Hence,

$$10 = 7c_{PU}50,000 \cdot 50$$

Or

$$c_{PU} \approx 4 \cdot 10^{-6}/7$$

Further:

$$c_{PE} = c_{PU}/20 \qquad c_{PI} = c_{PE}/10$$

Parameter identification

Concerning the web-announcement:

$$M_a(t) = \mu \exp\left(-\beta(t - t_0)\right)$$

Mu and beta are set such that it takes a week to reduce the effect of the announcement by a factor 0.9 and the announcement reach 10% of P. And we may vary the number of announcements.

Assuming that a fixed number of people at the tutorials (T=50):

$$c_{ME} T \delta(t_i)$$

Parameter identification

We assume that 1% of the interested try to install the software, which is easy due to J Ring, during one week and become evaluators:

$$c_{IE} = 0.1/7$$

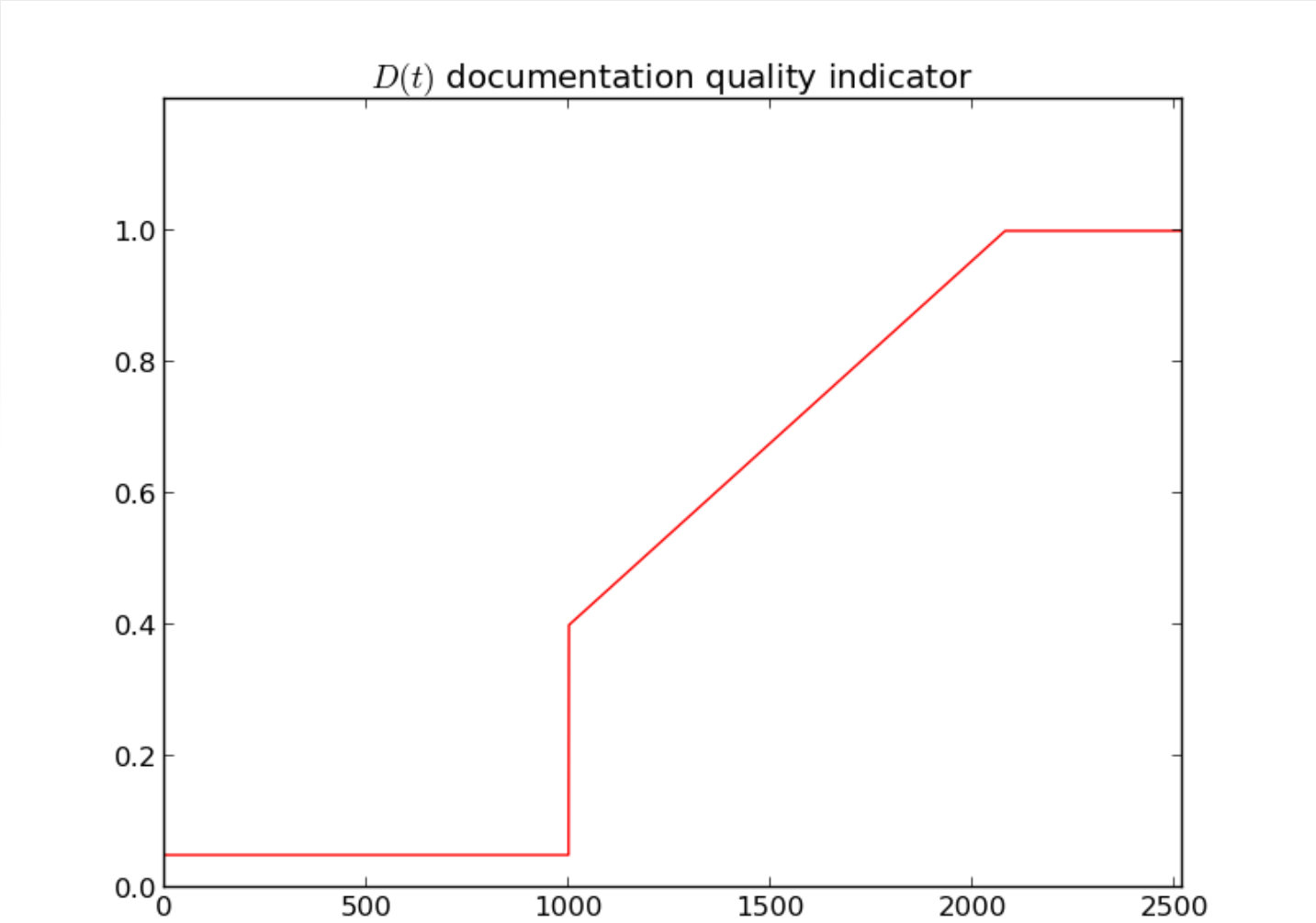
We assume that it takes four years to forget bad experiences (this is typically e.g. in finance). Hence,

$$c_{NI} = c_{NP} = 1/(4 \cdot 360)$$

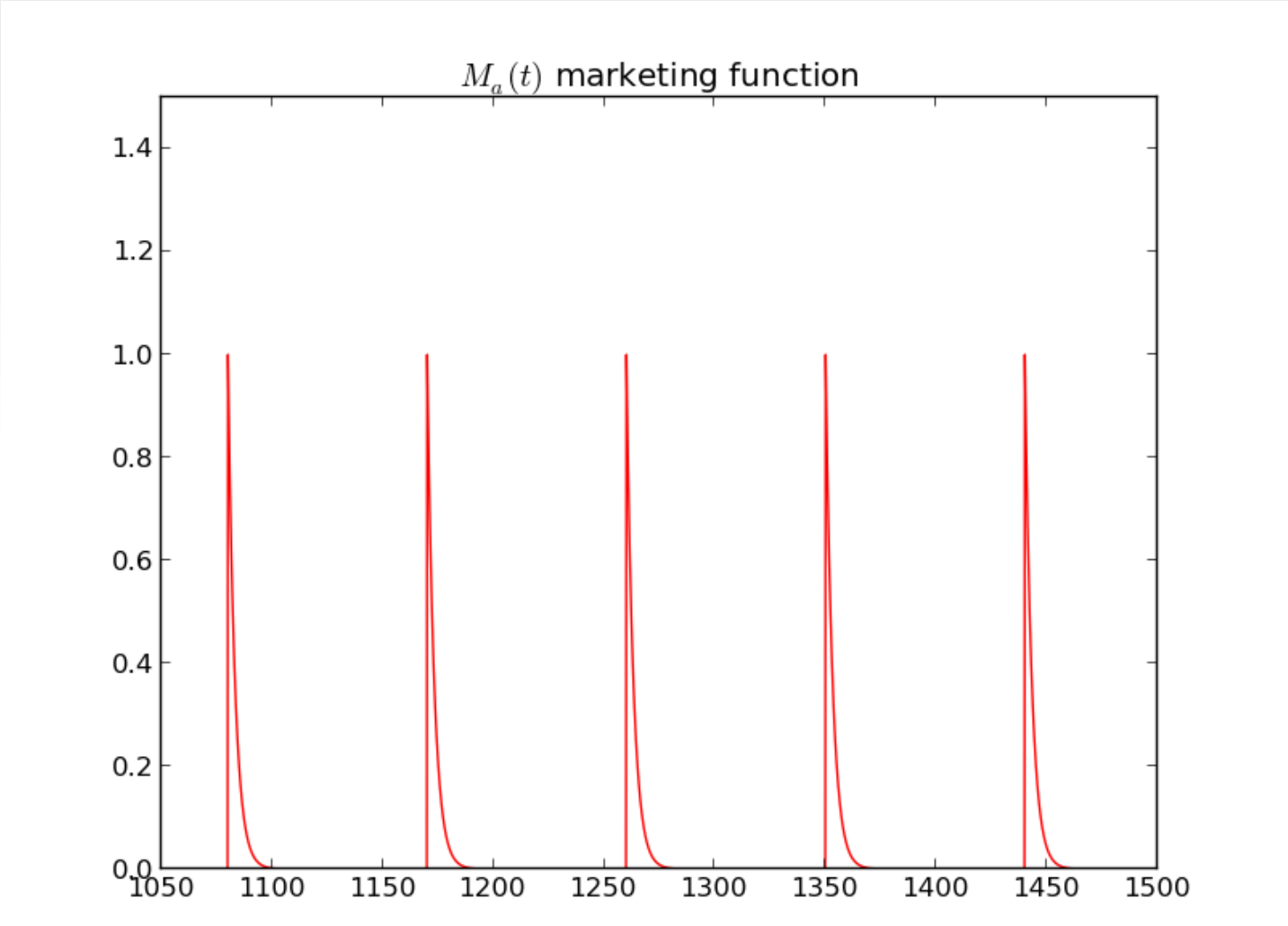
We assume that within one month, 10% of the evaluators become users and 10% decide that FEniCS is not suitable for their problem, i.e.,

$$c_{EU} = 0.1/30 \qquad c_{EN} = 0.1/30$$

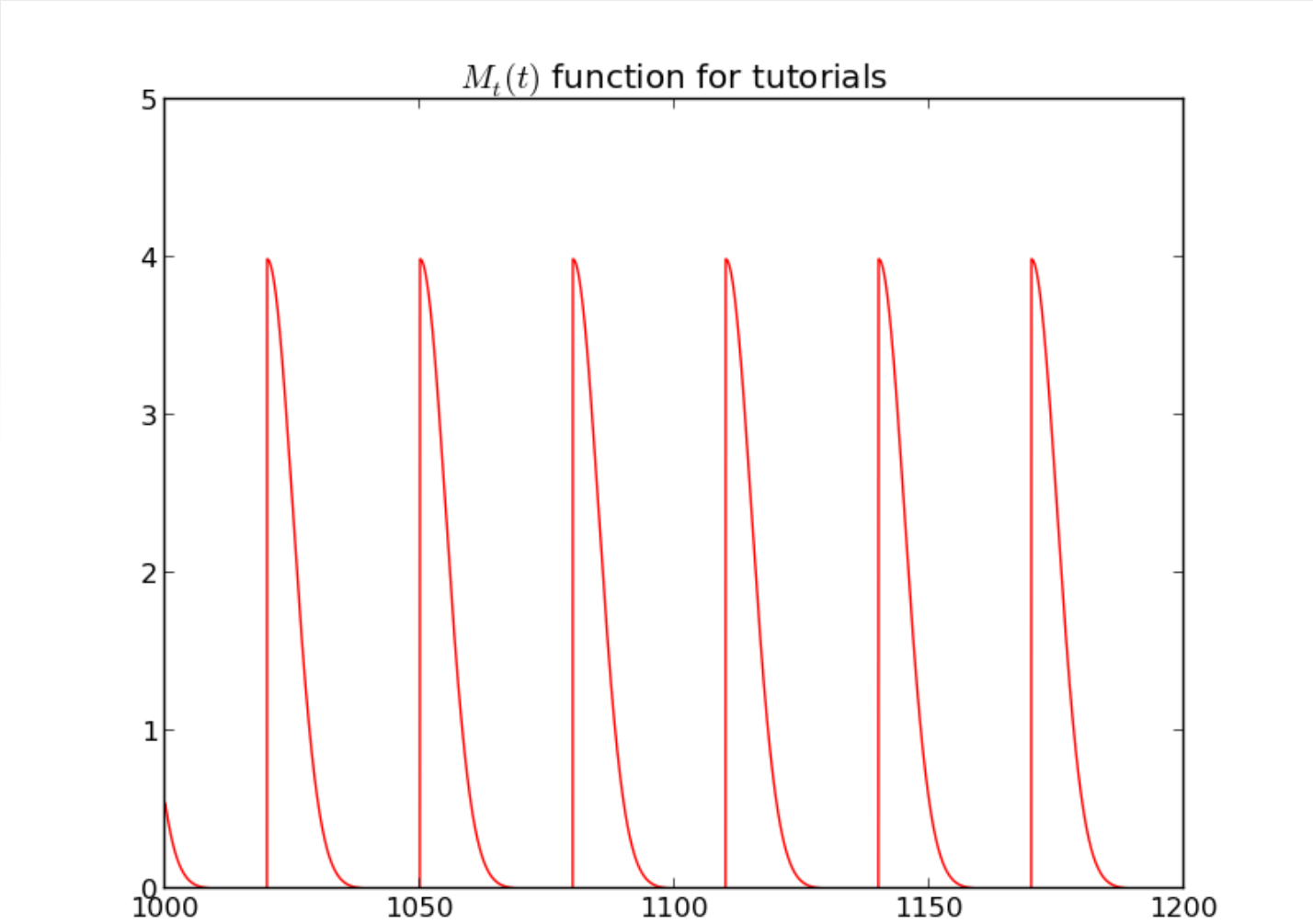
Documentation



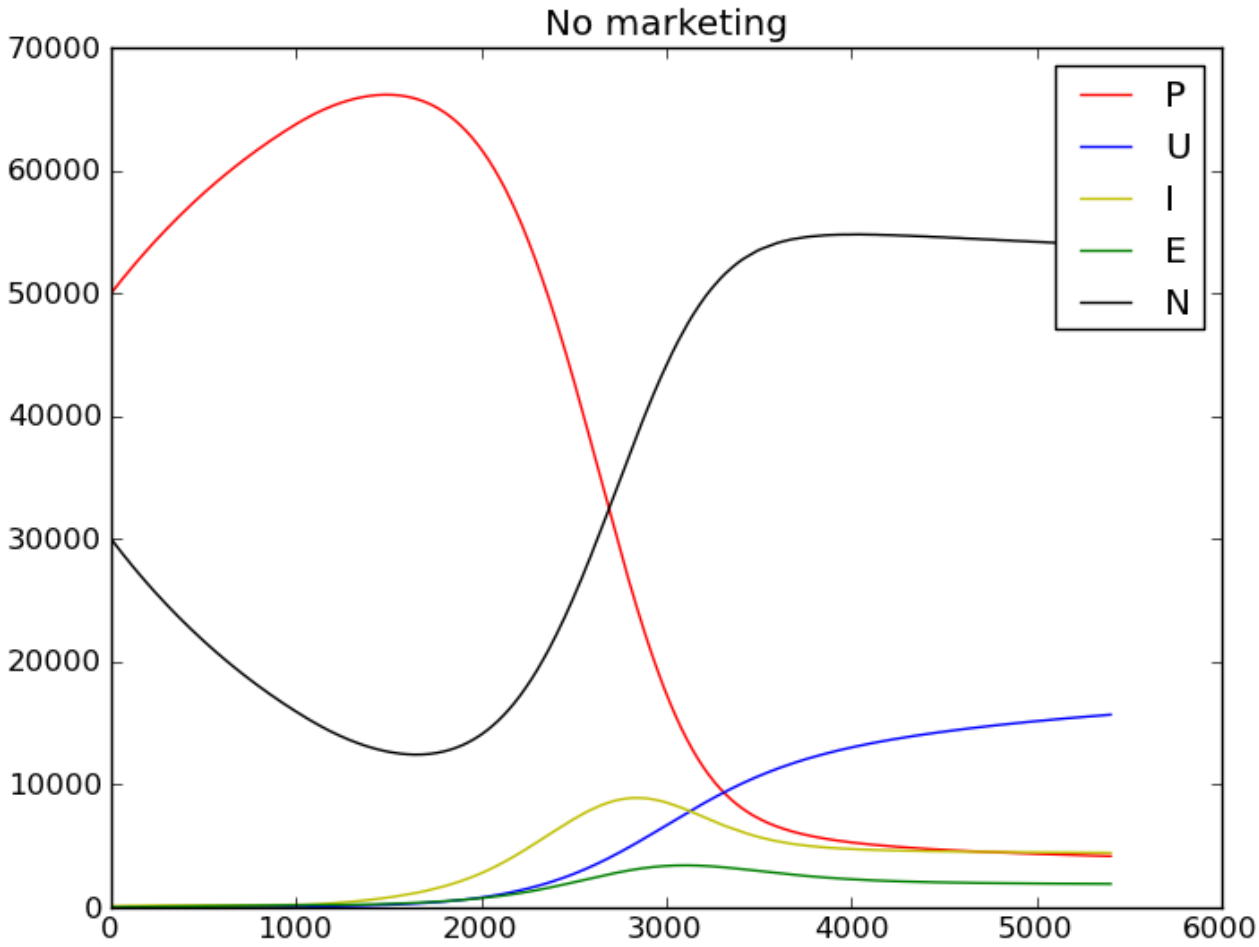
Web announcement



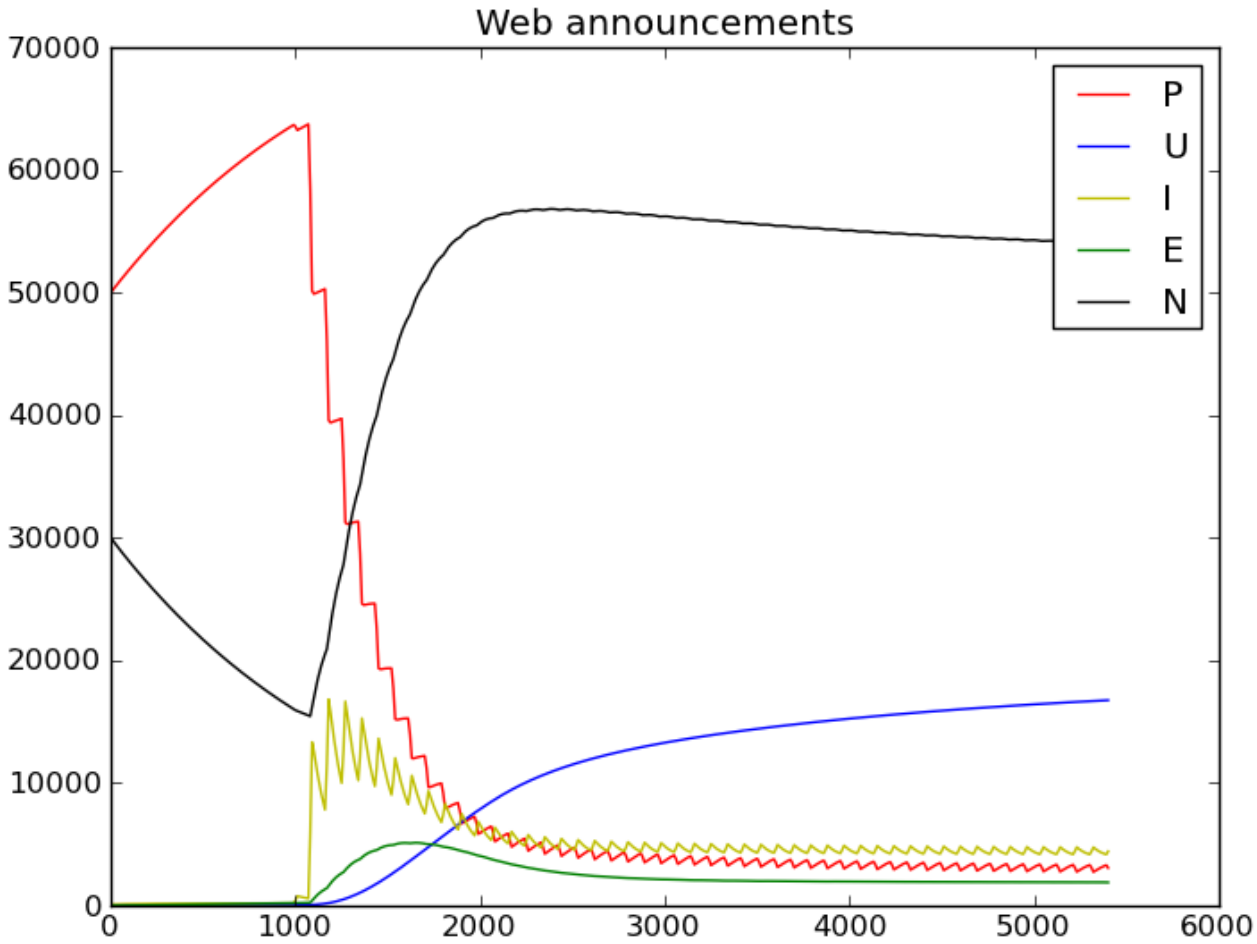
Tutorials



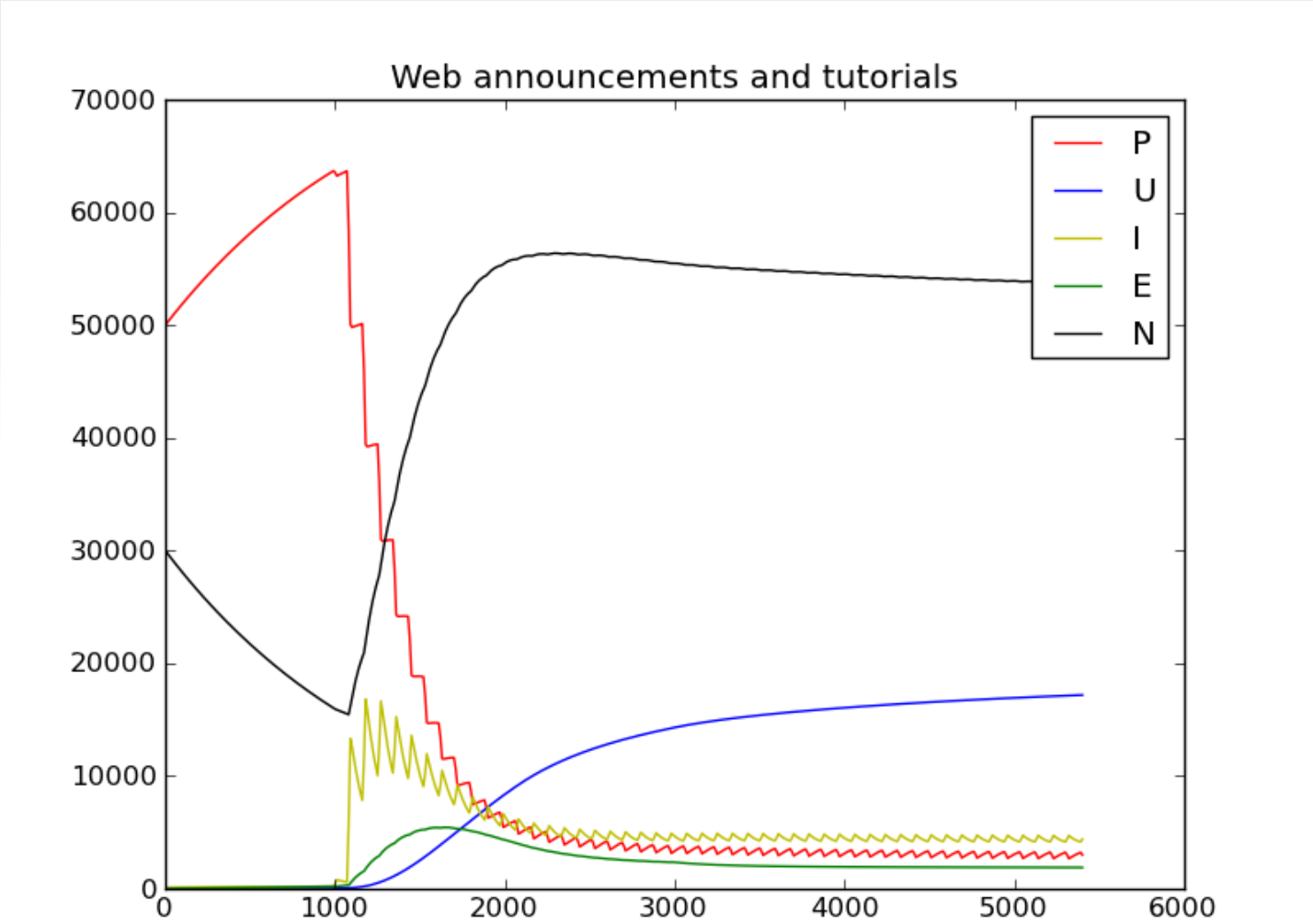
No marketing



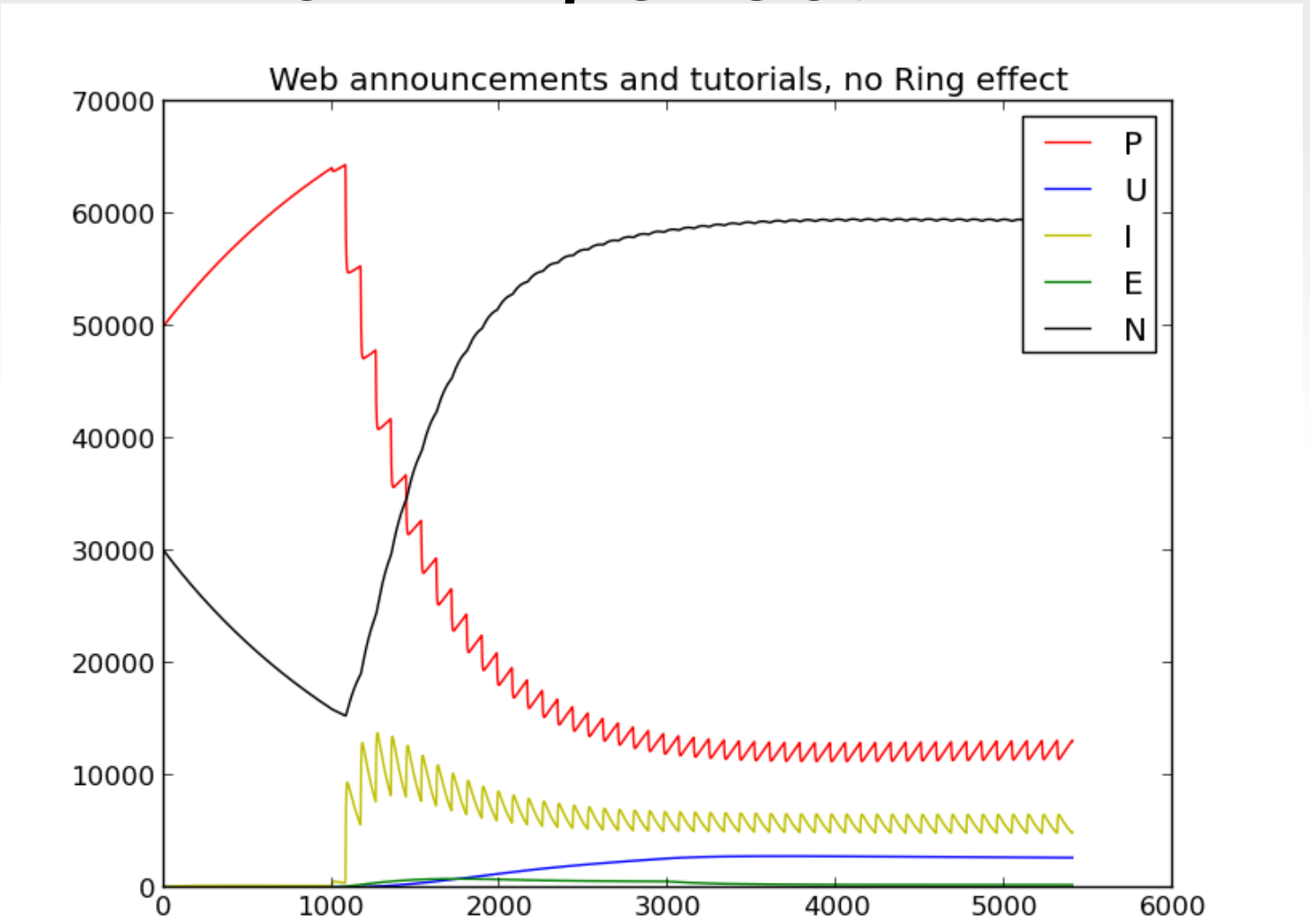
Adding web announcements



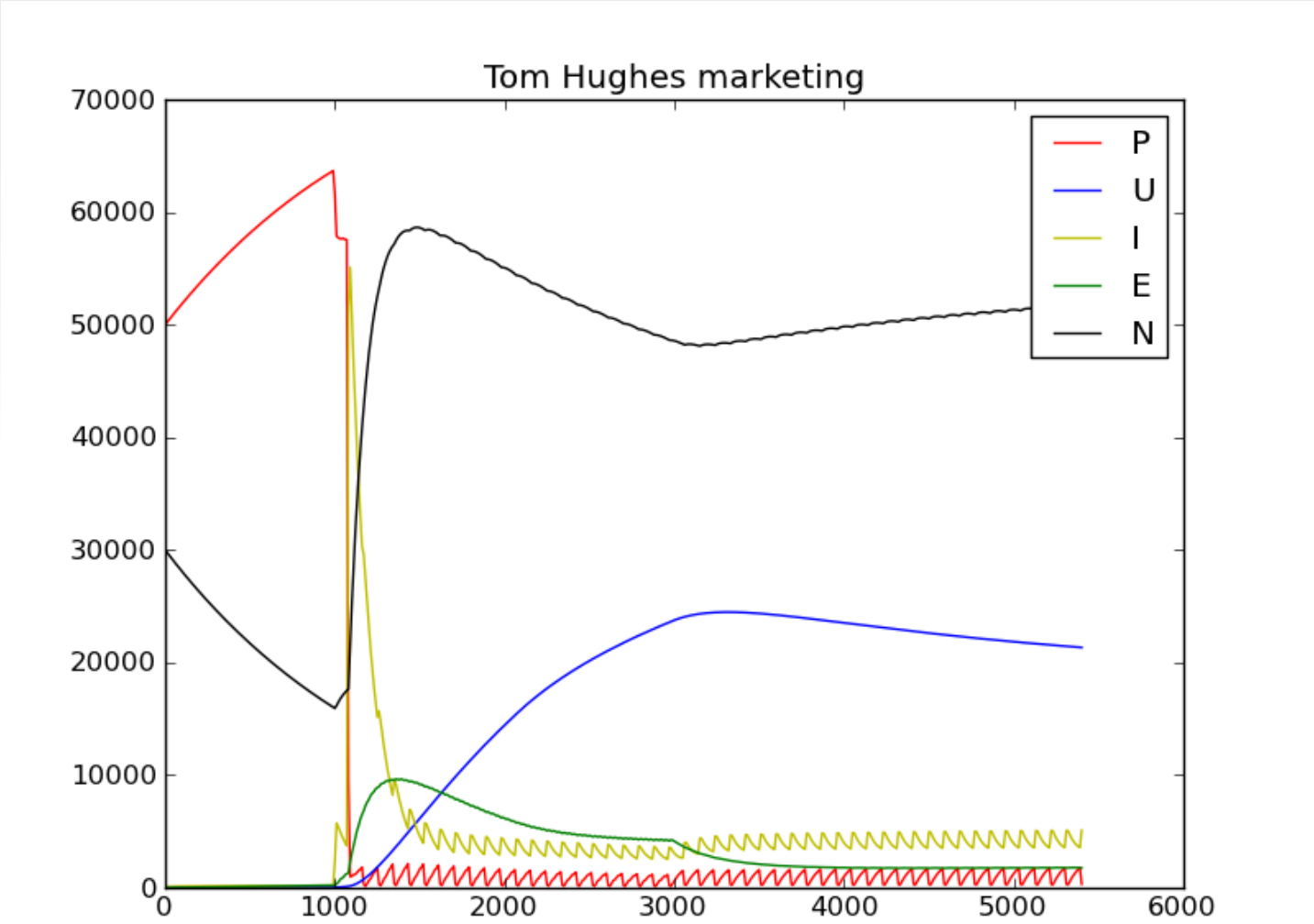
Web announcments and tutorials



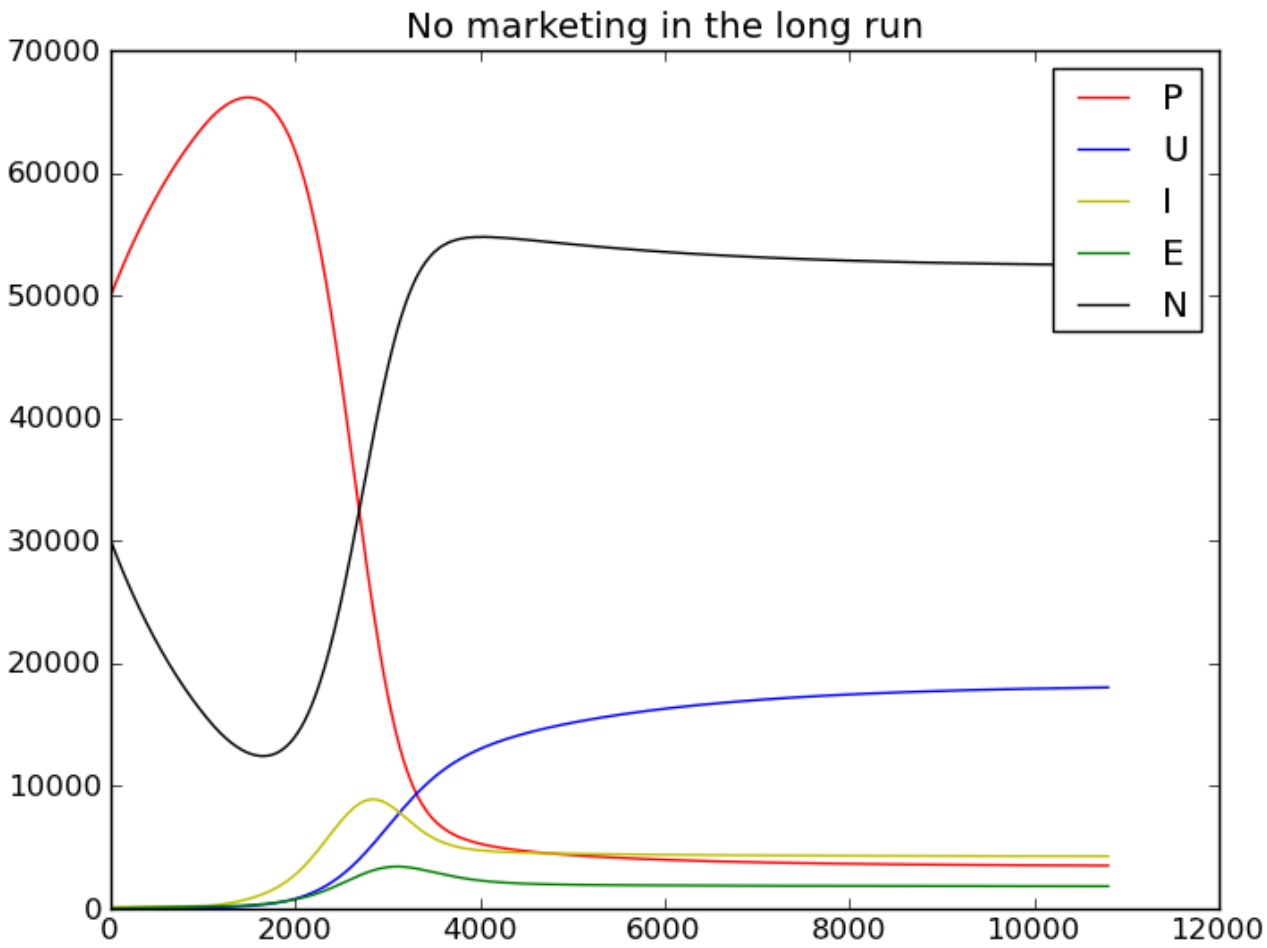
Web announcements and tutorials- no Ring effect



Aggressive marketing – Tom Hughes



Long run – no marketing



Long run – keeping users

Conclusion: FEniCS will fly

FEniCS VS Isogeometric

1 0

(in the long run)