# Our Research

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# Where we came from?


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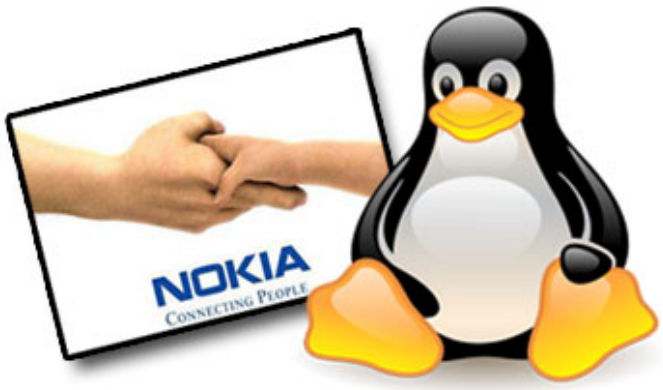
# Who uses open source?

## Business

Novell, Google, IBM, Panasonic, Virgin America, Cisco, Conoco Philips, Omaha Steaks, Amazon, Peugeot, Wikipedia, New York Stock Exchange, Burlington Coat Factory, Raymour and Flannigan, Tommy Hilfiger, Toyota Motor Sales, Travelocity, Boeing, Mercedes-Benz, AMD, Sony, United States Postal Service, Nokia, Ford, etc.

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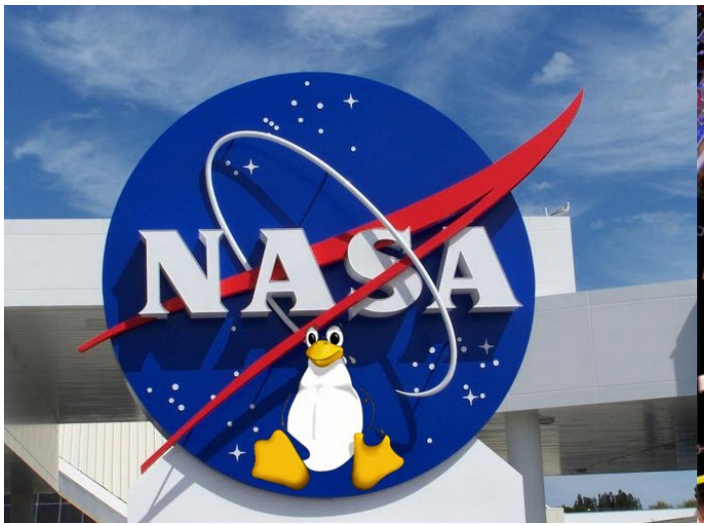
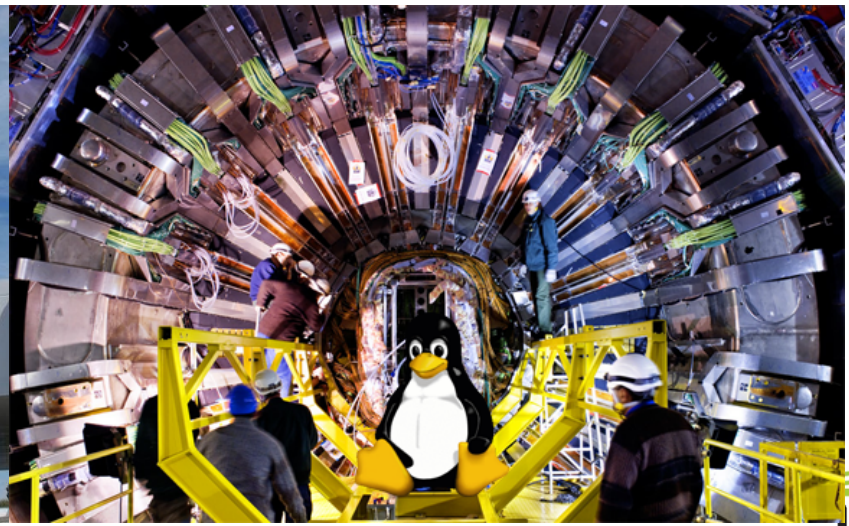
# Who uses open source?

## Science

NASA, CERN, Internet Archive, Centro Nacional de Supercomputación en Tianjin (China), ASV Roboat, laboratorio del Colégio Politécnico Federal de Lausanne.



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# Who uses open source?

## Governments

Junta de Andalucía, Ayuntamiento de Munich, Casa Blanca, Gobierno de Brasil, Departamento de Defensa de Estados Unidos (DoD), Ayuntamiento de Viena, Gobierno de España, Administración Federal de Aviación de EE.UU., Gobierno de Pakistan, Parlamento Frances, Cuba, Suiza, Macedonia, República Checa, República Popular China, Administración de la Seguridad Nuclear, Agencia de Seguridad Social de Sudáfrica, Turquía, Filipinas, Malasia, Federación Rusa, Ayuntamiento de Largo (Florida), Islandia, Venezuela, US Navy,

## Visit

`https://humanos.uci.cu/2013/06/quien-usa-linux/`

# The migration

## What we really need in a university?

1. Platform (OS).

# The migration

## What we really need in a university?

1. Platform (OS).
2. Development environment.
   - IDE
   - Compiler(s)
   - Libraries


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# The migration

## What we really need in a university?

1. Platform (OS).
2. Development environment.
   - IDE
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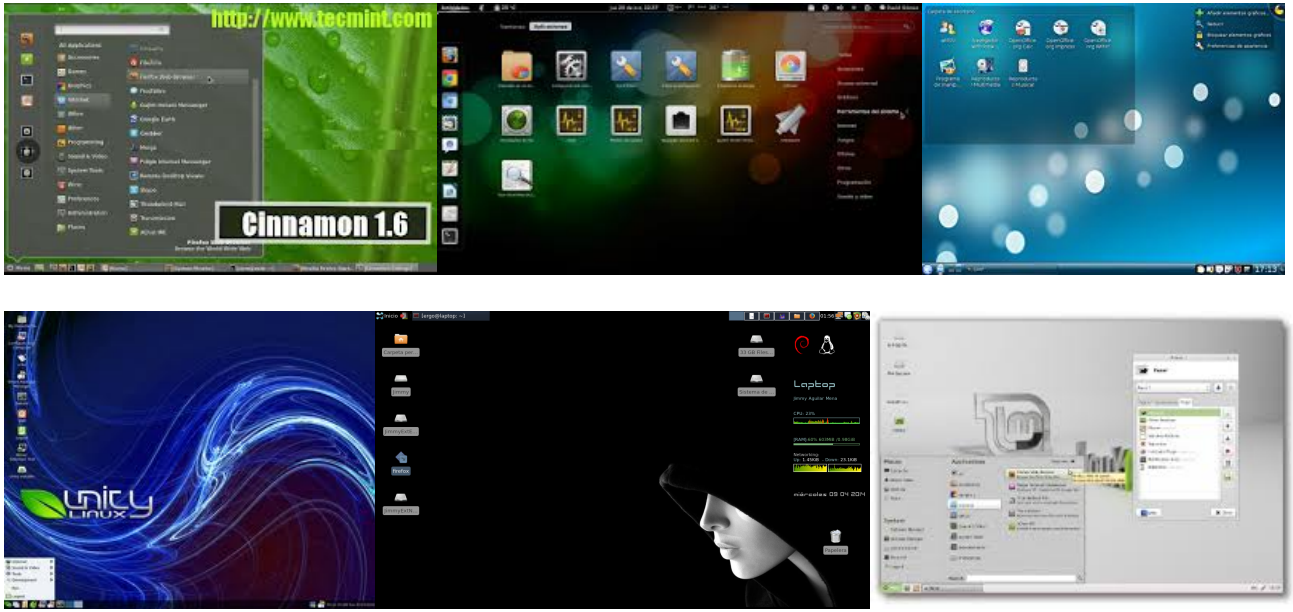
   - Libraries
3. Graphical environment

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# The migration

## What we really need in a university?

1. Platform (OS).
2. Development environment.
   - IDE
   - Compiler(s)
   - Libraries
3. Graphical environment
4. Tools for common work

- Research
  - Calculate
  - Process data
  - Construct graphs
- Education (teaching-learning)
  - Related with the subject.
- Common operation
  - Write documents
  - Surf the internet
  - Make presentations
  - Make posters

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*¿A quién va usted a creer, a mí o a sus propios ojos?*

*Who are you going to believe, to me or to your own eyes?*

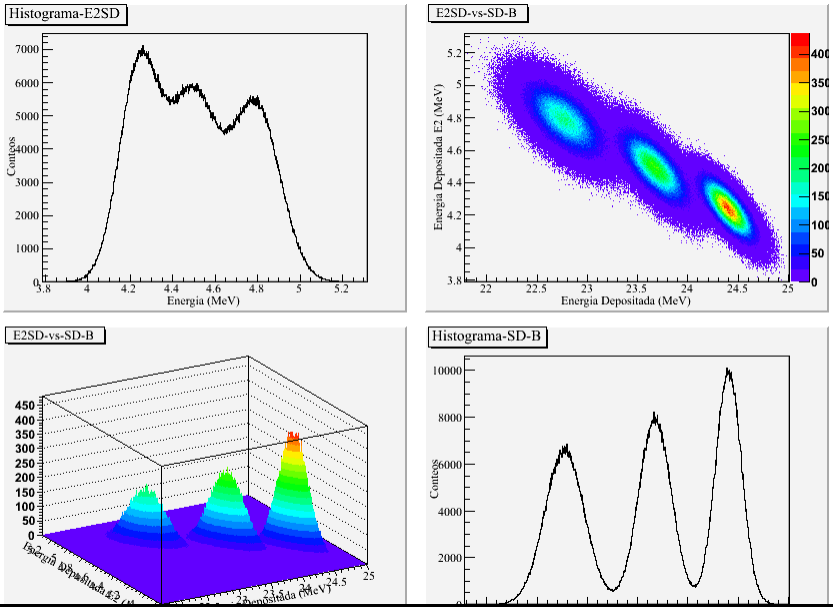
*Groucho Marx*

# In a research

## Monte Carlo simulation with geant4 and ROOT

All the software was free...

- Characterization of a $\Delta E - E$ spectrometer for the measurement of angular distribution in Nuclear Reactions with heavy ions. (Conference Proceedings XIV WONP-8th NURT' 2013. ISBN 978-959-7136-98-9)




Capítulo 1

Fundamentos Teóricos

Contents



### 1.1. Reacciones Nucleares

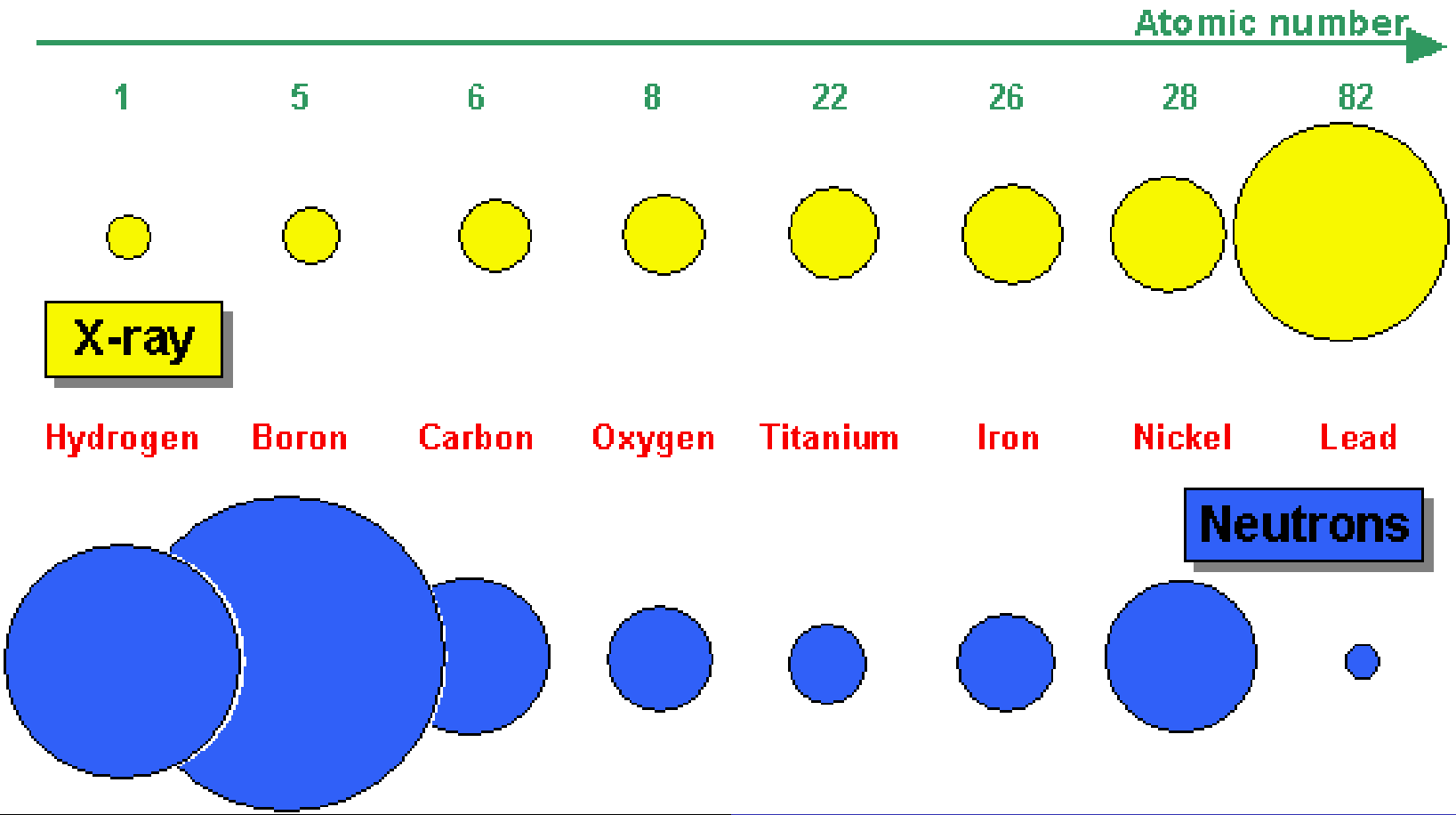
Un proceso binario(Fernández & J. 1997) es aquel en el cual una partícula incidente o *proyectil* $\alpha$ interactúa con un núcleo blanco A, y se da lugar a una partícula saliente o *eyectil* $\beta$ y un núcleo residual o de retroceso B. Este proceso se puede notar de la siguiente manera:

$$\alpha + A = B + \beta \quad (1.1)$$

# In a research

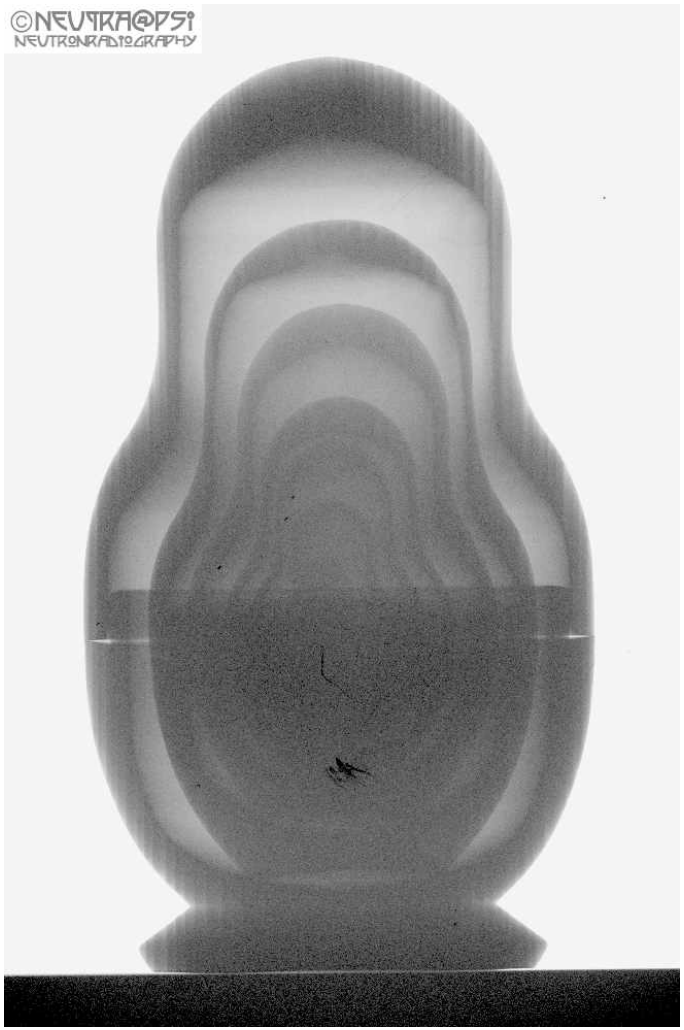
## Monte Carlo simulation with geant4 and ROOT

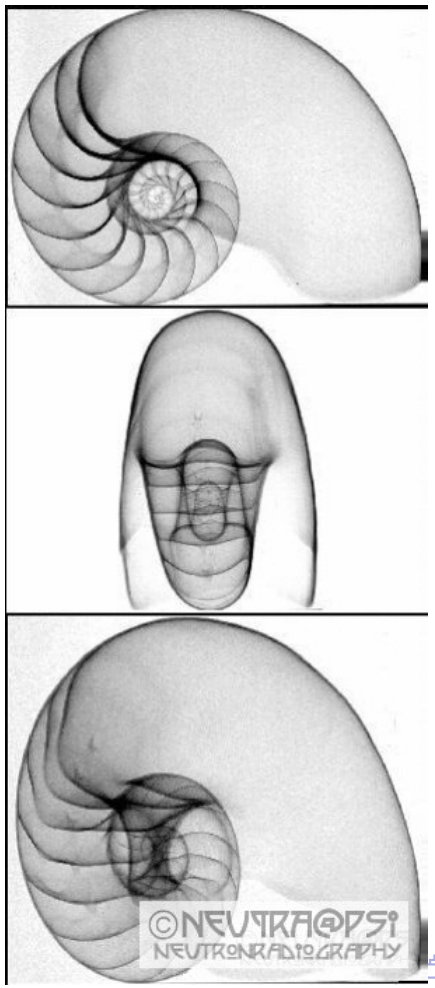
Fast neutron radiography.



# In a research

## Monte Carlo simulation with geant4 and ROOT

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# In education

There is a section called education in the Debian repository.
Some tools like Geogebra, Octave, Scilab, Yacas, Maxima, Gnuplot are useful not only for research but also for teaching.
You can make a contribution and many people will help you and maybe support your project.


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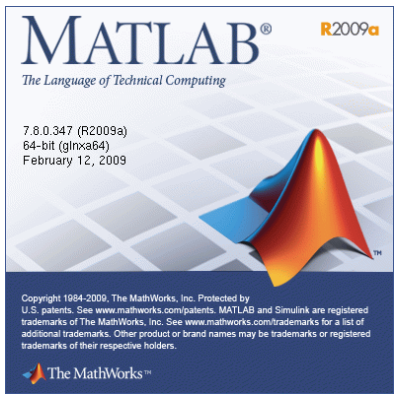
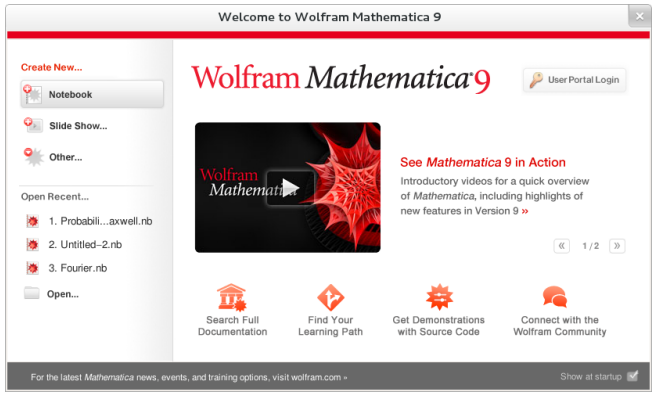
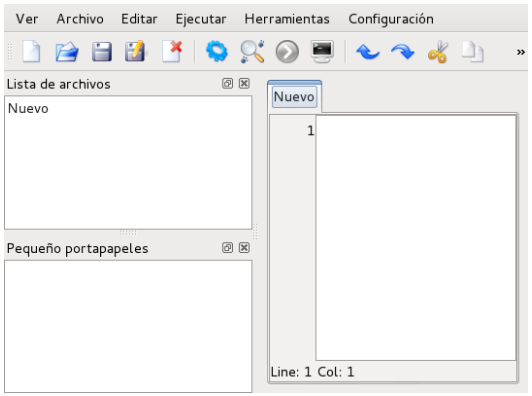
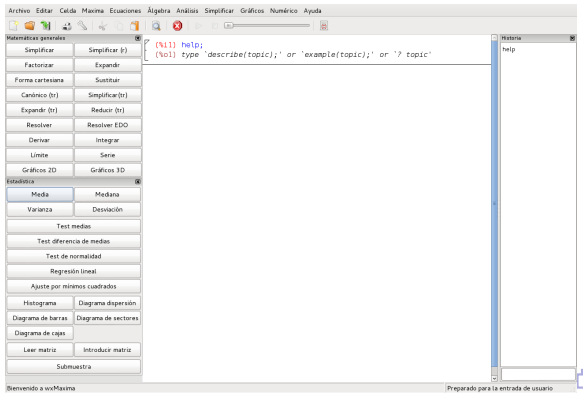
# My contribution

There are not any software designed for teaching numerical methods, in spite of there are a lot of softwares that uses and apply those methods.
I decided to design a software for teaching numerical methods to students with a no so hard programming background.



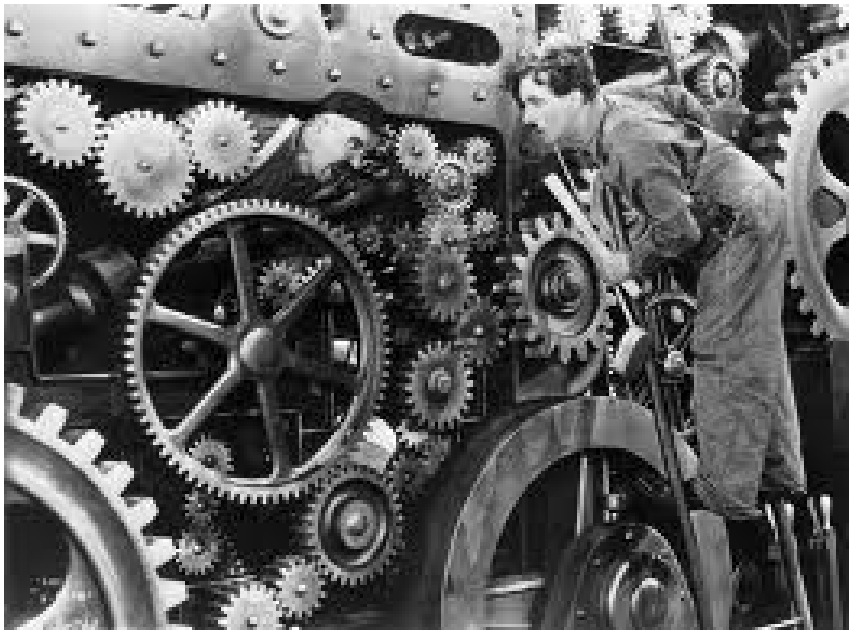



# Why something new?

As a pedagogical software it must be as easy to use as possible, and must provide a lot of useful information. That is the difference between our software and the others available free or not.

VS



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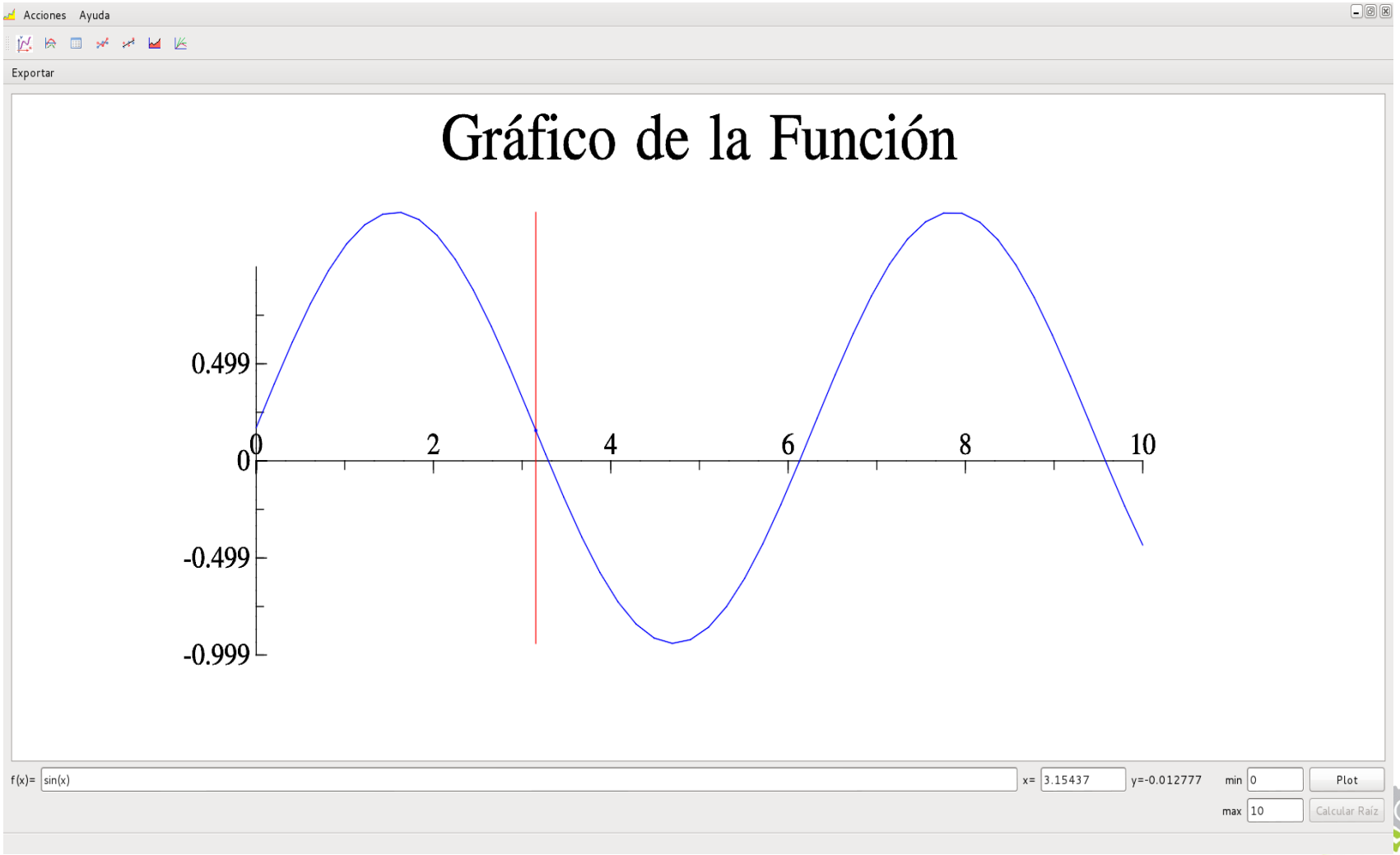
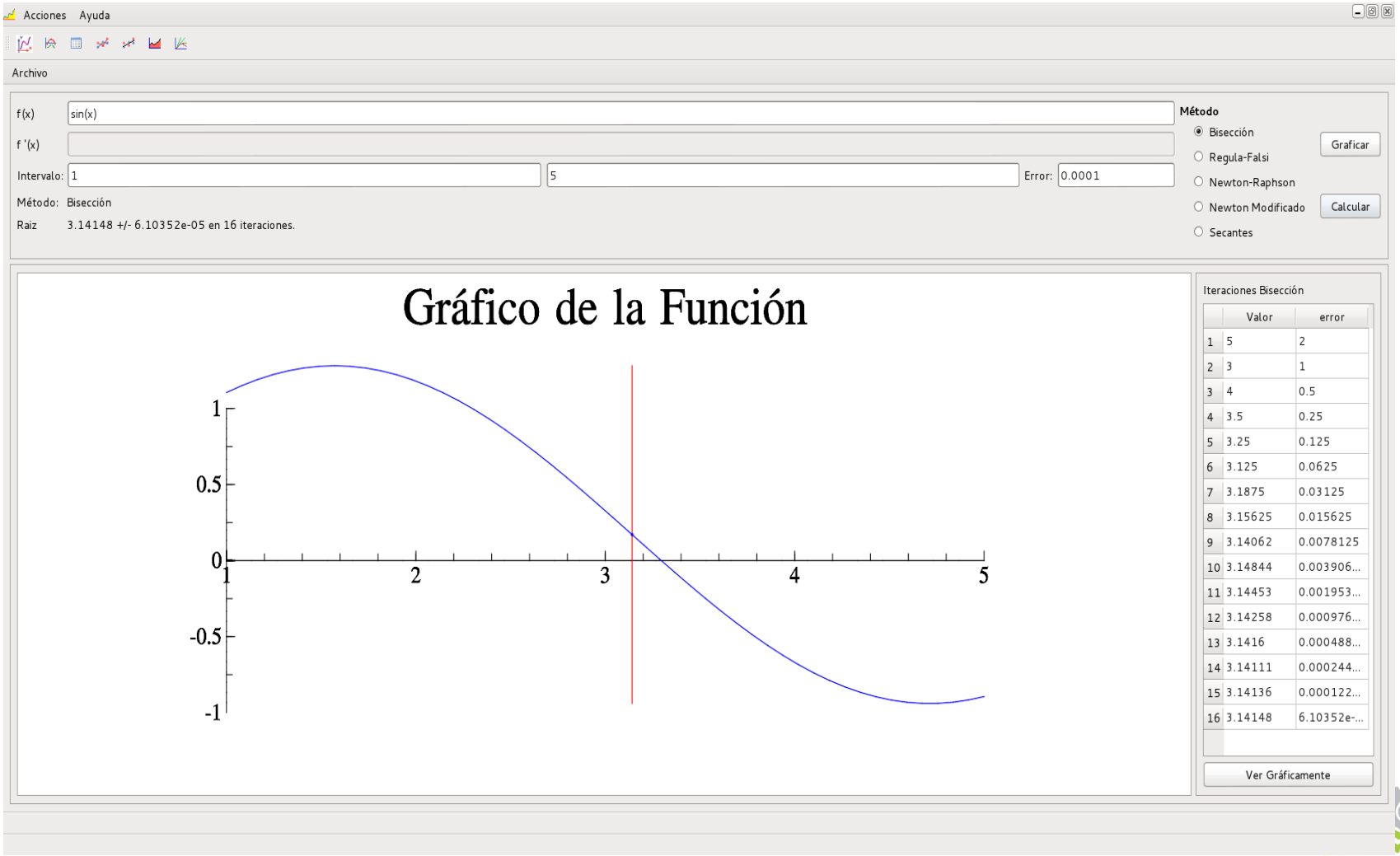

Acciones
Ayuda
Exportar
Gráfico de la Función
0.499
0
-0.499
-0.999
0
2
4
6
8
10
f(x)=
sin(x)
x=
3.15437
y=-0.012777
min
0
Plot
max
10
Calcular Raiz

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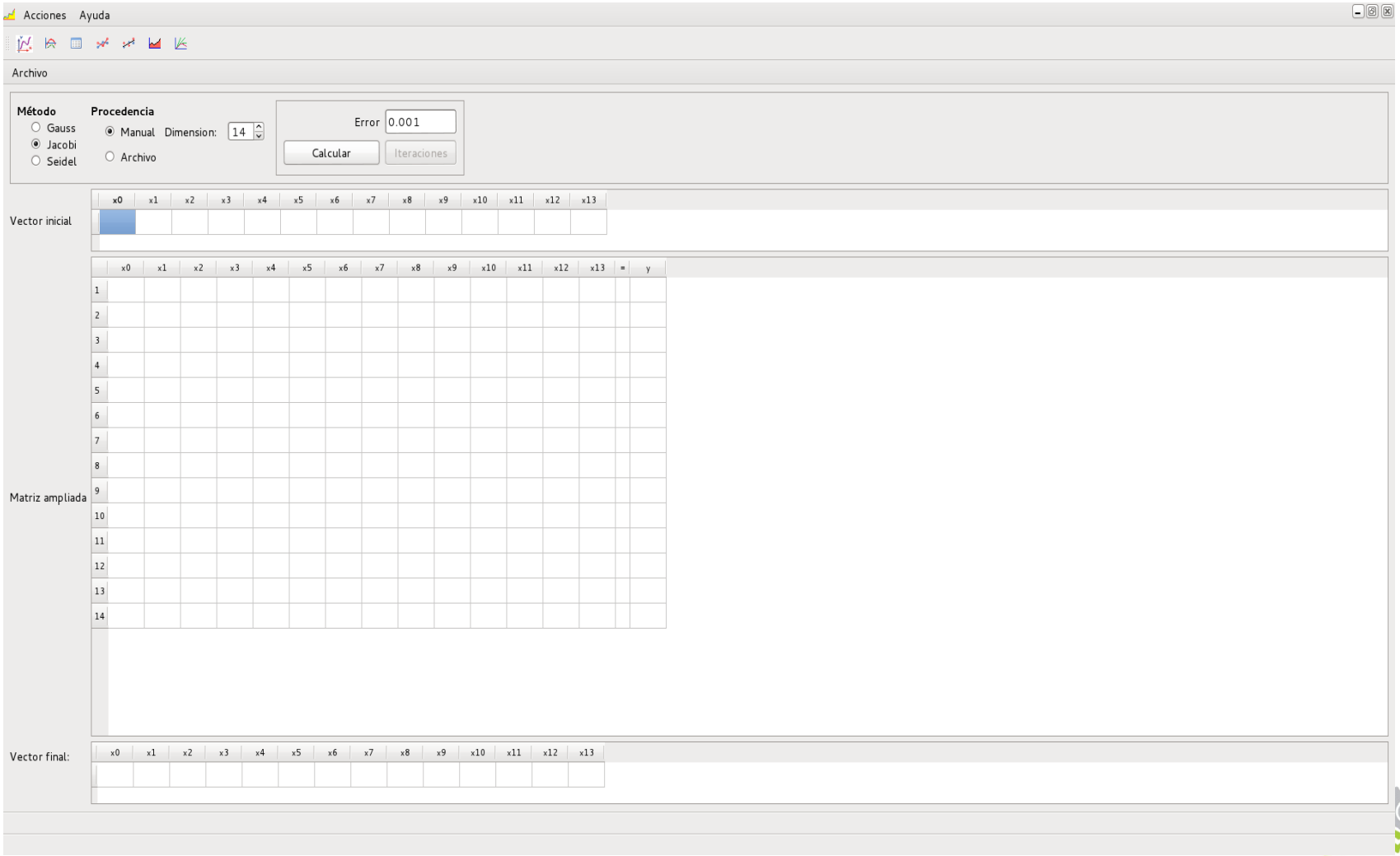
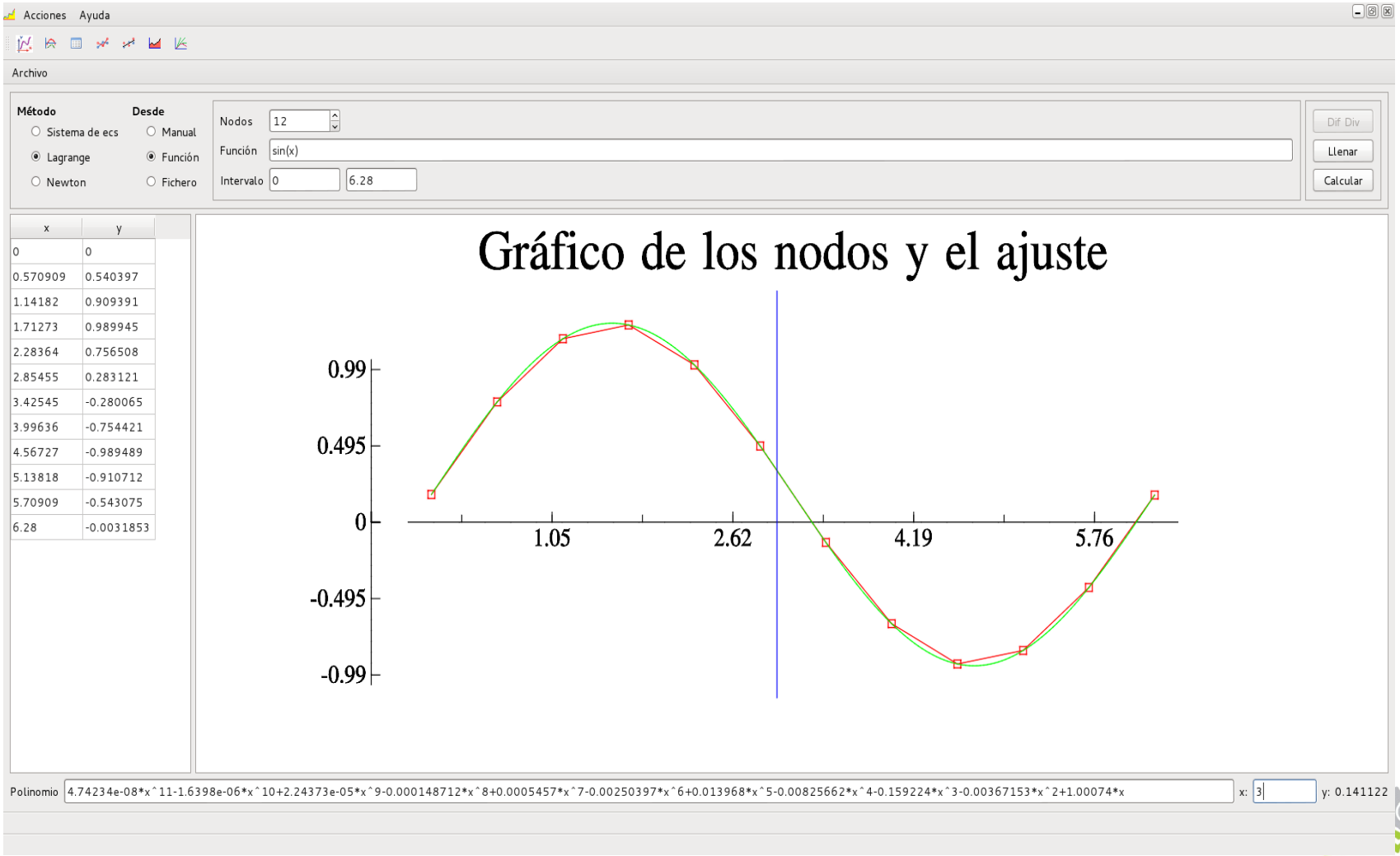
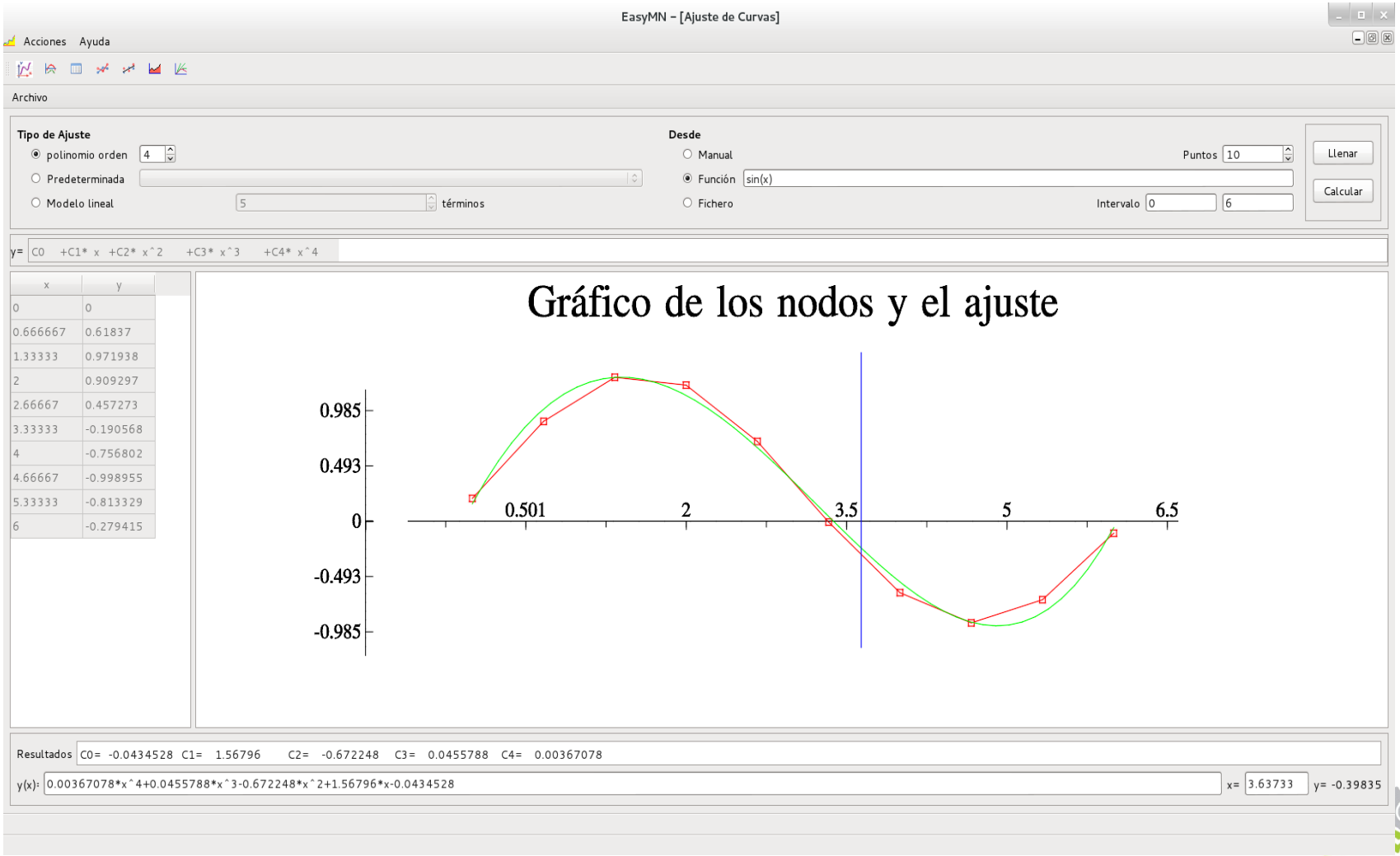
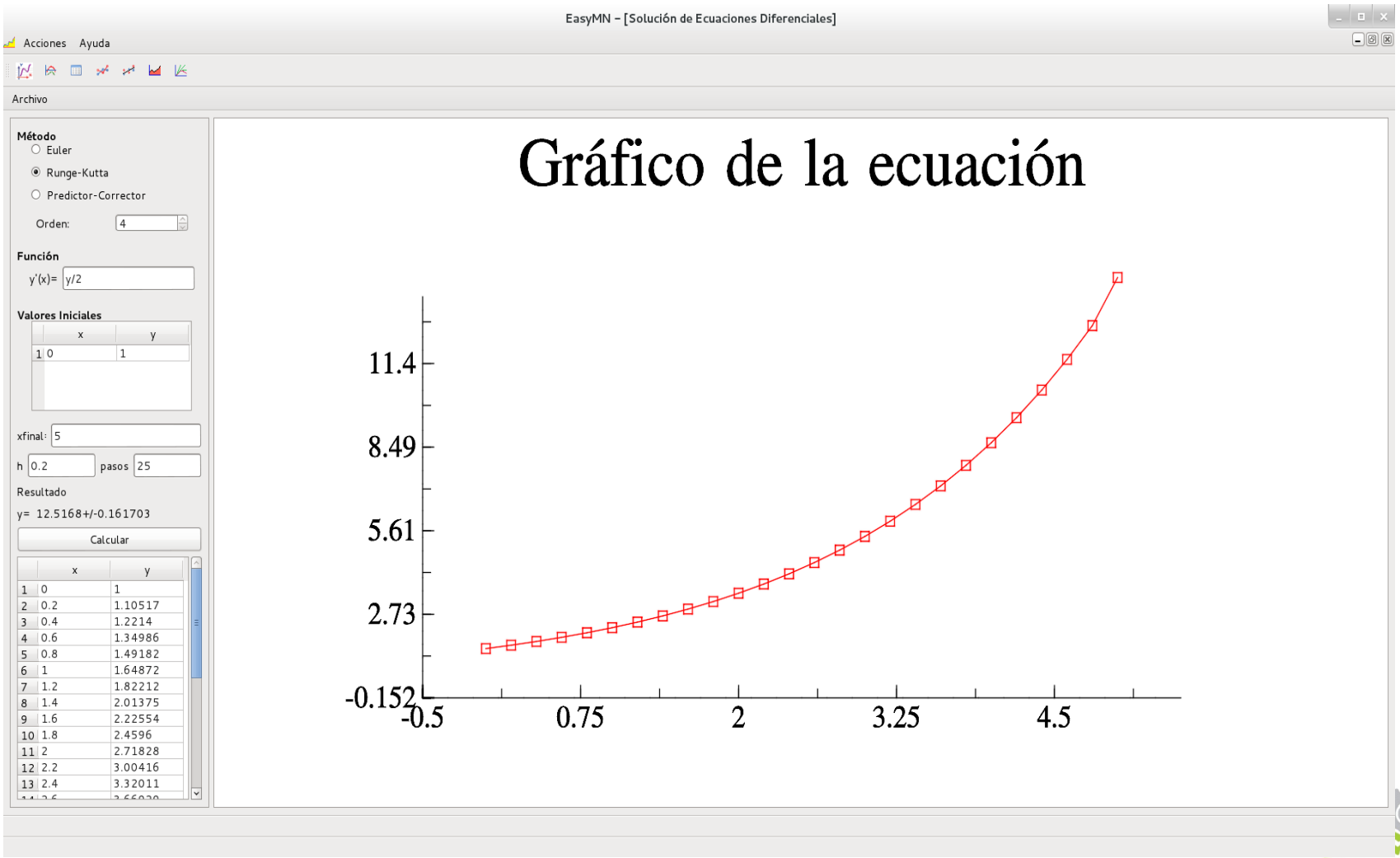

Acciones
Ayuda
Archivo
Método
Gauss
Jacobi
Seidel
Procedencia
Manual
Dimension:
14
Archivo
Error
0.001
Calcular
Iteraciones
Vector inicial
Matriz ampliada
Vector final:
x0 x1 x2 x3 x4 x5 x6 x7 x8 x9 x10 x11 x12 x13
= y

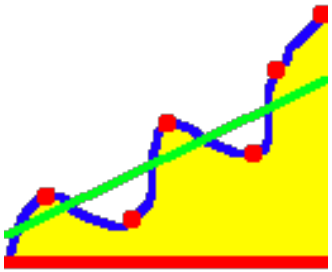

Acciones
Ayuda
Archivo
Método
Sistema de ecs
Lagrange
Newton
Desde
Manual
Función
Fichero
Nodos
12
Función
sin(x)
Intervalo
0
6.28
Dif Div
Llenar
Calcular
x
y
0 0
0.570909 0.540397
1.14182 0.909391
1.71273 0.989945
2.28364 0.756508
2.85455 0.283121
3.42545 -0.280065
3.99636 -0.754421
4.56727 -0.989489
5.13818 -0.910712
5.70909 -0.543075
6.28 -0.0031853
Gráfico de los nodos y el ajuste
0.99
0.495
0
-0.495
-0.99
1.05
2.62
4.19
5.76
Polinomio
4.74234e-08*x^11-1.6398e-06*x^10+2.24373e-05*x^9-0.000148712*x^8+0.0005457*x^7-0.00250397*x^6+0.013968*x^5-0.00825662*x^4-0.159224*x^3-0.00367153*x^2+1.00074*x
x: 3
y: 0.141122


EasyMN – [Ajuste de Curvas]
Acciones
Ayuda
Archivo
Tipo de Ajuste
polinomio orden
4
Predeterminada
Modelo lineal
5
términos
Desde
Manual
Puntos
10
Función
sin(x)
Fichero
Intervalo
0
6
Llenar
Calcular
y= C0 +C1* x +C2* x^2 +C3* x^3 +C4* x^4
x
y
0
0
0.666667
0.61837
1.33333
0.971938
2
0.909297
2.66667
0.457273
3.33333
-0.190568
4
-0.756802
4.66667
-0.998955
5.33333
-0.813329
6
-0.279415
Gráfico de los nodos y el ajuste
0.985
0.493
0
-0.493
-0.985
0.501
2
3.5
5
6.5
Resultados
C0= -0.0434528 C1= 1.56796 C2= -0.672248 C3= 0.0455788 C4= 0.00367078
y(x):
0.00367078*x^4+0.0455788*x^3-0.672248*x^2+1.56796*x-0.0434528
x=
y=


EasyMN – [Ajuste de Curvas]
Acciones
Ayuda
Archivo
Tipo de Ajuste
polinomio orden
4
Predeterminada
Modelo lineal
5
términos
Desde
Manual
Función
sin(x)
Fichero
Puntos
10
Intervalo
0
6
Llenar
Calcular
y= C0 +C1* x +C2* x^2 +C3* x^3 +C4* x^4
x
y
0 0
0.666667 0.61837
1.33333 0.971938
2 0.909297
2.66667 0.457273
3.33333 -0.190568
4 -0.756802
4.66667 -0.998955
5.33333 -0.813329
6 -0.279415
Gráfico de los nodos y el ajuste
0.985
0.493
0
-0.493
-0.985
0.501
2
3.5
5
6.5
Resultados
C0= -0.0434528 C1= 1.56796 C2= -0.672248 C3= 0.0455788 C4= 0.00367078
y(x): 0.00367078*x^4+0.0455788*x^3-0.672248*x^2+1.56796*x-0.0434528
x= 3.63733
y= -0.39835


EasyMN – [Solución de Ecuaciones Diferenciales]
Acciones
Ayuda
Archivo
Método
Euler
Runge-Kutta
Predictor-Corrector
Orden:
4
Función
y'(x)=
y/2
Valores Iniciales
x
y
1 0
1
xfinal:
5
h
0.2
pasos
25
Resultado
y= 12.5168+/-0.161703
Calcular
x
y
1 0 1
2 0.2 1.10517
3 0.4 1.2214
4 0.6 1.34986
5 0.8 1.49182
6 1 1.64872
7 1.2 1.82212
8 1.4 2.01375
9 1.6 2.22554
10 1.8 2.4596
11 2 2.71828
12 2.2 3.00416
13 2.4 3.32011
Gráfico de la ecuación
11.4
8.49
5.61
2.73
-0.152
-0.5
0.75
2
3.25
4.5

# Limitations



An open source tool for teaching numerical methods.

## It is for

- Teaching
- Small and fast calculations.
- Small and fast researches
- Old computers
- Any operative system.

## It is NOT for

- Thesis
- Papers
- Investigations
- To be commercialized or sold.

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# In profress and future.

1. The version 2.0 has been released just two weeks ago.
   1. New documentation system using doxygen.
   2. Qt5 and MathGl-7.2 supported.
   3. Some corrections to the parser.
   4. Fixed some bugs
2. The documentation needs to be improved in some aspects.
3. Add the statistics utilities.
4. Other interesting softwares.

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