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Birch and Swinnerton-Dyer Conjecture Clay Institute Millenium Problem Solution

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Abstract

This paper presents the solution to the Birch Swimmerton problem. It entails the use of critical damping of a Mass-Spring-Dash Pod system which, when modelled mathematically, provide the equation that allows the solution of the zeta problem to be solved.

Keywords: Zeta functions; Dash pod systems; Mean functions

Introduction

But in special cases one can hope to say something. When the solutions are the points of an abelian variety, the Birch and Swinnerton-Dyer conjecture asserts that the size of the group of rational points is related to the behavior of an associated zeta function ζ(s) near the point s=1. In particular this amazing conjecture asserts that if ζ(1) is equal to 0, then there are an infinite number of rational points (solutions), and conversely, if ζ(1) is not equal to 0, then there is only a finite number of such points [1].

Explanation

Equation of motion

From Verruijt, we know the equation of motion for a mass –spring-dashpod system is:

m∗d2u/dt2+c∗du/dt+ku=0

So, taking the resonant frequency into account, the equation from Verruijt becomes:

d2u/dt2+2zw0∗du/dt+w02u=0

Where w0=resonant frequency and z is a measure of the system damping [2].

At critical damping, the characteristic equation is the golden mean function:

x−=1/[x−1]

Or,

x2−x−1=0

The roots to this equation are, of course, -0.618 and 1.618.

Value for i-the imaginary number Now, before examining zeta z in equation form, we calculate a real value for the imaginary i= $\sqrt{(-1)}$

[1−i]=1/[(1−i)−1]

1−i=1/−i

−i=1/[1−i]

i=1/[i−1]

x=1/[x−1]

x=-0.618, 1.618

So, $\sqrt{(-1)}$ = -0.618, 1.618

Damping ratio zeta z

Now, zeta=z=damping ratio=w/w0:

$du0/dw = 0 : w/w0 = \sqrt{[1-2z2]}$

Algebraically:

du0/0=dw

$w = w0 * \sqrt{[1-2z2]}$

Taking the derivative:

du0/0=dw=w′=[w0∗(1−2z2)1/2]′

w0/2∗(1−2z2)1.5]/1.5

In the Birch conjecture, there are two possibilities to consider [3]. They are:

z(1)=0 and z(1)(not=)0

In the first case:

0=w0/3[(1−2(1)2]1.5

0=w0/3(11.5)

W0=0

Z(1)=0,w0=0

Critical damping

In the second case, we have critical damping. z(1) (not=)m 0

Say z(1)=1

1=w0/3[(1−2(12)]1.5 w0=3

Or w0=C1 w0 is a real number. In case 1 again:

Z(1)=0,w0=0

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$du / dw = 0w / w0 = \sqrt{[(1-2z2)]}$

$w / 0 = [(1-2(z)2)]$ w=0

w/w0=0/0 Dividing by zero has infinite solution. Now, finally, in the critical damping case:

$du / dw = 0 \; w / w0 = \sqrt{[(1-2(z2))]} \; w / C1 = \sqrt{[(1-2(12))]}$

w= $\sqrt{(-1)}(c1)$

We know $\sqrt{(-1)}$ =-0.618, 1.618. So, w=-0.618 0r 1.618 w/w0=0.618 C1/C1=0.618. Therefore there is a real solution to z at critical damping [4,5].

Conclusion

Simple Mechanics combined with knowledge of the zeta function and the value of the imaginary number provides the ingredients to solve the Birch and Swinnerton-Dyer Conjecture.

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