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Amplitude–Frequency Relationships in Simplified Wave Function Compared with Weight–Relative Growth Rate Relationships in Basic Growth Function

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This study was designed to investigate amplitude–frequency relationships in simplified wave function by making a comparison with weight–relative growth rate relationships in basic growth function. In basic growth function, combining the first, second and third derivatives led to a modified differential equation, from which simplified wave function as well as basic growth function was derived. The results obtained were as follows. Amplitude (A) in wave function corresponded to weight (W_0) in growth function. Since relative growth rate (r) in growth function was the rate of growth per unit of W, the correspondence in wave function might hypothetically be the number of frequencies (f) divided by amplitude (f/A). According to W–r relationships in growth function, corresponding relationships between A and f/A were suggested as follows. (i) High A and high f/A, (ii) high A and low f/A, (iii) low A and high f/A, (iv) low A and low f/A. Did these hypothetic relationships (i) ~ (iv) suggest a problem of energy in wave–matter relationships? It was suggested that hypothetic amplitude–frequency relationships were shown in simplified wave function by making a comparison with weight–relative growth rate relationships in basic growth function.

INTRODUCTION

In basic growth function, combining its first, second and third derivatives led to a modified differential equation for growth, from which, as solutions to it, not only basic growth function but also simplified wave function was derived when extending solutions to complex numbers (Shimojo *et al.*, 2006, 2007, 2009a, 2009b). Both growth phenomena and wave phenomena or structures are observed in plants and animals: vines of climbing plants, motion of flagella of spermatozoa, helical structures of proteins and DNA and so on. Correspondences between wave functions and growth functions seem to be an issue of interest from the viewpoint of being derived from the same differential equation.

The present study was designed, apart temporarily from animal agriculture, to investigate amplitude–frequency relationships in simplified wave function by making a comparison with weight–relative growth rate relationships in basic growth function.

AMPLITUDE–FREQUENCY RELATIONSHIPS IN SIMPLIFIED WAVE FUNCTION AND WEIGHT–RELATIVE GROWTH RATE RELATIONSHIPS IN BASIC GROWTH FUNCTION

Modified differential equation for basic growth function

Basic growth function is given by

$$W_B = W_0 \cdot \exp(r \cdot t), \tag{1}$$

where W_B = weight, t = time, r = relative growth rate, W_0 = weight at $t = 0$.

Combining the first, second and third derivatives of function (1) gives

$$\frac{d^2W/dt^2}{dW/dt} = \frac{d^3W/dt^3}{d^2W/dt^2} = r, \tag{2}$$

therefore,

$$(d^2W/dt^2)^2 = (dW/dt) \cdot (d^3W/dt^3). \tag{3}$$

Simplified wave functions as solutions to modified differential equation (3)

If solutions are extended to complex numbers, function (4) is also a solution to differential equation (3), as suggested by Shimojo *et al.* (2006, 2007, 2009a, 2009b),

$$W = W_0 \cdot \exp((\boldsymbol{i}r) \cdot t), \tag{4}$$

where $\boldsymbol{i}$ = imaginary unit.
Since function (4) is a simplified wave function, this is rewritten as follows,

$$\psi = A \cdot \exp((\boldsymbol{i}F) \cdot t), \tag{5}$$

where ψ = wave function, A = amplitude, F = term related to frequency.

Hypothetic correspondences between simplified wave function and basic growth function

Hypothetic correspondences are suggested between simplified wave function and basic growth function. The term A in wave function (5) corresponds to W_0 in growth function (1). There is a relationship between r and W through $r = (1/W)\cdot(dW/dt)$ in basic growth function (1). If this concept is forcedly applied to wave function (5), then F is hypothetically interpreted as number of fre-

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quencies (f) divided by amplitude (A), namely f/A.

There are combinations of W_0 and r in basic growth function (1); high W_0 and high r, high W_0 and low r, low W_0 and high r, low W_0 and low r. Therefore, hypothetic relationships between A and f/A are suggested as follows. (i) High A and high f/A, (ii) high A and low f/A, (iii) low A and high f/A, (iv) low A and low f/A. Boldly writing at the risk of making mistakes, do these hypothetic relationships (i) ~ (iv) suggest a problem of energy in wave–matter relationships?

Conclusions

It is suggested from the present study that amplitude–frequency relationships are hypothetically shown in simplified wave function by making a comparison with weight–relative growth rate relationships in basic growth function.

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