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The mathematical models of the periodical literature publishing process

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Abstract

Based on a theoretical analysis, the paper establishes the mathematical models of the periodical publishing process: a continuous model and a discrete model — a group of difference equations, which is derived from the former. The validity of the models is demonstrated by a particular solution of the continuous model at steady state. To some degree, the paper provides an effective mathematical tool for the quantitative study of the periodical literature publishing process. © 2000 Elsevier Science Ltd. All rights reserved.

Keywords: Periodical literature; Publishing process; Time delay; Mathematical model; Partial differential equation; Difference equation

1. Introduction

Various periodicals provide the base for the production of the literature. The periodical literature publishing process has close relationship with the process of literature increasing, literature obsolescence, and literature citation (Yu Guang & Yu Daren, 1996). The quantitative study *of* the process will be an important part of bibliometrics (Qiu, 1988). The authors (Yu Guang & Yu Daren, 1997) present a statistical analysis on the literature publishing delay process of six English journals. The statistical data show that there exists obvious regularity in the literature publishing process. Furthermore, the authors present the identification of the literature publishing process, establish the dynamic mathematical model of the process and

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Table 1
The relative factors of the periodical literature publishing process

Symbol	Name and concept	Dimension
t	time variable	t
T	the literature age (the age of deposited contribution); note: when the article is received, T is counted as 0	t
$X(t)$	the adopted contribution flux at time t	pieces/t
τ	the time delay caused by the examination of the contribution; note: it differs according to different periodicals; generally, it is about 3 months	t
$N(t)$	the deposited contribution quantity at time t; note: it is the quantity of the contributions deposited in the editorial office ready for publication	pieces
$N(T, t)$	the age distribution of the deposited contribution at time t	pieces/t
$Y(t)$	the published literature flux at time t	pieces/t
$Y(T, t)$	the age distribution of the published literature flux at time t	pieces /t^2
T_0	the time when the contribution is received	t

demonstrate its accuracy. In the article, the authors also illustrate that the publishing process of all the six journals can be described by a second-order transfer function with time delay. However, the identification model has its own limitation: it only describes the outer characteristics but not the theoretical characteristics of the process.

The periodical literature publishing process consists of the article posting process, article examining process (including article correcting process), waiting and publishing process. In order to study quantitatively, the authors define some physical quantities. After contributed to a journal, an article is examined, corrected and then adopted. The quantity of the articles adopted on the publication interval of a certain periodical is defined as the contribution adoption quantity per issue. To a certain periodical, the examining time is always a constant (1–3 months or so). It is called the examination time delay. The quantity of contributions, which is deposited in the editorial office after being examined, corrected and waiting for being published, is named as the deposited contribution quantity. The time from when a article is received to when it is published is called the age of deposited contribution. The quantity of the literature published in a certain issue of a periodical is called the published literature quantity per issue. The aim of the paper is to find the mathematical relationships among the quantities and establish the theoretical model of the literature publishing process.

The paper establishes two types of mathematical models: one is the continuous model — the partial differential equation when the literature publishing process is viewed as a continuous system (including article posting, examining, waiting and publishing); the other is the discrete model — a group of differential equations which can be obtained by making the continuous model discrete. The former has *the* advantage of simple calculation and is suitable for theoretical analysis and solving. The latter is suitable for digital analogy with computer, because the calculations being involved are difference summation.

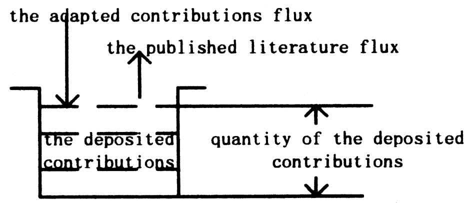

Fig. 1. The literature publishing process.

2. The continuous model of the periodical literature publishing process

2.1. Symbols and concepts

According to the analysis mentioned above, the main physical quantities which have influence on the literature publishing process are the contribution adoption quantity, the deposited contribution quantity, the age of deposited contribution and the published literature quantity. When the process is viewed as a continuous system changing with time, in order to simplify the study, we define the contributions adopted in the unit time as the adopted contribution flux, and the quantity of the literature published in the unit time as the published literature flux. The relative factors of the process are presented in Table 1.

According to the definition, we have $T=t-t_0$, namely, the age of the literature is the difference of the current time and the time when the contribution is received.

2.2. Basic equations

2.2.1. The differential equation of the deposited contribution quantity

The literature publishing process is shown in Fig. 1. The deposited contribution quantity has direct effect on the literature publishing process, the larger the deposited contribution quantity is, the more slowly the literature is published. There are two factors that cause the change of the deposited contribution quantity: the adopted contribution flux and the published literature flux. During the time differential divisor Δt, the change of the deposited contribution quantity

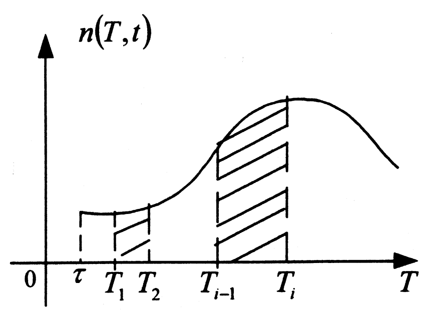

Fig. 2. The age distribution of deposited contributions.

is equal to the difference of the adopted contribution quantity and the published literature quantity on the time interval. Consequently, we have $\Delta N(t) = X(t)\Delta t - Y(t)\Delta t$.

Dividing both sides by Δt and letting $\Delta t \to 0$, we obtain

$$\frac{\mathrm{d}N(t)}{\mathrm{d}t} = X(t) - Y(t). \tag{1}$$

Eq. (1) is defined as the differential equation of the deposited contribution. It reflects the dynamic relationships among the deposited contribution quantity, the adopted contribution flux and the published literature flux.

2.2.2. The relationship of the deposited contribution quantity and the age distribution of deposited contribution

Generally, the deposited contributions in the editorial office have different ages. This fact can be described by an age distribution function of the deposited contribution. We suppose, at time t, the deposited contribution quantity function is $N(t)$, the age distribution is $n(T, t)$, shown in Fig. 2. When we take limited differential divisors Δt_i, the quantity of deposited contributions whose ages are on $(T_i, T_i + \Delta T_i)$ should be:

$$\Delta N_i(t) \cong n(T_i, T)\Delta T_i \quad \Delta T_i = T_i - T_{i-1}$$

Then the total quantity of the deposited contributions is

$$N(t) \cong \sum_{i=0}^{\infty} n(T_i, t)\Delta T_i.$$

Let $\Delta \mathrm{T_i} \to 0$, we get $N(t) = \int_0^{\infty} n(T, t)\,\mathrm{d}T$.

When the existence of time delay τ caused by the examination of the contribution is considered, we have

$$\begin{cases} n(T, t) = 0, & 0 \le T < \tau \\ n(T, t) \ge 0, & T \ge \tau \end{cases}.$$

Then, the integration turns to

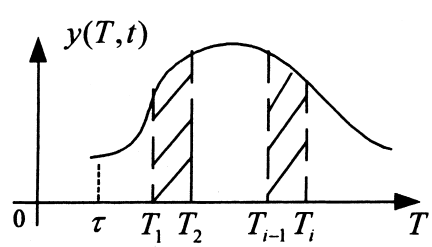

Fig. 3. The age distribution of published literature flux.

$$N(t) = \int_{\tau}^{\infty} n(T,\ t)\, \mathrm{d}T. \tag{2}$$

2.2.3. The relationship of the published literature flux and its age distribution

The published literature flux $Y(t)$ also has its age distribution function $y(T,\ t)$. Their relationship is established as follows. The curve shown in Fig. 3 is the age distribution curve of $y(T,\ t)$ at time t. when the time delay τ is also considered, we have

$$\begin{cases} y(T,\ t) = 0, & 0 \le T \le \tau \\ y(T,\ t) > 0, & T > \tau \end{cases}.$$

that is, only when $T > \tau$, the literature could have the opportunity to be published. At time t, the published literature flux whose age is on $(T_i,\ T_i + \Delta T_i)$ is

$$Y_i(t) = y(T_i,\ t)\Delta T_i \quad (\Delta T_i = T_i - T_{i-1}),$$

making summation, we have $Y(t) \cong \sum_{i=1}^{\infty} y(T_i,\ t)\Delta T_i$.

When $\Delta T_i \to 0$, we get

$$Y(t) = \int_{\tau}^{\infty} y(T,\ t)\, \mathrm{d}t. \tag{3}$$

2.2.4. The partial differential equation of the deposited contribution age distribution and the published literature flux age distribution

According to formula (1), we know that the change of the published literature flux causes that of the deposited contribution quantity. Similarly, the age distribution change of the former causes that of the latter. At time t, the quantity of the deposited contributions whose ages are on $(T,\ T+\Delta T($ is $n(T,\ t)\Delta T$. Δt later, the deposited contribution age, which is on $(T,\ T+\Delta T($ $(T > \tau)$ at time t, now is on $(T+\Delta t,\ T+\Delta t+\Delta T($. As a result, at time $t+\Delta t$, the quantity of deposited contributions whose ages are on $(T+\Delta t,\ T+\Delta t+\Delta T($ is $n(T+\Delta t,\ t+\Delta t)\Delta T$. It is the quantity of the literature published during Δt, namely, $y(T,\ t) \times \Delta T \times \Delta t$, that causes the change of the deposited contribution quantity. Consequently, the following formula is correct.

$$n(T,\ t) \times \Delta T - n(T+\Delta t,\ t+\Delta t) \times \Delta T = y(T,\ t) \times \Delta T \times \Delta t.$$

Rewriting it, we have

$$\frac{n(T,\ t) - n(T,\ t+\Delta t)}{\Delta t} + \frac{n(T,\ t+\Delta t) - n(T+\Delta t,\ t+\Delta t)}{\Delta t} = y(T,\ t).$$

Taking the limit as $\Delta t \to 0$, we obtain

$$\lim_{\Delta t \to 0} \frac{n(T,\ t) - n(T,\ t+\Delta t)}{\Delta t} + \lim_{\Delta t \to 0} \frac{n(T,\ t+\Delta t) - n(T+\Delta t,\ t+\Delta t)}{\Delta t} = y(T,\ t).$$

Rewriting it, we have

$$\frac{\partial n(T,\ t)}{\partial t} + \frac{\partial n(T,\ t)}{\partial T} = -y(T,\ t). \tag{4}$$

Equation (4), a partial differential equation of first order, reflects the inner relationship between the deposited contribution age distribution and the published literature flux age distribution.

2.2.5. The boundary condition of the age distribution of deposited contribution

A boundary condition is needed when solving the partial differential equation. When the age of the deposited contributions $T=\tau$ (τ is the pure time delay caused by the examination of articles), the age distribution of the deposited contributions is $n(\tau,\ t)$. At time t, the quantity of deposited contributions whose ages are on $(\tau,\ \tau+\Delta T)$ equals the quantity of the contributions adopted on $(t-\Delta T,\ t)$ minus the quantity of the contributions, whose ages are on $(\tau,\ \tau+\Delta T)$, published during the same time interval:

$$\int_{\tau}^{\tau+\Delta t} n(T,\ t)\,\mathrm{d}T = \int_{t-\Delta T}^{t} X(t)\,\mathrm{d}t - \int_{t-\Delta T}^{t}\int_{\tau}^{\tau+\Delta T} y(T,\ t)\,\mathrm{d}T\,\mathrm{d}t.$$

Dividing both sides by ΔT and taking the limit as $\Delta T \rightarrow 0$, we get

$$\lim_{\Delta T\rightarrow 0}\frac{1}{\Delta T}\int_{\tau}^{\tau+\Delta T} n(T,\ t)\,\mathrm{d}T = n(\tau,\ t).$$

$$\lim_{\Delta T\rightarrow 0}\frac{1}{\Delta T}\int_{t-\Delta T}^{t} X(t)\,\mathrm{d}t = X(t)$$

$$\lim_{\Delta T\rightarrow 0}\frac{1}{\Delta T}\int_{t-\Delta T}^{t}\int_{\tau}^{\tau+\Delta T} y(T,\ t)\,\mathrm{d}T\,\mathrm{d}t = \int_{\tau}^{\tau} y(T,\ t)\,\mathrm{d}T = 0.$$

Hence, we obtain

$$n(\tau,\ t) = X(t). \tag{5}$$

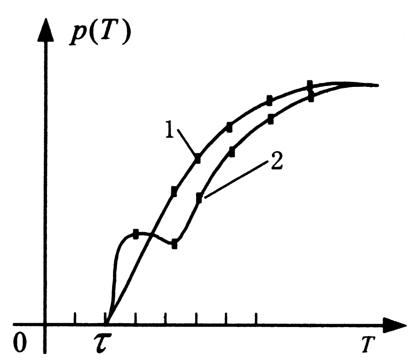

Fig. 4. The age distribution of deposited contribution publishing probabity.

Equation (5) is the boundary condition of the age distribution of the deposited contribution.

2.2.6. The age distribution function of the deposited contribution publishing probability

The deposited contributions of different ages have different probabilities, when editors of a certain periodical choose contributions to publish. Supposing, at time t, the age distribution function of the deposited contribution publishing probability is $P(T, t)$, we have

$$y(T, t) = P(T, t) \times n(T, t). \tag{6}$$

According to Eq. (6), to a certain T, if $n(T, t) = 0$ (there is no deposited contribution of the age), then $y(T, t) = 0$; if $P(T, t) = 0$ (the contribution is not chosen), then $y(T, t)$ also equals 0. This coincides with the common sense. Usually, $P(T, t)$ reflects the custom and the idea of the editor when he or she chooses contributions to publish. After consulting some editors, we find that the distribution of $P(T, t)$ has certain regularity. The majority of the editors think that the deposited contribution of long age has the priority to be published compared to the deposited contribution of short age. $P(T, t)$ coinciding with this idea is approximately described by the curve 1 shown in Fig. 4. However, some other editors think the deposited contribution of short age should also have chance to be published, in order to protect the publication right of the high quality contributions. $P(T, t)$ coinciding with this idea is shown as curve 2 in Fig. 4.

Since $P(T, t)$ has obvious influence on the publication delay process, it can be used to assess the literature publishing process being accorded with it through the equations established in the paper.

Ordinarily, $P(T, t)$ remains relatively stable for a rather long time, unless the compiler is replaced by another or the regularity of literature publication is changed. Usually, it is supposed that $P(T, t)$ has no relationship with time t on a certain interval, that is, $P(T, t) = P(T)$. Thus, the calculation is greatly simplified. From Eq. (6), we have

$$y(T, t) = P(T) \times n(T, t). \tag{7}$$

According to the derivation and analysis, we represent the basic equations and the boundary condition of the literature publishing process as the following:

$$\begin{cases} \dfrac{\mathrm{d}N(t)}{\mathrm{d}t} = X(t) - Y(t) \\ N(t) = \displaystyle\int_{\tau}^{\infty} n(T, t)\,\mathrm{d}T \\ Y(t) = \displaystyle\int_{\tau}^{\infty} y(T, t)\,\mathrm{d}T \\ \dfrac{\partial n(T, t)}{\partial t} + \dfrac{\partial n(T, t)}{\partial t} = -y(T, t) \\ n(\tau, t) = X(t) \\ y(T, t) = P(T) \times n(T, t) \end{cases}.$$

The initial conditions of the above are:

$$N(t)|_{t=0} = N_0,$$
$$n(T,\ t)|_{t=0} = n_0(T),$$
$$X(t)|_{t=0} = X_0,$$
$$Y(t)|_{t=0} = Y_0.$$

3. The discrete model of the periodical literature publishing process

The authors also establish the discrete model of the process: the difference equations, considering the intrinsic discrete characteristics of the periodical literature publishing process and the simplification of publishing process simulation.

Let k represent the issues of the periodical, i represents the different node points of the literature age (the age node point when the literature is published) and ΔT represents the interval between two published issues: $T_i - T_{i-1} = \Delta T$. And we define X_k as the quantity of contributions adopted on the publication interval between No. k and No. $k-1$, N_k as the quantity of contributions deposited before No. k is published, and Y_k as the quantity of the literature published in No. k.

3.1. The difference equation of the deposited contribution quantity

Changing the form of the differential equation of the deposited contribution quantity, and integrating t on the publishing interval of No. k and No. $k-1$, we have

$$N_k = N_{k-1} + X_k - Y_k. \tag{1'}$$

3.2. The relationship of the deposited contribution quantity and its age distribution

By making Eq. (2) discrete, we have the deposited contribution quantity before the publication of No. k:

$$N_k = \sum_{i=0}^{\infty} n_k(T_i)\Delta T. \tag{2'}$$

where ΔT is the interval between two issues of the periodical.

3.3. The relationship of the published literature quantity and its age distribution

We suppose $y_k(T)$ is the age distribution function of the published literature quantity of No. k. Then, by making Eq. (3) discrete, we get

$$Y_k = \sum_{i=0}^{\infty} y_k(T_i)\Delta T. \tag{3'}$$

When $0 \le T \le \tau$, the contributions have no opportunities to be published, so

$$\begin{cases} y_k(T) = 0 & 0 \le T \le \tau \\ y_k(T) > 0 & T > \tau \end{cases}.$$

3.4. The difference equation of the deposited contribution age distribution and the published literature age distribution

On the base of the definition, the literature age T is a function of time t, there is function $T = t - t_0$, we get $\mathrm{d}T/\mathrm{d}t = 1$. By changing the form of Eq. (4), we have

$$\frac{\mathrm{d}n(T,\ t)}{\mathrm{d}t} = \frac{\partial n(T,\ t)}{\partial t} + \frac{\partial n(T,\ t)}{\partial T} \times \frac{\mathrm{d}T}{\mathrm{d}t} = \frac{\partial n(T,\ t)}{\partial t} + \frac{\partial n(T,\ t)}{\partial T} = -y(T,\ t).$$

$$\Longrightarrow \mathrm{d}n(T,\ t) = -y(T,\ t)\,\mathrm{d}t.$$

Then, by integrating t in both sides of the above equation from kt_0 to $(k+1)t_0$, we derive the discrete difference equation

$$n_{k+1}(T_{i+1}) = n_k(T_i) - y_k(T_i)\Delta T. \tag{4'}$$

3.5. The boundary condition of the deposited contribution age distribution

Since the node point interval is ΔT, we have, on the base on Eq. (5):

$$n_k(\tau) = X_k/\Delta T. \tag{5'}$$

3.6. The age distribution function of the deposited contribution publishing probability

By making Eqs. (6) and (7) discrete, we have

$$y_k(T_i) = P_k(T_i) \times n_k(T_i). \tag{6'}$$

When $P_k(T)$ has no relation with k, namely, the publication probability is only relative to the age, we have

$$y_k(T_i) = P(T_i) \times n_k(T_i).$$

According to the derivation above, by making the continuous model discrete, we represent the difference equations and the boundary condition as follows:

$$\begin{cases} N_{k+1} = N_k + X_k - Y_k \\ N_k = \sum_{i=0}^{\infty} n_k(T_i) \times \Delta T \\ Y_k = \sum_{i=0}^{\infty} y_k(T_i) \times \Delta T \\ n_{k+1}(T_{i+1}) = n_k(T_i) - y_k(T_i)\Delta T \\ n_k(\tau) = X_k/\Delta T \\ \quad y_k(T_i) = P(T_i) \times n_k(T_i) \end{cases} .$$

The initial conditions are: $N_{k=0} = N_0,\ X_{k=0} = X_0,\ Y_{k=0} = Y_0$.

4. A particular solution of the mathematical model

In order to prove the adaptability of the mathematical model established in the paper, we analyse a type of particular solution. Firstly, we analyse the continuous model. No matter monthly, bimonthly or quarterly, once a periodical is published, its various indices will tend to be stable after some time. We think the periodical achieves its steady state, when the literature quantity of each issue and the deposited contribution quantity are stable, and the adopted contribution flux does not change. Certainty, at the state, various physical quantities which have great influence on the periodical literature publishing process do not change with time t. To get a simplified solution, we take the most simple age distribution of the literature publishing probability: $P(T) = P = \text{const.}$, which is according to the fact that contributions are taken randomly from the deposited ones to be published.

Now we begin to find the steady state solution of the literature publishing process, according to the suppositions. From Eqs. (4) and (6), we have

$$\frac{\partial n(T)}{\partial t} + \frac{\partial n(T)}{\partial T} = -y(T) = -P \times n(T).$$

When the state is steady, we have $\partial n(T)/\partial t = 0$.

Hence

$$\frac{dn(T)}{dT} = -P \times n(T) \Longrightarrow \frac{d\ \ln n(T)}{dT = -P} .$$

Integrating it, we obtain

$$\ln n(T) = \ln n(\tau) - \int_{\tau}^{T} P\ dt.$$

According to Eq. (5), $n(\tau) = X$. Then substituting it into the equation above, we have

$$n(T) = X \times e^{-P(T-\tau).} \quad (8)$$

Considering that $y(T) = P \times n(T)$, we have

$$y(T) = P \times X\mathrm{e}^{-P(T-\tau)}$$

By integrating it, we obtain the accumulated publication flux:when $0 \leq T \leq \tau$, $y(T) = 0$. Thus

$$\int_0^T y(T)\,\mathrm{d}T = \int_\tau^T y(T)\,\mathrm{d}T = \int_\tau^T X \times P \times \mathrm{e}^{-P(T-\tau)}\,\mathrm{d}T = X\int_\tau^T P\mathrm{e}^{-P(T-\tau)}\,\mathrm{d}T.$$

When the state is steady, $X = X_0 = Y_0$, we get

$$\int_0^T y(T)\,\mathrm{d}T = X1 - \mathrm{e}^{-P(T-\tau)}). \tag{9}$$

Substituting Eq. (8) into Eq. (2), we have

$$N = \int_\tau^\infty n(T)\,\mathrm{d}T = \int_\tau^\infty X \times \mathrm{e}^{-P(T-\tau)}\,\mathrm{d}T = \frac{X}{P}$$

$$\therefore P = \frac{X}{N.} \tag{10}$$

Substituting Eq. (10) into Eq. (9), we have

$$\int_0^T y(T)\,\mathrm{d}T = X(1 - \mathrm{e}^{-(T-\tau/(N/X))}). \tag{11}$$

Since at steady state, $X = Y$, then Eq. (11) is changed into

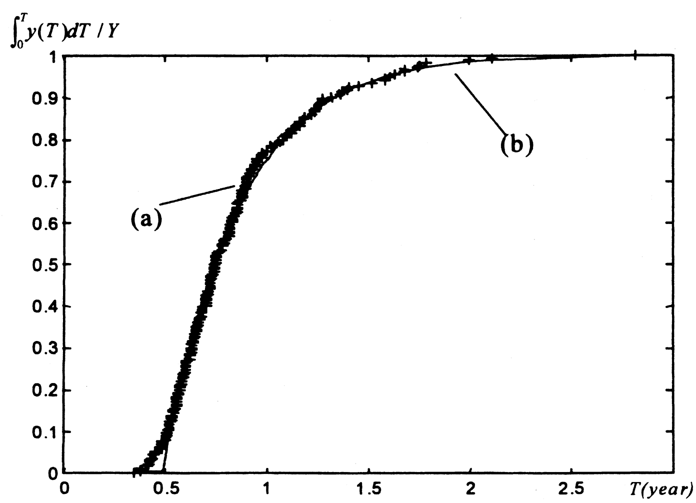

Fig. 5. Comparison of the statistical result (a) and the analytical result (b) of *J. Math. Phys. ('94)*

$$\int_0^T y(T)\,\mathrm{d}T = Y(1 - \mathrm{e}^{-(T-\tau/(N/Y))}). \tag{12}$$

The left side of the equation represents the age distribution of the accumulated publication flux. If we take *year* as the time unit, the left side means the total account of the published literature whose age is under T, each year. N/Y is the time constant. Therefore, we obtain the stable state solution of the age distribution of the periodical accumulated publication flux, under the particular condition — the publication probability density is a constant.

Secondly, by using the same method, we obtain the particular solution, namely $P = X/N$ and the stable state solution, of the discrete model of the periodical literature publishing process.

$$\sum_{i=0}^{m} y(T_i) = \left[1 - \left(1 - \frac{Y}{N}\right)^m\right] \times \frac{Y}{\Delta T} \tag{12a}$$

where $T_0 = \tau$.

Equation (12a) is the difference equation of the age distribution of the accumulated publication flux. When we take *year* as time unit, the left side of (12a) also means the total account of the literature published each year, whose age is under T. It is not difficult to understand that the quantity of the left sides of (12) and (12a) can be accounted. We can see that the supposed particular condition (P = const.) can be used to describe the publishing process of some periodicals roughly, comparing curve (a) in Fig. 5 which reflects the statistical result of *Journal of Mathematical Physics ('94)* with the curve (b) which reflects the analysis result of two kinds of the particular solutions of the mathematical models. The feasibility, therefore, of the periodical publishing process mathematical models we derived is proved.

Equation (12) clearly illustrates the factors which have influence on the rate of the literature publishing process. They are the time delay τ caused by the examination of the contributions, the deposited contribution quantity N and the published literature flux Y. In fact, when running a periodical, the editorial office often has a certain quantity of deposited contributions in order to avoid lacking for articles. However, the over large quantity of the deposited contributions must cause big publication time delay which leads to bad influence on the timely information transmission and decreases the useful value of the literature. So the intrinsic law illustrated by the particular solutions discussed in the paper have a certain value in directing the running of a periodical.

5. Conclusion

Two kinds of the theoretical mathematical models which represent the periodical literature publishing process are established. They are the continuous partial differential equation and the discrete difference equation. By finding the particular solutions under the simplest condition, the effectiveness of the models on illustrating the physical essence of the literature publishing process is demonstrated. The establishment of the models makes the study on the literature publishing process leap from the surface (empirical formula, identification model) to the

Table 2
The data corresponding to Fig. 5

	The statistical result of *Journal of Mathematical Physics*('94)		The result of the particular solutions of the mathematical models	
T (year)	$\int_0^T y(T)\,dT/Y$	$\int_0^T y(T)\,dT$ (pieces)	$\int_0^T y(T)\,dT/Y$	$\int_0^T y(T)\,dT$ (pieces)
0.3444	0	1.0000	0.	0
0.4222	0.0269	6.0000	0.	0.
0.4778	0.0645	13.0000	0.	0.
0.4861	0.0699	14.0000	0.0076	1.4191
0.5028	0.0806	16.0000	0.0510	9.5341
0.5139	0.1022	20.0000	0.0789	14.7460
0.5278	0.1237	24.0000	0.1125	21.0461
0.5472	0.1559	30.0000	0.1577	29.4811
0.5556	0.1828	35.0000	0.1763	32.9636
0.5694	0.2097	40.0000	0.2064	38.5974
0.5861	0.2312	44.0000	0.2411	45.0867
0.6028	0.2527	48.0000	0.2743	51.2922
0.6278	0.2903	55.0000	0.3214	60.0954
0.6361	0.3172	60.0000	0.3364	62.9011
0.6500	0.3387	64.0000	0.3606	67.4400
0.6639	0.3602	68.0000	0.3840	71.8128
0.6833	0.3978	75.0000	0.4153	77.6675
0.7111	0.4301	81.0000	0.4573	85.5189
0.7222	0.4624	87.0000	0.4733	88.4992
0.7361	0.4892	92.0000	0.4925	92.1018
0.7667	0.5323	100.0000	0.5325	99.5706
0.7889	0.5591	105.0000	0.5595	104.6305
0.8167	0.5860	110.0000	0.5912	110.5456
0.8528	0.6398	120.0000	0.6289	117.6048
0.8778	0.6774	127.0000	0.6530	122.1064
0.9000	0.7097	133.0000	0.6731	125.8621
0.9472	0.7366	138.0000	0.7120	133.1369
0.9722	0.7581	142.0000	0.7306	136.6309
1.0028	0.7742	145.0000	0.7518	140.5951
1.0778	0.8011	150.0000	0.7971	149.0527
1.1306	0.8280	155.0000	0.8239	154.0626
1.1806	0.8495	159.0000	0.8460	158.1972
1.2611	0.8817	165.0000	0.8759	163.7951
1.3611	0.9086	170.0000	0.9051	169.2553
1.5167	0.9355	175.0000	0.9375	175.3096
1.6778	0.9624	180.0000	0.9594	179.4121
1.7472	0.9731	182.0000	0.9663	180.7019
1.9944	0.9892	185.0000	0.9826	183.7553
2.8139	1.0000	187.0000	0.9981	186.6399

intrinsic law. It not only provides the effective mathematical tool for the quantitised study on the literature publishing process, but the methodological significance for the study on literature obsolescence and increasing process. Besides, it makes it possible to predict and control the literature publishing process.

Appendix A

See Table 2.

References

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