Mathematical model for the hit phenomenon
as a tool to predict popularity of weekly TV dorama

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Abstract

A mathematical model for the hit phenomenon in entertainment within a society is presented as a stochastic process of interactions of human dynamics. The model uses only the time distribution of advertisement budget as an input, and word-of-mouth (WOM) represented by posts on social network systems is used as data to compare with the calculated results. The unit of time is a day. We apply the model to the predict of popularity of TV drama using the social network log in blogs. We found that the indirect communication coefficient P agrees well with the measured TV ratings point using blog.

**Keyword:** mathematical model for hit phenomena; blog; WOM(word-of-mouth)

A mathematical model for the hit phenomenon in entertainment within a society is presented as a stochastic process of interactions of human dynamics in the sense of many-body theory in physics. In the model we use only the time distribution of advertisement budget as an input, and word-of-mouth (WOM) represented by posts on social network systems is used as observed data to compare with the calculated results. The unit of time is a day. We write down the equation of purchase intention at the individual level   as

$$\frac{dI_i(t)}{dt} = -aI_i(t) + \sum_j d_{ij}I_j(t) + \sum_j \sum_k h_{ijk}d_{jk}I_j(t)I_k(t) + f_i(t)$$

where d_{ij}, h_{ijk}, and $f_i(t)$ are the coefficient of the direct communication, the coefficient of the indirect communication, and the random effect for person i, respectively. We consider the above equation for every consumer. The advertisement and publicity effect are include in A(t). Using this equation, our calculations for the Japanese motion picture market have agreed very well with the actual residue distribution in time[1].

  Using this equation, **We** applied to some other social phenomena[2-5].

In this study we apply our mathematical model for hit phenomena for weekly TV drama. In fig.1, we show the correlation of Viewing rate of drama vs indirect communication. The calculation shows us that the viewing rate can be predict using the mathematical model. The calculation agrees also very well with the counts of the observed blog posting. Therefore, the mathematical model of hit phenomena we presented will be applicable to many marketing problem where the time-dependence of the popularity is significant.
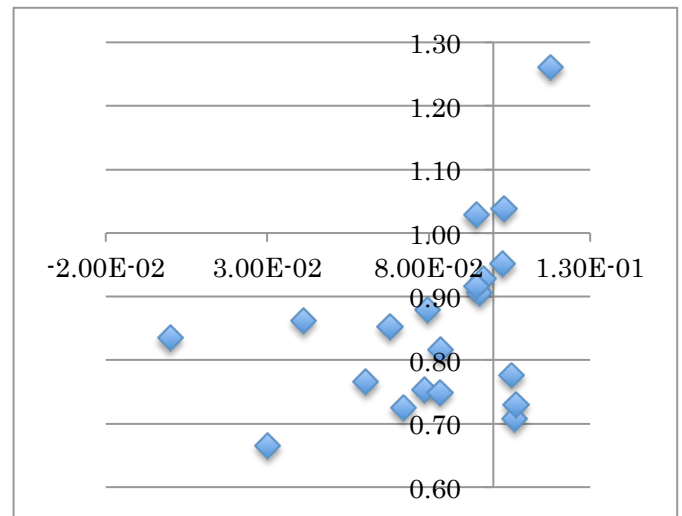
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