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Modeling The Distribution of Speakers of Languages Using Geometrical and Econimical Relations

Summary Sheet

Globalization has been the developmental trends of our world. The rapid increase of exchanges between different continents and countries requires much more interactions between people who speak different languages. The goal of this paper is to investigate the development trends of global languages, and choose best locations for setting up international offices when taking both the long-term and short-term benefits of large multinational companies into account.

Firstly, we propose a language distribution model to predict the change of different languages in the next 50 years. It simulates the distribution of language speakers over time and the geographical distribution of different languages in the same period. Among them, the distribution of native language speakers and that of second language speakers mainly affect the distribution of a given language.

Then, the gray prediction model is applied to predict the number of speakers of native languages in the next 50 years, and a geographic and economic relations based models are proposed to forecast the number of second languages speakers of different language. The approximate language distribution of different languages in the next 50 years can be obtained by adding up the number of native language speakers with that of second language speakers.

In geographic relations based model, all countries are divided into different language areas according to what native languages are used in these countries. Capitals of each country are treated as hotspot cities, and the distance between two hotspot cities is used to define a spreading factor which is multiplied with the population of a country to estimate the number of second language speakers of the language used as the native language in another country.

In economic relations based model, we choose the top nine countries in the global economic power as nine economies, and each economy has its own mother tongue. An influence factor of a language in another country is defined based on the economic and trade volume between the two countries. And the second language speakers of a given language can be the product of the influence factor and the population of the country.

Then, the gray forecasting model is used to estimate the population migration in the next 50 years. Through the change of population net migration in different language areas, the pattern and direction of population migration are speculated, and the change of language geographical distribution is thus obtained.

Finally, through the aforementioned models, the influence of language is evaluated using factors such as geography, economy, exchange of knowledge and media as well as foreign affairs. The weight of each index is determined via the analytic hierarchy process (AHP), and a three layer stratified structure is obtained, which provides the basis for the opening of the office of large international companies.