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# Modifying the Learning Algorithm on the Kirby's Model for Simultaneous Bilingual Case

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**Keywords:** Front end process, Separator, Bilingual, Kirby's model, Iterated Learning Model, Grammar acquisition.

To study the language evolution, there are many frameworks for investigating the cultural evolution of linguistic structure. One of them is a famous Iterated Learning Model (ILM) that named Kirby's model.

Kirby's model can work well in various experiments. But it cannot simulate some of case studies such as case studies of Latin language evolution. I am interested in this problem and set the objective of the research that is to design and implement language separator in order to make the Kirby's model which supports bilingual environments.

Language separator is a feature helping agent in Kirby's model differentiate two languages by observing the frequency of the co-occurrence of vocabularies and sentence structure. And Language separator will be successful, when languages in former generation can be transmitted to the next generation.

For this objective, we purposed the method. First of all, we modified the Kirby's model according to bilingual education in the real world. We give more definition about language in modified Kirby's model. We change the start generation from agent with blank grammar to agent with ideal grammar. We set a new characteristic of speaker agent and learner agent. We modify the speak process and invention to make agent can speak two language without mixing them. We modify the learning process by adding

scoring system to evaluate the relation score of each rule named front end process. The mechanism of front end process is observing co-occurrence of using rules. And we implemented the separator to help agent differentiate the languages by using relation score table that got from front end process. The separator will be applied when learner agent change role to be speaker agent.

After applying our proposed method, languages in former generation can be transmitted to the next generation. It shows the best performance when using the grammar that has no common area between two languages as grammar of n-th generation. And it shows the good performance when using the grammar that the number of rules in common area between two languages is grammar of n-th generation less than four.