1. Introduction

In the analysis of research data, the investigator often needs to decide whether several independent samples may be regarded as having come from the same population (e.g. [2]). Doing this problem in a statistical sense, we always set up classes for the variable in question and forming a frequency distribution. The most commonly used statistic is Pearson's χ^2 statistic (Pearson, 1900 [9]):

Consider a l-sample multinomial vector $n = \{n_1, n_2, \ldots, n_l\}$ with

$$\sum_{i=1}^{l} n_i = N .$$

The Pearson chi-squared test

$$\chi^2 = \sum_i \sum_j \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

is a well known statistical test for investigating the significance of the differences between observe data arranged in l classes and the theoretically expected frequencies in the l classes. It is clear that the large discrepancies between the observed data and expected cell counts will result in larger values of χ^2.

However, a somewhat ambiguous question is whether discrete data can be considered categorical and use the traditional χ^2-test. For example, when we are asked that " how much do you satisfy your life? ", you may response a fuzzy number (say, 70% of the satisfy). If we filled the fuzzy numbers in the questionnaire, then the sampling survey is not like the traditional sampling survey anymore. We can fill the fuzzy numbers in the questionnaires. When we do so, is it still appropriate to use the traditional χ^2-test for analysis those fuzzy data? In the paper of Wu and Chang (2007) [10], who use the fuzzy χ^2 test to check the significant difference, but didn't give a theoretic proof. Therefore, we will prove the detail in our paper.

There are some papers discussed the fuzzy random variables and fuzzy expected value, e.g. [4] [6] [7], but we don't want to prove the fuzzy χ^2 in this definition, since it will let our proof become more and more difficult. In our paper, we want to find a formula of fuzzy statistic distribution which is somewhat similar to the traditional statistic distribution. We hope that the fuzzy sample data can be used of this distribution to find out their expected value and variance. And then we can use traditional statistic method to prove the fuzzy χ^2.