1077-11-1290 **Jing-Jing Huang*** (huang@math.psu.edu), Department of Mathematics, 012 McAllister Building, State College, PA 16802. *Counting the number of solutions to the Erdős-Straus-Schinzel equation and related problems.*

In this talk, we are mainly concerned with the Diophantine equation

$$\frac{a}{n} = \frac{1}{x_1} + \frac{1}{x_2} + \cdots + \frac{1}{x_k}$$

and its number of positive integer solutions $R_k(n;a)$. We begin with the binary case $k = 2$, more precisely, we will investigate the distribution of the function $R_2(n;a)$. By averaging over n, we study the first moment and second moment behaviors of $R_2(n;a)$. For instance, one of our results is

$$\sum_{\substack{n\le N\\(n,a)=1}} R_2(n;a) = NP_2(\log N;a) + O_a(N\log^5 N),$$

where $P_2(\cdot;a)$ is a quadratic function whose coefficients depend on a. Furthermore, we show that, after normalisation, $R_2(n;a)$ satisfies Gaussian distribution, which is an analog of the Erdős-Kac theorem.

On the other hand, let $E_a(N)$ denote the number of $n \le N$ such that $R_2(n;a) = 0$. We will establish that when $a \ge 3$

$$E_a(N) \sim C(a)\frac{N(\log\log N)^{2^{m-1}-1}}{(\log N)^{1-1/2^m}},$$

with m defined in the talk.

The next project would be to study the ternary case $k = 3$. While the conjectured, by Erdős, Straus and Schinzel, that for fixed $a \ge 4$, we have $R_3(n;a) > 0$ when n is sufficiently large, is still wide open, here we will try to understand the mean value $\sum_{n\le N} R_3(n;a)$ and give some interesting results. (Received September 18, 2011)