IKKI O'LCHOVLI SIMPLEKSDA ANIQLANGAN MENDEL VA BERNULLI O'LCHOVLARI ORASIDAGI BOG'LANISH

Xurramov O.Sh.
(QarDU),

Faraz qilaylik (E,m) - ixtiyoriy o'lchovli fazo bo'lsin. $\Omega=\bigcap_{i=1}^{\infty}E_i$ fazoni qaraymiz, bu yerda hamma i lar uchun $E_i=E$ dir. Faraz qilaylik $E=(1,2,...,n)$ n ta elementdan chekli to'plam $p(i)=p_i$ - E da qaralayotgan taqsimot bo'lsin. Faraz qilaylik ξ_n funksiya, fazoning ixtiyoriy $w=(w_1,w_2,...)\in\Omega$ elementiga o'zining n-koordinatasi w_n ni mos qo'ysin. Bunday funksiya ξ_n n- koordinatali funksiya deyiladi.

Faraz qilaylik $F-\sigma$-algebra hamma chekli o'lchamli t silendrlar to'plamidan hosil qilingan bo'lsin,yani quydagi to'plamlardan iborat bo'lsin

$$\{w:\xi_m(w)=i_0,\ \ \xi_{m+1}(w)=i_1,...,\xi_{m+k}(w)=i_k\}$$

$F-\sigma$- algebrada ikkita P va Q o'lchovlarni qo'ydagi ko'rinishda aniqlaymiz. Q o'lchov F fazoda o'zining qiymatlari bilan bir qiymatli aniqlanadi

$$Q\{w:\xi_m(w)=i_0,\ \ \xi_{m+1}(w)=i_1,...,\xi_{m+k}(w)=i_k\}=Q_m(i_1,i_2,...,i_k)=Q_{mk}$$

Agar

$$Q_{mk}=p_{i_1}p_{i_2}...p_{i_k} \qquad (1)$$

Deb olsak, u holda qo'ydagi munosabat o'rinli bo'ladi

$$Q_{mk}\geq 0,\qquad \sum_{i=1}^{n}Q_m(i_1,i_2,...,i_k,i)=Q_{mk},\qquad \sum_{i=1}^{n}P_m(i)=1$$

(1) ga mos keluvchi o'lchov Q Bernulli o'lchovi deb ataladi.

Faraz qilaylik E={1,2,3} bo'lsin. S^2 simpleksda kvadratik stoxastik operatorni qo'ydagicha aniqlaymiz:

$P_{11,1}=1$	$P_{12,1}=1/2$	$P_{13,1}=0$
$P_{11,2}=0$	$P_{12,2}=1/2$	$P_{13,2}=1$
$P_{11,3}=0$	$P_{12,3}=0$	$P_{13,3}=0$

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$P_{22,1}=1/4$	$P_{23,1}=0$	$P_{33,1}=0$
$P_{22,2}=1/2$	$P_{23,2}=1/2$	$P_{33,2}=0$
$P_{22,3}=1/4$	$P_{23,3}=1/2$	$P_{33,3}=1$

Bu operator uchun avloddan avlodga o'tishda Mendel qonunlari o'rinli bo'ladi.Shuning uchun bunday operatorlar Mendel operatorlari deyiladi.

Faraz qilaylik $x^{(0)}=\left(x_1^0,x_2^0,x_3^0\right)-$ E dagi boshlang'ich taqsimot va $\mathrm{P}_x(0)-$ Ω, dagi qo'ydagi funksiyalar oilasiga mos keluvchi ehtimolli o'lchov bo'lsin.

$$\mathrm{P}_{m_k}=p_m k\left(i_0,i_1,i_2,\ldots,i_k\right)=x_{i_0}^{(m)}\sum_{m_1,\ldots,m_k=1}^{3}p_{i_0 m_1,i_1}\cdot p_{i_1 m_2,i_2}\cdot$$

$$P_n(i_0,i_1,\ldots,i_k)=x_{i_o}^n\sum_{m_1,\ldots,m_k=1}^{n}P_{i_0 m_1,i_1}\cdot P_{i_1 m_2,i_2}\cdot P_{i_2 m_3,i_3}\ldots\ldots P_{i_{k-1}m_k,}x_{m_1}^{(n)}\cdot x_{m_2}^{(n+1)}\ldots x_{m_k}^{(n+k-1)} \quad (2)$$

Chekli taqsimotlar oilasi yordamida hosil qilingan o'lchovni Mendel o'lchovi deb ataymiz.

Teoreman. Mendel o'lchovi P va Bernulli o'lchovi Q singulyardir.

Isbot. Tekshirib ko'rish qiyin emaske P_{m_k} va Q_{m_k} o'lchovlar dagi hamma shartlarni qanoatlantiradi. Shuning uchun $P\perp Q$ shart

$$\bigcap_{k\geq0}\left(\sum_{k\geq0}f_k^{1/2}Q_k\right)=0 \quad (3)$$

Bo'lganda bajariladi. Bu yerda $f_n-P_{m_k}$ ni Q_{m_k} ga nisbatan Radona – Nikadima ko'paytmasidir. Shunday qilib, teoremaning isboti (3) tenglikdan kelib chiqadi. Shu tenglikni isbtlaymiz. (2) tenglikdan

$$P_{m_k}=P_m(i_0,i_1,i_2,\ldots,i_k)=x_{i_0}^{(m)}\sum_{m_1=1}^{3}P_{i_0 m_1,i_1}x_{m_1}^{(m)}\cdot\sum_{m_1=2}^{3}P_{i_1 m_2,i_2}x_{m_1}^{(m)}\cdot x_{m_2}^{(m+1)}\ldots$$

$$\sum_{m_k=1}^{3}P_{i_{k-1}m_k,i_k}x_{m_{k-1}}^{(m+k-2)}x_{m_k}^{(m+k-1)}\left[x_{i_1}^{(m)}x_{i_2}^{(m+1)}\ldots x_{i_{k-1}}^{(m+k-2)}\right]^{-1}=$$

$$\frac{P(\xi_k=i_{0,}\ \xi_{k+1}=i_1)\ldots\ldots P(\xi_{k+k-1}=i_{k-1,}\ \xi_{k+k}=i_k)}{x_{i_1}^{(m)}x_{i_2}^{(m+1)}\ldots x_{i_{k-1}}^{(m+k-2)}}$$

(4) ni olamiz

Bilamizki

$$P(\{w:(\xi_m(w)=1,\ \xi_{m+1}(w)=1\})=x_1^{(m)}\sum_{i=1}^{3}P_{1i,1}x_i^{(m)}=\frac{x_1^{(m)}x_1^{(m)}}{(x_1+1/2x_2)}$$

$$P(\{w:(\xi_m(w)=2,\ \xi_{m+1}(w)=2\})=x_2^{(m)}\sum_{i=1}^{3}P_{2i,2}x_i^{(m)}=1/2x_2^{(m)}$$

$$P(\{w:(\xi_m(w)=3,\ \xi_{m+1}(w)=3\})=x_3^{(m)}\sum_{i=1}^{3}P_{3i,3}x_i^{(m)}=\frac{x_3^{(m)}x_3^{(m)}}{(x_3+1/2x_2)}$$

$$P(\{w:(\xi_m(w)=1,\ \xi_{m+1}(w)=2\})=x_1^{(m)}\sum_{i=1}^{3}P_{1i,2}x_i^{(m)}=\frac{x_1^{(m)}x_1^{(m)}}{2(x_1+1/2x_2)}$$

$$P(\{w:(\xi_m(w)=1,\ \xi_{m+1}(w)=3\})=x_1^{(m)}\sum_{i=1}^{3}P_{1i,3}x_i^{(m)}=0$$

$$P(\{w:(\xi_m(w)=2,\ \xi_{m+1}(w)=3\})=x_2^{(m)}\sum_{i=1}^{3}P_{2i,3}x_i^{(m)}=\frac{x_2^{(m)}x_3^{(m)}}{2(x_2+1/2x_3)}$$

$$P(\{w:(\xi_m(w)=2,\ \xi_{m+1}(w)=2\})=1/2x_2^{(m)}=1/2x_2^{(1)}$$

$$P(\{w:(\xi_m(w)=1,\ \xi_{m+1}(w)=3\})=0$$

dir. Qolgan hollarda

$$P(\{w:(\xi_m(w)=i_0,\ \xi_{m+1}(w)=i_1\})=\frac{x_{i_0}^{(m)}x_{i_1}^{(m)}}{2^{|i_o-i_1|}(x_i+1/2x_2)}=\frac{x_{i_0}^{(1)}x_{i_1}^{(1)}}{2^{|i_o-i_1|}(x_{i_0}+1/2x_2)}$$

(3) yordamida (4) dan

$$P_m(i_0,i_1,i_2,\dots,i_k)=$$

$$\begin{cases} 0, \quad i_j=1,\ i_{j+1}=3 \quad i_j=3,\ i_{j+1}=1. \\ [2^{-1}x_2^{(1)}]^k \quad i_j=2 \quad j=0,1,...,k \\ \dfrac{x_{i_0}^{(1)}[x_{i_1}^{(1)}....x_{i_{k-1}}^{(1)}]^2 x_{i_{k-1}}^{(1)}}{4^{\left(|i_0-i_1|+...+|i_{k-1}-i_k|\right)}\left(x_{i_1}+1/2x_2\right)...\left(x_{i_{k-1}}+1/2x_2\right)}, \quad i_j=1,3 \\ \dfrac{x_{i_0}^{(1)}[x_{i_1}^{(1)}....x_{i_{ы}}^{(1)}]^2 x_2^{(1)t}[x_{i_{s+t}}^{(1)}.....x_{i_{k-2}}^{(1)}]^2 x_{i_{k-1}}^{(1)}}{2^{2(k-1-l)}\left(x_{i_1}+1/2x_2\right)...\left(x_{i_s}+1/2x_2\right)\left(x_{i_{s+t}}+1/2x_2\right)...\left(x_{i_{k-1}}+1/2x_2\right)}, \end{cases} \tag{5}$$

qolgan holler uchun, bu yerda $l=\left|\left\{f: i_j=2\right\}\right|$ to‘plamning quvvatini aniqlaydi. Bu yerdan osongina ko‘rsatish mumkinki

$$\bigcap_{k\geq 0}\left(\sum_k \left(P_k/Q_k\right)^{1/2} Q_k\right) \leq 3\bigcap_{k\geq 0}\left(x_{i_1}^{(1)}x_{i_2}^{(1)}.....x_{i_n}^{(1)}\right)^{1/2}=0$$

dir. Teorema isbot bo‘ldi.

Natija. $x^{(0)} \neq \overline{x}^{(0)} \in S^2$ bo‘lganda $P_{x^{(0)}}$ o‘lchov va $P_{\overline{x}^{(0)}}$ o‘lchov singulyardir.

Adabiyotlar

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