UDC 624.07::519.83

V.V. Romanuke

Khmelnytskyy National University, Khmelnytskyy

AN EXPECTED CASE IN THE ANTAGONISTIC MODEL OF MAKING THE FOUR-MOUNT CONSTRUCTION UNDER INTERVAL UNCERTAINTIES WITH INCORRECTLY PRE-EVALUATED ONE LEFT AND TWO RIGHT ENDPOINTS

There is proved the possible continuum of the second player optimal strategies under the most probable case in the antagonistic game, modeling the fix of cross-section squares of a four-mount construction. The total four-mount pressure on the construction is fixed to unit, but separately these four mounts pressures are unknown, and pre-evaluated only as three intervals. There has been set the maximal number of heterogeneous incorrect pre-evaluations with one left and two right endpoints, what actually generates that continuum.

Keywords: *four-mount construction, cross-section squares, antagonistic game, heterogeneous incorrect pre-evaluations, second player optimal strategies continuum.*

Problem at general view

Suppose that there are four propping poles or bars, mounting a stabilized construction. The pressure on the construction though is unknown, it may be fixed or normed to the unit [1, 2]. However, no one of four mounts may be assigned with the fixed pressure, so each mount pressure is uncertain. But bounds of such local pressures are fixed as endpoints of intervals, so the i-th mount pressure

$$x_i \in [a_i;\, b_i] \subset (0;\, 1) \text{ by } b_i > a_i \text{ for } i = \overline{1,\, 3}. \qquad (1)$$

The fourth mount pressure $x_4 = 1 - \sum_{i=1}^{3} x_i$ is determined obviously over the interval uncertainties $\{[a_i;\, b_i]\}_{i=1}^{3}$. The factor, acting against the pressure, is the total cross-section square of those four mounts, that might be normed to the unit also. Then, if this is done, clearly that the i-th mount cross-section square is

$$y_i \in [a_i;\, b_i] \subset (0;\, 1) \text{ by } b_i > a_i \text{ for } i = \overline{1,\, 3} \qquad (2)$$

and the fourth mount cross-section square

$$y_4 = 1 - \sum_{i=1}^{3} y_i\,. \qquad (3)$$

So, it is clear that for making the four-mount construction rationally the mount cross-section square should be taken to minimize ratios [3, 4] $\left\{x_i / y_i^2\right\}_{i=1}^{3}$ and $\left(1 - \sum_{i=1}^{3} x_i\right) \Big/ \left(1 - \sum_{i=1}^{3} y_i\right)^2$.

Last available references analysis

In minimizing the ratios $\left\{x_i / y_i^2\right\}_{i=1}^{3}$ and $\left(1 - \sum_{i=1}^{3} x_i\right) \Big/ \left(1 - \sum_{i=1}^{3} y_i\right)^2$ there must be laid any situation with local pressures and mount cross-section squares, including the worst ones. And as that worst is the maximum of the ratios $\left\{x_i / y_i^2\right\}_{i=1}^{3}$ and $\left(1 - \sum_{i=1}^{3} x_i\right) \Big/ \left(1 - \sum_{i=1}^{3} y_i\right)^2$, then it issues the corresponding model in the form of the antagonistic game with the kernel

$$T(\mathbf{X},\, \mathbf{Y}) = T(x_1,\, x_2,\, x_3;\, y_1,\, y_2,\, y_3) =$$
$$= \max\left\{ \frac{x_1}{y_1^2},\, \frac{x_2}{y_2^2},\, \frac{x_3}{y_3^2},\, \left(1 - \sum_{i=1}^{3} x_i\right) \Big/ \left(1 - \sum_{i=1}^{3} y_i\right)^2 \right\} \qquad (4)$$

for taking the optimal cross-section squares $\left\{y_i^*\right\}_{i=1}^{3}$. This game is convex [1, 3, 5], so the second player, having every pure strategy $\mathbf{Y} = [y_1 \;\; y_2 \;\; y_3]$ within the parallelepiped $\prod_{i=1}^{3} [a_i;\, b_i]$, possesses the optimal strategy

$$\mathbf{Y}_* = \left[y_1^* \;\; y_2^* \;\; y_3^*\right] \qquad (5)$$

existing in accordance to the theorem about pure optimal strategies of the second player in the convex antagonistic game. Then, going ahead,

$$\mathbf{Y}_* = \left[y_1^* \;\; y_2^* \;\; y_3^*\right] \in \arg \min_{\mathbf{Y} \in \prod_{i=1}^{3} [a_i;\, b_i]} \left\{ \max_{\mathbf{X} \in \prod_{i=1}^{3} [a_i;\, b_i]} T(\mathbf{X},\, \mathbf{Y}) \right\} =$$

$$= \arg \min_{\mathbf{Y} \in \prod_{i=1}^{3} [a_i;\, b_i]} \left\{ \max_{\mathbf{X} \in \prod_{i=1}^{3} [a_i;\, b_i]} \left(\max \left\{ \frac{x_1}{y_1^2}, \frac{x_2}{y_2^2}, \frac{x_3}{y_3^2}, \left(1 - \sum_{i=1}^{3} x_i\right) \Bigg/ \left(1 - \sum_{i=1}^{3} y_i\right)^2 \right\} \right) \right\} =$$

$$= \arg \min_{\mathbf{Y} \in \prod_{i=1}^{3} [a_i;\, b_i]} \left\{ \max \left\{ \frac{b_1}{y_1^2}, \frac{b_2}{y_2^2}, \frac{b_3}{y_3^2}, \left(1 - \sum_{i=1}^{3} à_i\right) \Bigg/ \left(1 - \sum_{i=1}^{3} y_i\right)^2 \right\} \right\}. \quad (6)$$

Particularly, the components of the optimal strategy (5) are determined from the equality

$$\frac{b_j}{y_j^2} = \left(1 - \sum_{i=1}^{3} à_i\right) \Bigg/ \left(1 - \sum_{i=1}^{3} y_i\right)^2 \text{ by } j = \overline{1, 3} \quad (7)$$

if it is true within the parallelepiped $\prod_{i=1}^{3} [a_i;\, b_i]$, that is its j-th root $y_j = y_j^*$ belongs to the interval $[a_j;\, b_j]$ and

$$y_j^* = \sqrt{b_j} \Bigg/ \left(\sum_{i=1}^{3} \sqrt{b_i} + \sqrt{1 - \sum_{i=1}^{3} a_i} \right) \quad \forall\ j = \overline{1, 3}. \quad (8)$$

Surely, if the equality (7) can't be fulfilled within the parallelepiped $\prod_{i=1}^{3} [a_i;\, b_i]$, then at least one of its six vertices had been pre-evaluated incorrectly, meaning one or even more of the following occasions:

$$\sqrt{b_k} \Bigg/ \left(\sum_{i=1}^{3} \sqrt{b_i} + \sqrt{1 - \sum_{i=1}^{3} a_i} \right) > b_k \text{ by } k \in \left\{\overline{1, 3}\right\}, \quad (9)$$

$$\sqrt{b_k} \Bigg/ \left(\sum_{i=1}^{3} \sqrt{b_i} + \sqrt{1 - \sum_{i=1}^{3} a_i} \right) < a_k \text{ by } k \in \left\{\overline{1, 3}\right\}. \quad (10)$$

Consequently, for finding the optimal strategy (5) by (6) there will be solved the unequalized relationship (7), though it should be tried to get equalized as even as possible.

Paper goal

Will find the optimal strategy (5) in the antagonistic game with the kernel (4) with maximal number of incorrect pre-evaluations, expressed as (9) or (10). Clearly, this number is three. Homogeneous incorrect pre-evaluations, being only either (9) $\forall\ k = \overline{1, 3}$ or (10) $\forall\ k = \overline{1, 3}$, are pretty trivial [6, 7] and followed by obvious solutions for the second player [7, 8]. Here will solve under conditions

$$\sqrt{b_p} \Bigg/ \left(\sum_{i=1}^{3} \sqrt{b_i} + \sqrt{1 - \sum_{i=1}^{3} a_i} \right) > b_p, \quad (11)$$

$$\sqrt{b_q} \Bigg/ \left(\sum_{i=1}^{3} \sqrt{b_i} + \sqrt{1 - \sum_{i=1}^{3} a_i} \right) > b_q, \quad (12)$$

$$\sqrt{b_r} \Bigg/ \left(\sum_{i=1}^{3} \sqrt{b_i} + \sqrt{1 - \sum_{i=1}^{3} a_i} \right) < a_r, \quad (13)$$

outcropping heterogeneous incorrect pre-evaluations for $\{p, q, r\} = \{1, 2, 3\}$, where the r-th left endpoint and the p-th and the q-th right endpoints had been evaluated before erroneously. Heterogeneous incorrect pre-evaluations (11) — (13) are equivalent to the corollary conditions

$$y_p^* < \sqrt{b_p} \Bigg/ \left(\sum_{i=1}^{3} \sqrt{b_i} + \sqrt{1 - \sum_{i=1}^{3} a_i} \right), \quad (14)$$

$$y_q^* < \sqrt{b_q} \Bigg/ \left(\sum_{i=1}^{3} \sqrt{b_i} + \sqrt{1 - \sum_{i=1}^{3} a_i} \right), \quad (15)$$

$$y_r^* > \sqrt{b_r} \Bigg/ \left(\sum_{i=1}^{3} \sqrt{b_i} + \sqrt{1 - \sum_{i=1}^{3} a_i} \right), \quad (16)$$

which with (7) and the equality (7) roots (8) give the inequality

$$\frac{b_s}{\left(y_s^*\right)^2} > \frac{b_r}{\left(y_r^*\right)^2}, \quad s \in \{p, q\}. \quad (17)$$

Surely, the relationship of $\left(1 - \sum_{i=1}^{3} a_i\right) \Bigg/ \left(1 - \sum_{i=1}^{3} y_i^*\right)^2$ within (17) must be strongly considered.

Theorem on optimal strategies (5) continuum from the r-th endpoint for an expected case

Pushing up off declarations or statements above, there is an assertion to determine instantly the optimal strategy (5) components.

Theorem. Under conditions (11) — (13) in the antagonistic game with the kernel (4), defined on the parallelepiped $\prod_{i=1}^{3} [a_i;\, b_i] \times \prod_{i=1}^{3} [a_i;\, b_i]$, there is the inequality

$$\frac{b_s}{b_s^2} = \frac{1}{b_s} > \frac{b_r}{a_r^2}, \quad s \in \{p, q\}, \quad (18)$$

forcing down one of the subsequent double or triple inequalities:

$$\frac{1}{b_s} > \frac{b_r}{a_r^2} > \frac{1 - \sum_{i=1}^{3} a_i}{\left(1 - b_p - b_q - a_r\right)^2},$$

$$\{p,\,q,\,r\}=\{1,\,2,\,3\}\,,\quad s\in\{p,\,q\}\,, \tag{19}$$

$$\frac{1}{b_s}>\frac{1-\sum_{i=1}^{3}a_i}{\left(1-b_p-b_q-a_r\right)^2}\geq\frac{b_r}{a_r^2}\,,$$

$$\{p,\,q,\,r\}=\{1,\,2,\,3\}\,,\quad s\in\{p,\,q\}\,, \tag{20}$$

$$\frac{1}{b_m}\geq\frac{1-\sum_{i=1}^{3}a_i}{\left(1-b_p-b_q-a_r\right)^2}\geq\frac{1}{b_n}>\frac{b_r}{a_r^2}\,,$$

$$\{p,\,q,\,r\}=\{1,\,2,\,3\}\,,\quad \{m,\,n\}=\{p,\,q\}\,, \tag{21}$$

$$\frac{1-\sum_{i=1}^{3}a_i}{\left(1-b_p-b_q-a_r\right)^2}>\frac{1}{b_s}>\frac{b_r}{a_r^2}\,,$$

$$\{p,\,q,\,r\}=\{1,\,2,\,3\}\,,\quad s\in\{p,\,q\}\,. \tag{22}$$

For one of the inequalities (19) — (21) the second player has the optimal strategy (5) with components

$$y_p^*=b_p\,, \tag{23}$$

$$y_q^*=b_q\,, \tag{24}$$

$$y_r^*=a_r\,. \tag{25}$$

Besides, those inequalities (19) — (21) for supposition $b_m\leq b_n$ may give the continuum of optimal strategies (5) in at least r-th component y_r^*, where the m-th component is the single,

$$y_m^*=b_m\,,\quad m\in\{p,\,q\}\ \text{ by }\ b_m\leq b_n\,, \tag{26}$$

but if

$$1-b_m-\sqrt{b_m\left(1-\sum_{i=1}^{3}a_i\right)}\geq b_n+b_r \tag{27}$$

then

$$y_n^*\in\left[\frac{1}{2}\left(\begin{array}{c}\sqrt{b_m b_n}+a_n+\left(\sqrt{b_m b_n}-a_n\right)\times\\ \times\operatorname{sign}\left(\sqrt{b_m b_n}-a_n\right)\end{array}\right);\ b_n\right], \tag{28}$$

$$y_r^*\in\left[a_r;\ b_r\right], \tag{29}$$

and if

$$1-b_m-\sqrt{b_m\left(1-\sum_{i=1}^{3}a_i\right)}<b_n+b_r \tag{30}$$

then

$$y_n^*\in\left[\frac{1}{2}\left(\begin{array}{c}\sqrt{b_m b_n}+a_n+\left(\sqrt{b_m b_n}-a_n\right)\times\\ \times\operatorname{sign}\left(\sqrt{b_m b_n}-a_n\right)\end{array}\right);\ y_n^{(\max)}\right], \tag{31}$$

$$y_r^*\in\left[a_r;\ y_r^{(\max)}\right], \tag{32}$$

by

$$y_n^{(\max)}+y_r^{(\max)}=1-b_m-\sqrt{b_m\left(1-\sum_{i=1}^{3}a_i\right)}\,. \tag{33}$$

For the inequality (19) or (20) that optimal strategies (5) continuum exists definitely.

Proof. Firstly, the inequality (18) is stated from (7) via substituting the right sides of (11) — (13) into (7) with its roots (8). Further, accepting $y_p=b_p$, $y_q=b_q$, $y_r=a_r$, there appears the fraction $\frac{1-\sum_{i=1}^{3}a_i}{\left(1-b_p-b_q-a_r\right)^2}$ to be inserted as relationship into (18). This insertion has four versions, stated as (19) — (22), and one of them exists definitely. The inequalities (19) — (21) could have been shortened like

$$\frac{1}{b_m}\geq\frac{1-\sum_{i=1}^{3}a_i}{\left(1-b_p-b_q-a_r\right)^2}\,,\quad \{p,\,q,\,r\}=\{1,\,2,\,3\} \tag{34}$$

for supposition $b_m\leq b_n$ by $\{m,\,n\}=\{p,\,q\}$. The inequality (34) shows here the optimal game value $v_{opt}=\frac{1}{b_m}$, which is particularly reached at the components (23) — (25) of the optimal strategy (5). Of course, the second player payoff $\frac{1}{b_m}$ will not increase if the second player uses such the component y_r^* that

$$\frac{1}{b_m}\geq\frac{b_r}{\left(y_r^*\right)^2} \tag{35}$$

and

$$\frac{1}{b_m}\geq\frac{1-\sum_{i=1}^{3}a_i}{\left(1-b_p-b_q-y_r^*\right)^2} \tag{36}$$

simultaneously. Supplementary, the second player payoff $\frac{1}{b_m}$ will not increase if the second player uses such the component y_n^* that

$$\frac{1}{b_m}\geq\frac{b_n}{\left(y_n^*\right)^2} \tag{37}$$

and

$$\frac{1}{b_m}\geq\frac{1-\sum_{i=1}^{3}a_i}{\left(1-b_m-y_n^*-a_r\right)^2}\,. \tag{38}$$

However, (38) is always true inasmuch as (34) and $y_n^*\leq b_n$ are true, what increases the inequality (38) rightside denominator and decreases the inequality (38) rightside.

So, the requirement (38) is substituted to

$$\frac{1}{b_m} \geq \frac{1-\sum_{i=1}^{3} a_i}{\left(1-b_m-y_n^*-y_r^*\right)^2} \tag{39}$$

being the intersection of (36) and (38). Consequently, the second player possesses such components y_n^* and y_r^*, appearing optimal, that there are true the inequalities (35), (37) and (39) simultaneously. The inequality (35) is true $\forall\ y_r^* \geq a_r$ because of (18). From (37) there is the inequality $y_n^* \geq \sqrt{b_m b_n}$. From (39) here it runs that

$$1-b_m-y_n^*-y_r^* \geq \sqrt{b_m\left(1-\sum_{i=1}^{3} a_i\right)} \tag{40}$$

what gives the condition

$$y_n^*+y_r^* \leq 1-b_m-\sqrt{b_m\left(1-\sum_{i=1}^{3} a_i\right)} \tag{41}$$

for using the sum of the optimal n-th and r-th components. In the case of (27) the n-th and the r-th optimal components are not bounded from the right, so (28) and (29) define them. Otherwise, if (30) is true then the sum (33) of maximal values of the n-th and r-th optimal components restricts them to (31) and (32). The m-th optimal strategy (5) component is (26) as decreasing it will increase the payoff. In the case of (19) or (20), where (34) turns strict, there at least the r-th optimal component may be varied within a nonzero-measure interval with the left endpoint a_r for the still optimal game value $v_{opt} = \frac{1}{b_m}$, without changing it. That means the definite optimal strategies (5) continuum for (19) or (20). The theorem has been proved.

The proved case of optimality of the second player with one of the inequalities (19) — (21) might have been called expected as it is most probable that from (7) with increasing y_r^* from $\frac{\sqrt{b_r}}{\sum_{i=1}^{3}\sqrt{b_i}+\sqrt{1-\sum_{i=1}^{3}a_i}}$ and decreasing y_p^* from $\frac{\sqrt{b_p}}{\sum_{i=1}^{3}\sqrt{b_i}+\sqrt{1-\sum_{i=1}^{3}a_i}}$ and, once again, decreasing y_q^* from $\frac{\sqrt{b_q}}{\sum_{i=1}^{3}\sqrt{b_i}+\sqrt{1-\sum_{i=1}^{3}a_i}}$ there eventually appears (34). For instance, the endpoints

$$a_1 = 0.1,\ b_1 = 0.2,\ a_2 = 0.12,$$

$$b_2 = 0.19,\ a_3 = 0.25,\ b_3 = 0.27 \tag{42}$$

in the interval uncertainties $\left\{\left[a_i;\, b_i\right]\right\}_{i=1}^{3}$ constitute the case, where $p=m=2$, $q=n=1$, $r=3$,

$$\frac{\sqrt{b_p}}{\sum_{i=1}^{3}\sqrt{b_i}+\sqrt{1-\sum_{i=1}^{3}a_i}} = \frac{\sqrt{b_2}}{\sum_{i=1}^{3}\sqrt{b_i}+\sqrt{1-\sum_{i=1}^{3}a_i}} > $$
$$> 0.2098 > b_2 = 0.19, \tag{43}$$

$$\frac{\sqrt{b_q}}{\sum_{i=1}^{3}\sqrt{b_i}+\sqrt{1-\sum_{i=1}^{3}a_i}} = \frac{\sqrt{b_1}}{\sum_{i=1}^{3}\sqrt{b_i}+\sqrt{1-\sum_{i=1}^{3}a_i}} > $$
$$> 0.204 > b_1 = 0.2, \tag{44}$$

$$\frac{\sqrt{b_r}}{\sum_{i=1}^{3}\sqrt{b_i}+\sqrt{1-\sum_{i=1}^{3}a_i}} = \frac{\sqrt{b_3}}{\sum_{i=1}^{3}\sqrt{b_i}+\sqrt{1-\sum_{i=1}^{3}a_i}} < $$
$$< 0.244 < a_3 = 0.25, \tag{45}$$

so the conditions (11) — (13) have appeared true, and $b_2 < b_1$,

$$\frac{1}{b_m} = \frac{1}{b_2} > 5.263 \geq 4.09 >$$
$$> \frac{1-\sum_{i=1}^{3} a_i}{\left(1-b_2-b_1-a_3\right)^2} = \frac{1-\sum_{i=1}^{3} a_i}{\left(1-b_p-b_q-a_r\right)^2}, \tag{46}$$

what solidifies the option (34). Inasmuch as

$$1-b_m-\sqrt{b_m\left(1-\sum_{i=1}^{3} a_i\right)} = 1-b_2-\sqrt{b_2\left(1-\sum_{i=1}^{3} a_i\right)} >$$
$$> 0.49 \geq 0.47 = b_1+b_3 = b_n+b_r \tag{47}$$

then

$$y_1^* \in \left[\sqrt{b_m b_n};\, b_n\right] = \left[\sqrt{0.038};\, 0.2\right], \tag{48}$$

$$y_3^* \in \left[0.25;\, 0.27\right], \tag{49}$$

by (28) and (29) correspondingly, where it just has been used that $\sqrt{b_m b_n} = \sqrt{0.038} > 0.1 = a_n$. Certainly, $y_2^* = b_2 = 0.19$ and $v_{opt} = \frac{1}{b_2} = \frac{100}{19}$. And the power of the obtained optimal strategies (5) continuum may be observed through the $\left[\sqrt{0.038};\, 0.2\right]\times\left[0.25;\, 0.27\right]$-rectangle.

Conclusion and prospect for further work

Despite of the solved case with maximal number of heterogeneous incorrect pre-evaluations under condition (34) or (19) — (21), there remains a point of how to apply the optimal strategies (5) continuum in practice [9, 10], because for a real four-mount construction there is an obvious need to make three propping bars or poles with fixed cross-section squares $\left\{ y_i = y_i^* \right\}_{i=1}^{3}$ and the fourth with cross-section square (3). The most rational way of the continuum application is fixing cross-section squares as equal as possible [11, 12]. A prospect for further work is finding the optimal strategy (5) in the same game under the reversed case (22) in respect to (34). Besides, there stays another case with maximal number of heterogeneous incorrect pre-evaluations, where the incorrectness tangles two left and one right endpoints.

List of references

1. Романюк В.В. Моделювання дії нормованого одиничного навантаження на три колони однакової висоти у будівельній конструкції і знаходження оптимальної площі кожної опори / В.В. Романюк // Проблеми трибології. – 2010. – № 3. – С. 18-25.

2. Романюк В.В. Регулярна оптимальна стратегія проектувальника у моделі дії нормованого одиничного навантаження на N-колонну будівельну конструкцію-опору / В.В. Романюк // Проблеми трибології. – 2011. – № 2. – С. 111-114.

3. Воробьёв Н.Н. Теория игр для экономистов-кибернетиков / Н.Н. Воробьёв. – М.: Наука, Главная редакция физико-математической литературы, 1985. – 272 с.

4. Романюк В.В. Обчислення оптимальних площ поперечних перерізів у конструкції з трьома опорами за умов часткової невизначеності стискаючих зусиль на елементи з поздовжньою стійкістю / В.В. Романюк // Вісник Хмельницького національного університету. Технічні науки. – 2011. – № 1. – С. 86-93.

5. Пшеничный Б.Н. Выпуклый анализ и экстремальные задачи / Б.Н. Пшеничный. – М.: Наука, Главная редакция физико-математической литературы, 1980. – 320 с.

6. Романюк В.В. Про особливі компоненти оптимальної стратегії проектувальника у моделі дії нормованого одиничного навантаження на триколонну будівельну конструкцію / В.В. Романюк // Проблеми трибології. – 2011. – № 1. – С. 44-46.

7. Romanuke V.V. Digression on the right off-bound projector optimal strategy in four props construction being pressed uncertainly / V.V. Romanuke // Системи обробки інформації. – 2011. – Вип. 2 (92). – С. 129-132.

8. Романюк В.В. Нерегулярна ліворуч оптимальна стратегія проектувальника першого степеня у моделі усунення чотирьохелементних невизначеностей як антагоністичній грі на шестивимірному гіперпаралелепіпеді для оптимізації конструювання чотирьохопорної платформи / В.В. Романюк // Вісник Хмельницького національного університету. Технічні науки. – 2011. – № 4. – С. 74-82.

9. Harsanyi J.C. A General Theory of Rational Behavior in Game Situations / J.C. Harsanyi // Econometrica. – 1966. – Vol. 34. – P. 613-634.

10. Harsanyi J.C. A General Theory of Equilibrium Selection in Games / J.C. Harsanyi, R. Selten. – Cambridge Mass.: The MIT Press, 1988. – 396 p.

11. Дарков А.В. Строительная механика: [учебник для строит. спец. вузов] / А.В. Дарков, Н.Н. Шапошников; [8-е изд., перераб. и доп.]. – М. : Высш. шк., 1986. – 607 с.: ил.

12. Киселев В.А. Строительная механика: Спец. курс. Динамика и устойчивость сооружений: [учебник для вузов] / В.А. Киселев. – [3-е изд., испр. и доп.]. – М.: Стройиздат, 1980. – 616 с.: ил.

Надійшла до редколегії 17.11.2011

Рецензент: д-р техн. наук, проф. Р.В. Сорокатий, Хмельницький національний університет, Хмельницький.

ОДИН ОЧІКУВАНИЙ ВИПАДОК В АНТАГОНІСТИЧНІЙ МОДЕЛІ МОНТУВАННЯ ЧОТИРЬОХОПОРНОЇ КОНСТРУКЦІЇ В УМОВАХ ІНТЕРВАЛЬНИХ НЕВИЗНАЧЕНОСТЕЙ З НЕКОРЕКТНО ПОПЕРЕДНЬО ОЦІНЕНИМИ ОДНИМ ЛІВИМ І ДВОМА ПРАВИМИ КІНЦЯМИ

В.В. Романюк

Доводиться можливий континуум оптимальних стратегій другого гравця у найбільш імовірному випадку в антагоністичній грі, що моделює підбір площ поперечного перерізу чотирьохопорної конструкції. Загальний чотирьохопорний тиск на конструкцію приведений до одиниці, однак чотири опорних тиски невідомі та попередньо оцінені лише як три інтервали. Поставлено максимальне число неоднорідних некоректних попередніх оцінок з одним лівим і двома правими кінцями, що й породжує згаданий континуум.

Ключові слова: *чотирьохопорна конструкція, площі поперечного перерізу, антагоністична гра, неоднорідні некоректні попередні оцінки, континуум оптимальних стратегій другого гравця.*

ОДИН ОЖИДАЕМЫЙ СЛУЧАЙ В АНТАГОНИСТИЧЕСКОЙ МОДЕЛИ МОНТИРОВАНИЯ ЧЕТЫРЁХОПОРНОЙ КОНСТРУКЦИИ В УСЛОВИЯХ ИНТЕРВАЛЬНЫХ НЕОПРЕДЕЛЁННОСТЕЙ С НЕКОРРЕКТНО ПРЕДВАРИТЕЛЬНО ОЦЕНЕННЫМИ ОДНИМ ЛЕВЫМ И ДВУМЯ ПРАВЫМИ КОНЦАМИ

В.В. Романюк

Доказывается возможный континуум оптимальных стратегий второго игрока в наиболее вероятном случае в антагонистической игре, моделирующей подбор площадей поперечного сечения четырёхопорной конструкции. Общее четырёхопорное давление на конструкцию приведено к единице, однако четыре опорных давления неизвестны и предварительно оценены лишь как три интервала. Поставлено максимальное число неоднородных некорректных предварительных оценок с одним левым и двумя правыми концами, что и порождает оговоренный континуум.

Ключевые слова: *четырёхопорная конструкция, площади поперечного сечения, антагонистическая игра, неоднородные некорректные предварительные оценки, континуум оптимальных стратегий второго игрока.*