Metode Pengambilan Keputusan Atribut Berganda Berdasarkan Bilangan Fuzzy Eksponensial

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Pendahuluan

- Masalah multi-atribut decision making (MADM) adalah salah satu sektor kunci dalam ilmu pengetahuan keputusan modern, teori dan metode yang telah diterapkan secara luas di bidang teknikdesign, sociallife, investmentdecisioning making andprojectevaluation.
- Masalah pengambilan keputusan themulti-atribut adalah signifikansi teoretis yang mendalam dan memiliki latar belakang aplikasi praktis yang luas di berbagai industri
- penelitian tentang masalah pengambilan keputusan multi atribut selalu menjadi topik utama bagi orang

- Menggabungkan teori titik ideal fuzzy, mengajukan metode pengambilan keputusan TOPSIS multi-atribut melalui penentuan nilai ekspektasi dari bilangan fuzzy eksponensial dan ukuran jarak antara bilangan fuzzy eksponensial (Xu dan Wang).
- Sebagian besar masalah dalam pengambilan keputusan terutama terdiri dari jumlah interval, triangular fuzzy numbers dan trapezoidal fuzzy numbers
- ada sedikit penelitian tentang beberapa masalah pengambilan keputusan fuzzy berbasis pada bilangan fuzzy eksponensial

Exponential Fuzzy Numbers

Table 1. Fuzzy decision-making matrix.

	C_1	C_2	C_3	C_4	C_5	C_6
A_1	(0.85,0.05,0.05)	(0.92,0.02,0.03)	(0.94,0.03,0.01)	(0.96,0.03,0.03)	(0.91,0.01,0.01)	(0.97,0.02,0.02)
A_2	(0.95,0.05,0.05)	(0.89,0.01,0.03)	(0.94,0.02,0.03)	(0.92,0.02,0.03)	(0.97,0.03,0.01)	(0.93,0.03,0.02)
A_3	(0.91,0.03,0.04)	(0.86,0.02,0.04)	(0.94,0.03,0.03)	(0.94,0.03,0.02)	(0.89,0.03,0.03)	(0.92,0.01,0.02)
A_4	(0.87,0.02,0.03)	(0.93,0.02,0.02)	(0.88,0.03,0.02)	(0.89,0.03,0.04)	(0.90,0.03,0.04)	(0.93,0.01,0.03)
A_5	(0.89,0.03,0.06)	(0.92,0.03,0.03)	(0.95,0.05,0.02)	(0.93,0.02,0.02)	(0.92,0.02,0.04)	(0.87,0.02,0.03)

Table 2. Standardized decision-making matrix.

	C_1	C_2	C_3	C_4	C_5	C_6
A_1	(0.1902,0.0106,0.0106)	(0.2035,0.0041,0.0062)	(0.2030,0.0062,0.0021)	(0.2069,0.0062,0.0062)	(0.1983,0.0021,0.0021)	(0.2100,0.0042,0.0042)
A_2	(0.2125,0.0106,0.0106)	(0.1969,0.0021,0.0062)	(0.1987,0.0041,0.0062)	(0.1983,0.0041,0.0062)	(0.2113,0.0063,0.0021)	(0.2013,0.0063,0.0042)
A_3	(0.2036,0.0064,0.0085)	(0.1903,0.0041,0.0082)	(0.2030,0.0062,0.0062)	(0.2026,0.0062,0.0041)	(0.1939,0.0063,0.0063)	(0.1991,0.0021,0.0042)
A_4	(0.1946,0.0043,0.0064)	(0.2058,0.0041,0.0041)	(0.1901,0.0062,0.0041)	(0.1918,0.0062,0.0083)	(0.1961,0.0063,0.0085)	(0.2013,0.0021,0.0063)
A_5	(0.1991,0.0064,0.0128)	(0.2035,0.0062,0.0062)	(0.2052,0.0103,0.0041)	(0.2004,0.0041,0.0041)	(0.2004,0.0042,0.0085)	(0.1883,0.0042,0.0063)

Table 3. Expected value, variance, score value and accurate weight of each attribute.

	Fuzzy weight value	Expected value	Variance	Score value	Accurate weight of each attribute
C_1	(0.20,0.02,0.03)	0.00911	0.00180	5.04855	0.12385
C_2	(0.10,0.01,0.01)	0.00177	0.00017	10.12889	0.24848
C_3	(0.25,0.03,0.02)	0.01083	0.00254	4.25836	0.10446
C_4	(0.10,0.01,0.02)	0.00281	0.00029	9.61984	0.23599
C_5	(0.20,0.03,0.02)	0.00861	0.00161	5.33667	0.13092
C_6	(0.15,0.01,0.03)	0.00572	0.00090	6.37157	0.15630

Table 4. The weighted distance between each scheme and the positive/negative ideal schemes.

	A^+	A^-
A_1	[0.0262,0.0041,0.0051,0.0021,0.0161,0.0021]	[0.0025,0.0151,0.0149,0.0160,0.0064,0.0226]
A_2	[0.0044,0.0098,0.0065,0.0096,0.0053,0.0116]	[0.0243,0.0095,0.0134,0.0084,0.0174,0.0130]
A_3	[0.0119,0.0164,0.0032,0.0072,0.0203,0.0118]	[0.0163,0.0031,0.0167,0.0108,0.0024,0.0128]
A_4	[0.0209,0.0031,0.0170,0.0160,0.0172,0.0087]	[0.0077,0.0164,0.0031,0.0024,0.0055,0.0159]
A_5	[0.0144,0.0052,0.0043,0.0084,0.0119,0.0226]	[0.0139,0.0142,0.0160,0.0096,0.0105,0.0021]

Table 5. The weighted distance between each scheme and the positive/negative ideal schemes, relative closeness and sorting result.

	D_i^+	D_i^-	ε_i	**Sorting result**
A_1	0.0077	0.0138	0.6403	1
A_2	0.0084	0.0131	0.6080	2
A_3	0.0121	0.0094	0.4377	4
A_4	0.0125	0.0091	0.4214	5
A_5	0.0106	0.0109	0.5070	3

Langkah-Langkah

- Langkah Pertama

$$\tilde{c}_{ij} = \frac{c_{ij}}{\sum_{i=1}^{m} c_{ij}}, \quad \tilde{\sigma}_{ij} = \frac{\max c_{ij}}{\sum_{i=1}^{m} c_{ij}} \sigma_{ij}, \quad \tilde{\tau}_{ij} = \frac{\max c_{ij}}{\sum_{i=1}^{m} c_{ij}} \tau_{ij}$$

Langkah -Langkah

Langkah Kedua

- Expected

Suppose $\tilde{a} = (c, \sigma, \tau) \in FE(R)$; the expected value of $\tilde{a}$ is:

$$E(\tilde{a}) = \int_{-\infty}^{+\infty} x u_{\tilde{a}}(x) dx$$

Langkah -Langkah

- Varian

$$Var(\tilde{a}) = \int_{-\infty}^{+\infty} (x - E(\tilde{a}))^2 u_{\tilde{a}}(x)dx$$

Langkah -Langkah

- Langkah Ketiga

Positive ideal scheme:

$$A^+ = [A_1^+, A_2^+, \cdots, A_n^+],\ A_j^+ = (c_j^+, \sigma_j^+, \tau_j^+) = (\max_i \tilde{c}_{ij}, \min_i \tilde{\sigma}_{ij}, \max_i \tilde{\tau}_{ij}) \quad (6)$$

Negative ideal scheme:

$$A^- = [A_1^-, A_2^-, \cdots, A_n^-],\ A_j^- = (c_j^-, \sigma_j^-, \tau_j^-) = (\min_i \tilde{c}_{ij}, \max_i \tilde{\sigma}_{ij}, \min_i \tilde{\tau}_{ij}) \quad (7)$$

Langkah -Langkah

- Langkah Keempat

The weighed distance between scheme A_i and the positive ideal scheme:

$$D_i^+(A_i, A^+) = \sum_{j=1}^{n} w_j D(A_{ij}, A_i^+) \tag{10}$$

The weighed distance between scheme A_i and the negative ideal scheme:

$$D_i^-(A_i, A^-) = \sum_{j=1}^{n} w_j D(A_{ij}, A_i^-) \tag{11}$$

Langkah -Langkah

- Langkah Kelima

$$\varepsilon_i = \frac{D_i^-(A_i, A^-)}{D_i^+(A_i, A^+) + D_i^-(A_i, A^-)}$$

Hasil Akhir

	D_i^+	D_i^-	ε_i	Sorting result
A_1	0.0077	0.0138	0.6403	1
A_2	0.0084	0.0131	0.6080	2
A_3	0.0121	0.0094	0.4377	4
A_4	0.0125	0.0091	0.4214	5
A_5	0.0106	0.0109	0.5070	3

Kesimpulan

- Mengenai masalah pengambilan keputusan multi-atribut fuzzy, makalah ini mengusulkan beberapa metode pengambilan keputusan fuzzy multiple berdasarkan angka eksponensial fuzzy. Menurut definisi harapan dan varians dalam teori probabilitas, dan dengan secara komprehensif mempertimbangkan preferensi sikap pembuat keputusan, metode ini dapat mewujudkan perlakuan atribut bobot atribut yang akurat. Selanjutnya, berdasarkan data dari masing-masing komponen rahasia, jarak antara masing-masing skema dan skema ideal positif / negatif dihitung, masing-masing, untuk mendapatkan kedekatan relatif masing-masing skema. Akhirnya, kelayakan dan efektivitas metode yang diusulkan telah dilakukan melalui analisis kasus. Metode pengambilan keputusan yang diusulkan lebih unggul untuk pengembangan proses clearlogic, asimpledecision dan penyelesaian dari pemahaman. Sebagai tambahan, metode tersebut memiliki nilai penerapan yang sangat baik dan nilai pembuatan keputusan praktis, memberikan referensi pengambilan keputusan prospektif untuk memecahkan masalah pengambilan keputusan fuzzy multi atribut.