Fuzzy linear programming with trapezoidal fuzzy numbers (TrFNs) is considered and a new method is developed to solve it. In this method, TrFNs are used to capture imprecise or uncertain information for the imprecise objective coefficients and/or the imprecise technological coefficients and/or available resources. The auxiliary multi-objective programming is constructed to solve the corresponding possibility linear programming with TrFNs. The auxiliary multi-objective programming involves four objectives: minimizing the left spread, maximizing the right spread, maximizing the left endpoint of the mode and maximizing the middle point of the mode. Three approaches are proposed to solve the constructed auxiliary multi-objective programming, including optimistic approach, pessimistic approach and linear sum approach based on membership function. An investment example and a transportation problem are presented to demonstrate the implementation process of this method. The comparison analysis shows that the fuzzy linear programming with TrFNs developed in this paper generalizes the possibility linear programming with triangular fuzzy numbers.
A fuzzy number \( \tilde{m} = (l, m_1, m_2, r) \) is a TrFN, where the membership function \( \mu_{m_1} \) of \( \tilde{m} \) is

\[
\mu_{m_1}(x) = \begin{cases} 
\frac{x - l}{m_1 - l} & (l < x < m_1), \\
1 & (m_1 \leq x \leq m_2), \\
\frac{r - x}{r - m_2} & (m_2 < x \leq r).
\end{cases}
\]

The closed interval \([m_1, m_2]\) is the mode of \( \tilde{m} \). \( l \) and \( r \) are the lower and upper limits of \( \tilde{m} \) [22].

It is easily seen that a TrFN \( \tilde{m} = (l, m_1, m_2, r) \) is reduced to a real number \( m \) if \( l = m_1 = m_2 = r \). Conversely, a real number \( m \) can be written as a TrFN \( \tilde{m} = (m, m, m) \). A TrFN \( \tilde{m} = (l, m_1, m_2, r) \) is reduced to a TrFN \( \tilde{m} = (l, m_1, r) \) if \( m_1 = m_2 \).

TrFN \( \tilde{m} = (l, m_1, m_2, r) \) is called a positive TrFN if \( l \geq 0 \) and one of \( l, m_1, m_2 \) and \( r \) is non-zero. Furthermore, \( \tilde{m} = (l, m_1, m_2, r) \) is called a normalized positive TrFN if it is a positive TrFN, \( l \geq 0 \) and \( r \leq 1 \).

2. Definition for trapezoidal fuzzy numbers and interval objective programming

2.1. Definition for trapezoidal fuzzy numbers

A fuzzy number \( \tilde{m} \) is a special fuzzy subset on the set \( R \) of real numbers. Let \( \tilde{m} = (l, m_1, m_2, r) \) be a TrFN, where the membership function \( \mu_{m_1} \) of \( \tilde{m} \) is

\[
\mu_{m_1}(x) = \begin{cases} 
\frac{x - l}{m_1 - l} & (l < x < m_1), \\
1 & (m_1 \leq x \leq m_2), \\
\frac{r - x}{r - m_2} & (m_2 < x \leq r).
\end{cases}
\]

The closed interval \([m_1, m_2]\) is the mode of \( \tilde{m} \). \( l \) and \( r \) are the lower and upper limits of \( \tilde{m} \) [22].
دریافت فوری متن کامل مقاله

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات