Determining Feasible Solution in Imprecise Linear Inequality Systems

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Abstract

In this paper, we investigate imprecise linear inequality problems when there is no solution. In general, inconsistency of ordinary linear inequality model can be overcome by changes in the coefficients of constraints and right hand sides. Many of researches discuss infeasibility on crisp linear inequality, but few researchers have dealt with imprecise inequality. First, A method for solving imprecise linear inequality will be reviewed which based on the concept of degree of inequality holding true for two intervals, and then states of their solution will be examined. If system inequalities in the best state coefficients technology and right hand sides have solution and in the worst state coefficients technology and right hand sides haven’t solution, our objective is the determining greatest intervals of coefficients technology and right-hand sides so that system have solution. Indeed, the solutions which satisfy the linear inequalities with degree holding true are searched, such as have minimum relaxation. In sequence, numerical example is given for demonstrating our approach.

Mathematics Subject Classification: 90C05, 90C70

Keywords: interval linear inequality, degree holding inequality true, infeasibility

1 Introduction

Inconsistency in linear inequalities is a problem on many practical situations. In general, inconsistency of a model can be overcome by changes in the coefficients and right-hand sides of the constraints. Many works related to the problem of inconsistency in linear inequality and present some views on how it
can be tackled. A classical approach to deal with infeasibility involving the adjustment of the right-hand side of the constraints to restore feasibility, the first time was given by Roodman in 1979 [5]. Vatolin [6] developed a broad theory on the study of inconsistent mathematical programming problems, presenting duality concepts for corrected systems. Many researches will have applied fuzzy set theory for relaxation in the original problem. For sample, Wang proposed a method to solve infeasible inequality problems by the concept of fuzzy relation [7]. Amaral [1] has studied the problem of the minimal correction of an infeasible set of linear inequalities accordingly to the Frobenius norm. His method fulfills the problem of correcting the matrix of coefficients A by A + H and vector b by b + p to minimize the Frobenius norm of [H, p]. Infeasibility in imprecise linear inequality is seldom discussed. We apply an approach for converting interval linear inequality to ordinal linear inequality. This approach uses degree of inequality holding true. In Section 2 we formulate the problem and the theoretical developments by regarding to the correction of inequalities system with degree of inequality holding true. Then in section 3 a special case of interval linear inequality which is infeasible will be solved. Finally in section 4 the behavior of the method over numerical example will be shown.

2 Solving imprecise inequality systems

Consider the following linear inequality system:
\[
\sum_{j=1}^{n} [a_{ij}^l, a_{ij}^u] x_j \leq [b_i^l, b_i^u] \quad i = 1, \ldots, m \tag{1}
\]
\[
x_j \geq 0 \quad j = 1, \ldots, n
\]
This is the family of all systems
\[
\sum_{j=1}^{n} a_{ij} x_j \leq b_i \quad i = 1, \ldots, m
\tag{2}
\]
whose data satisfy
\[
a_{ij} \in [a_{ij}^l, a_{ij}^u], \quad b_i \in [b_i^l, b_i^u] \quad \forall ij
\]
In this inequality, technological coefficients and right hand sides are imprecise (interval). In this paper we will investigate feasibility or infeasibility of system (1).

**Definition 2.1** a system (1) is said to be weakly feasible if some systems (2) with data interval is feasible, and it is called strongly feasible if each system (2) with data interval is feasible.[2]

The adaptive set of points to system (1) is called feasible region $S$. The following special cases are being considered from the system (1). The system (3) can be concluded if technological coefficients are lower bound and sources in upper bound (in the best state).
\[
\sum_{j=1}^{n} a_{ij}^l x_j \leq b_i^u \quad i = 1, \ldots, m \tag{3}
\]
\[
x_j \geq 0 \quad j = 1, \ldots, n
\]
Feasible region in this case called $S_I$ (Ideal space).
Similarly, if the technological coefficients are in the upper bound and source in the lower bound then feasible region $S_A$ (Anti-ideal space) is resulted in the
Determining feasible solution

Theorem 2.2 Prove \( S_A \subseteq S \subseteq S_I \).

Proof: \( \forall a_{ij} : a^l_{ij} \leq a_{ij} \leq a^u_{ij} \quad (x_j \geq 0) \Rightarrow a^l_{ij} x_j \leq a_{ij} x_j \leq a^u_{ij} x_j \Rightarrow \sum_{j=1}^{n} a^l_{ij} x_j \leq \sum_{j=1}^{n} a_{ij} x_j \leq \sum_{j=1}^{n} a^u_{ij} x_j \) and \( b^l_i \leq b_i \leq b^u_i \quad i = 1, \ldots, m \).

\( x_j \in S_A \Rightarrow \sum_{j=1}^{n} a^l_{ij} x_j \leq b^l_i \Rightarrow \sum_{j=1}^{n} a_{ij} x_j \leq \sum_{j=1}^{n} a^u_{ij} x_j \leq b^u_i \Rightarrow \sum_{j=1}^{n} a_{ij} x_j \leq b_i \Rightarrow x_j \in S \)

also \( x_j \in S_A \Rightarrow \sum_{j=1}^{n} a^u_{ij} x_j \leq b^l_i \Rightarrow \sum_{j=1}^{n} a_{ij} x_j \leq \sum_{j=1}^{n} a^u_{ij} x_j \leq b^u_i \Rightarrow \sum_{j=1}^{n} a_{ij} x_j \leq b_i \Rightarrow x_j \in S_I \)

Corollary 2.1 If \( S_A \neq \phi \) then \( S \neq \phi \) and \( S_I \neq \phi \), means the system (1) is always feasible. (strongly feasible)

Corollary 2.2 If \( S_I = \phi \) then \( S = \phi \), means the system (1) is always infeasible.

Corollary 2.3 If \( S_I \neq \phi \) and \( S_A = \phi \), then problem (1) will be feasible in some intervals and sometimes infeasible in the others. (weakly feasible)

Several definitions exist how to determine the feasible region inequality (2). A classical approach to deal with infeasibility involving the adjustment of right hand side of the constraints to restore feasibility, in this approach technological coefficients are supposed deterministic. In approach Leon et al. [4], which discussed for linearly constrained problems, with making perturb in the right-hand side coefficients attained feasibility. the changing of right hand side of the constraints is performed according to value of duality variables and proportional to objective.

The other definition given by Ishibuchi and Tanaka is based on the concept of degree of inequality holding true for two intervals. (this definition is foundation of our work).

Definition 2.3 If \( A = [a^l, a^u] \) is an interval number and a real number \( x \), for relation \( A \leq x \), define degree holding true \( g(A \leq x) \) as:[3]

\[
g(A \leq x) = \begin{cases} 
0 & x \leq a^l \\
\frac{x-a^l}{a^u-a^l} & a^l \leq x \leq a^u \\
1 & x \geq a^u
\end{cases}
\]  

(5)
Feasible region of (8) can be transformed into

\[ S_b \text{ constraint: } \]

constraint (2) can be transformed equally into the following crisp inequality

According to above statement, the interval system (2) can be determined by the following theorem.

**Theorem 2.4** For a given degree of inequality holding true \( q \), the interval constraint (2) can be transformed equally into the following crisp inequality

\[
\sum_{j=1}^{n} (qa^u_{ij} + (1-q)a^l_{ij})x_j \leq (1-q)b^u_i + qb^l_i \quad i = 1, \ldots, m
\]  

Now if we consider degree of holding true \( q_a \) for coefficients \( a_{ij} \) and \( q_b \) for values \( b_i \), system (1) is converted to:

\[
\sum_{j=1}^{n} a^l_{ij}x_j + q_a \sum_{j=1}^{n} (a^u_{ij} - a^l_{ij})x_j \leq b^l_i + q_b(b^u_i - b^l_i) \quad i = 1, \ldots, m
\]

Feasible region of (8) can be transformed into \( S_A \), if \( q_a = 1 \) and \( q_b = 0 \), such as if \( q_a = 0 \) and \( q_b = 1 \), feasible region (8) will be \( S_I \).

For given \( q_a \) and \( q_b \), feasible region (8) is called \( S_q \). Regarding theorem (1), \( S_A \subseteq S_q \subseteq S_I \).

**Theorem 2.5** If model (8) is feasible for \( q_a \) and \( q_b \) then for ever \( q'_a \) and \( q'_b \) with conditions \( q'_a \leq q_a \) and \( q'_b \geq q_b \) (with feasible region \( S'_q \)) is feasible.

Proof: \( \forall q'_a \leq q_a \Rightarrow (a^u_{ij} - a^l_{ij})q'_a \leq (a^u_{ij} - a^l_{ij})q_a \)

By multiplying above statement in \( x_j \geq 0 \) and summing statements:

\[
\sum_{j=1}^{n} a^l_{ij}x_j + q'_a \sum_{j=1}^{n} (a^u_{ij} - a^l_{ij})x_j \leq \sum_{j=1}^{n} a^l_{ij}x_j + q_a \sum_{j=1}^{n} (a^u_{ij} - a^l_{ij})x_j
\]

\( \forall x \in S_q \text{ thus } \sum_{j=1}^{n} a^l_{ij}x_j + q'_a \sum_{j=1}^{n} (a^u_{ij} - a^l_{ij})x_j \leq \sum_{j=1}^{n} a^l_{ij}x_j + q_a \sum_{j=1}^{n} (a^u_{ij} - a^l_{ij})x_j \leq b^l_i + q_b(b^u_i - b^l_i) \quad \text{so } q'_b \geq q_b \text{ therefore } b^l_i + q_b(b^u_i - b^l_i) \leq b^l_i + q'_b(b^u_i - b^l_i)
\]

\[
\sum_{j=1}^{n} a^l_{ij}x_j + q'_a \sum_{j=1}^{n} (a^u_{ij} - a^l_{ij})x_j \leq b^l_i + q'_b(b^u_i - b^l_i) \quad \text{for ever } i
\]

\( \Rightarrow x \in S'_q \text{ means } S_q \subseteq S'_q \), Since \( S_q \neq \phi \) then \( S'_q \neq \phi \).

Now we discuss over special state for \( S_I \) and \( S_A \).

### 3 Weak feasibility of inequalities

By attention the corollary 3.1, If \( S_I \neq \phi \) and \( S_A = \phi \), then problem (1) can be feasible or infeasible for parts of intervals of coefficient and right-hand side, this is called weakly feasible. We will obtain intervals for \( q_a \) and \( q_b \) whereby problem (8) is feasible. On the other word, determination domain interval such as model (8) become strongly feasible.
3.1 Determination of minimum $q_b$

If in system (8) be replaced $q_a = 0$, the system (9) is resulted.

\[
\sum_{j=1}^{n} a_{ij}^t x_j \leq b_i^t + q_b (b_i^n - b_i^t) \quad i = 1, \ldots, m \tag{9}
\]

The system (9) is feasible. Because if $q_b = 1$ then feasible region (9) is converted to feasible region $S_I$. Now we will reduce $q_b$, in so that system (9) would remain feasible. In order to, consider the following model:

\[
q_b^* = \min q_b
\]

s.t. \[
\sum_{j=1}^{n} a_{ij}^t x_j \leq b_i^t + q_b (b_i^n - b_i^t) \quad i = 1, \ldots, m
\]

\[
q_b \geq 0, \quad x_j \geq 0 \quad j = 1, \ldots, n \tag{10}
\]

The linear programming (10) has a solution $q_b = 1$, then is feasible. The optimal solution of (10) is less or equal 1, therefore, $0 \leq q_b^* \leq 1$.

**Theorem 3.1** The model (10) is infeasible for $q_b \leq q_b^*$, means the feasible region (9) is empty for $q_b \leq q_b^*$.

**Proof:** It’s trivial.

Since the model (10) is feasible for $q_b^*$, thus the model (9) is feasible. Therefore, for $q_b \leq q_b^*$ and $q_a = 0$, the model (8) is infeasible.

**Theorem 3.2** The system (8) is infeasible for $q_b \leq q_b^*$ and for all values $q_a$.

**Proof:**

\[
q_a \geq 0 \Rightarrow a_{ij}^t \leq a_{ij}^t + q_a (a_{ij}^n - a_{ij}^t) = \sum_{j=1}^{n} a_{ij}^t x_j \leq \sum_{j=1}^{n} [a_{ij}^t + q_a (a_{ij}^n - a_{ij}^t)]x_j
\]

Appositionally, if problem (8) is feasible, then

\[
\sum_{j=1}^{n} [a_{ij}^t + q_a (a_{ij}^n - a_{ij}^t)]x_j \leq b_i^t + q_a (b_i^n - b_i^t)
\]

Since $q_b \leq q_b^*$, thus $b_i^t + q_b (b_i^n - b_i^t) \leq b_i^t + q_b^* (b_i^n - b_i^t)$

Regarding above statement and transitive relation, it will be resulted:

\[
\sum_{j=1}^{n} a_{ij}^t x_j \leq b_i^t + q_b^* (b_i^n - b_i^t) \quad i = 1, \ldots, m
\]

which violate (11), therefore, theorem is valid.

Now, consider the system (8) with $q_b = q_b^*$.

\[
\sum_{j=1}^{n} [a_{ij}^t + q_a (a_{ij}^n - a_{ij}^t)]x_j \leq b_i^t + q_b^* (b_i^n - b_i^t) \tag{12}
\]

The inequality (12) for $q_a = 0$ is feasible.

To find maximum value for $q_a$, so that the statement (12) is feasible, consider the following model:

\[
q_a^* = \max q_a
\]

s.t. \[
\sum_{j=1}^{n} [a_{ij}^t + q_a (a_{ij}^n - a_{ij}^t)]x_j \leq b_i^t + q_b^* (b_i^n - b_i^t) \quad i = 1, \ldots, m
\]

\[
0 \leq q_a \leq 1, \quad x_j \geq 0 \quad j = 1, \ldots, n \tag{13}
\]

The model (13) is feasible for $q_a = 0$, then has optimal solution $q_a^*$, and $0 \leq q_a^* \leq 1$. Thus the optimal solution is bounded. But this model is nonlinear and would be solved with nonlinear method.

**Theorem 3.3** The model (13) for $q_a > q_a^*$ is infeasible.

**Proof:** It’s trivial, because otherwise contradicts $q_a^*$ to be maximum.
corollary 3.1 The system (8) for \( q_a = q_a^* \) and \( q_b = q_b^* \) is feasible, and according to theorem 2.4 for each \( q_a \leq q_a^* \) and \( q_b \geq q_b^* \) is always feasible.

3.2 Determination of maximum \( q_a \)

Consider the system (8) with \( q_b = 1 \)

\[
\sum_{j=1}^{n} [a_{ij} + q_a(a_{ij}^u - a_{ij}^l)] x_j \leq b_i^u \quad i = 1, \ldots, m \\
x_j \geq 0 \\
q_a \leq 1 \\
q_a \leq 1 \\
x_j \geq 0 \\
j = 1, \ldots, n
\]

(14)

This model for \( q_a = 0 \) is feasible. Now we want to find maximum value of \( q_a \), so that the model (14) would stay feasible. In order to, use of the model (15):

\[
q_a^* = \max q_a \\
s.t. \sum_{j=1}^{n} [a_{ij} + q_a(a_{ij}^u - a_{ij}^l)] x_j \leq b_i^u \\
0 \leq q_a \leq 1 \\
x_j \geq 0 \\
j = 1, \ldots, n
\]

(15)

Since \( q_a = 0 \) is a feasible solution for (15) and \( 0 \leq q_a^* \leq 1 \), then the above model is feasible and bounded. If \( q_a^* \) is optimal solution of the model (15), the model will be infeasible for \( q_a > q_a^* \), therefore, feasible region of (14) is empty. (Otherwise \( q_a^* \) can not be maximal).

The model (8) is infeasible for all \( q_a > q_a^* \) and all values for \( q_b \). consider the model (8) with \( q_a = q_a^* \).

\[
\sum_{j=1}^{n} [a_{ij} + q_a^*(a_{ij}^u - a_{ij}^l)] x_j \leq b_i^u + q_b(b_i^u - b_i^l) \\
x_j \geq 0 \\
j = 1, \ldots, n
\]

(16)

A solution for (16) is \( q_b = 1 \). We look for minimum value \( q_b \), so that model (16) be stayed feasible. For this purpose, we apply the model (17) as follow:

\[
q_b^* = \min q_b \\
s.t. \sum_{j=1}^{n} [a_{ij} + q_b(a_{ij}^u - a_{ij}^l)] x_j \leq b_i^l + q_b(b_i^u - b_i^l) \\
q_b \geq 0 \\
x_j \geq 0 \\
j = 1, \ldots, n
\]

(17)

The model (17) has a feasible solution \( q_b = 1 \), therefore \( 0 \leq q_b^* \leq 1 \). Since (17) for \( q_b \geq q_b^* \) is feasible, then (16) is also feasible.

Theorem 3.4 The system (8) for \( q_b < q_b^* \) and \( q_a \geq q_a^* \) is infeasible.

Proof:

\[
\sum_{j=1}^{n} a_{ij}^l x_j + q_b^*(\sum_{j=1}^{n} (a_{ij}^u - a_{ij}^l)) x_j \leq \sum_{j=1}^{n} a_{ij}^l x_j + q_a \sum_{j=1}^{n} (a_{ij}^u - a_{ij}^l)] x_j
\]

(8)

Appositionally, if problem (8) is feasible for \( q_b < q_b^* \), then the right hand side of above statement isn’t greater than \( b_i^l + q_b(b_i^u - b_i^l) \), therefore violate minimum \( q_b^* \), thus the model (8) for \( q_a = q_a^* \) and \( q_b \leq q_b^* \) is infeasible. If \( q_a \leq q_a^* \) and \( q_b < q_b^* \), then the model (8) has solution.

\[
\sum_{j=1}^{n} a_{ij}^l x_j + q_a^*(\sum_{j=1}^{n} (a_{ij}^u - a_{ij}^l)) x_j \leq \sum_{j=1}^{n} a_{ij}^l x_j + q_a \sum_{j=1}^{n} (a_{ij}^u - a_{ij}^l)] x_j
\]

(8)

\[
\Rightarrow b_i^l + q_b^*(b_i^u - b_i^l) \leq b_i^l + q_b(b_i^u - b_i^l)
\]
Determining feasible solution

Also if \( q_b \geq q_b' \), we show the system (8) is infeasible. Since if doesn’t mean
\[
\sum_{j=1}^{n} a_{ij}^u x_j + q_a \sum_{j=1}^{n} (a_{ij}^u - a_{ij}^l) x_j \leq b_i^l + q_b(b_i^u - b_i^l) \quad q_b \leq 1 \Rightarrow b_i^l + q_b(b_i^u - b_i^l) \leq b_i^u \Rightarrow \sum_{j=1}^{n} a_{ij}^l x_j + q_a \sum_{j=1}^{n} (a_{ij}^u - a_{ij}^l) x_j \leq b_i^u \text{ This contradicts first suppose.}
\]

Therefore the model (8) for \( \forall q_b \geq q_b' \) and \( q_a \leq q_a' \) is feasible. The above discussion and feasible and infeasible regions are shown in table 1.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>( q_b' )</th>
<th>( q_b^* )</th>
<th>( q_a )</th>
<th>( q_a' )</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>( q_b^* )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>( q_a )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>( q_a' )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>1</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
</tr>
</tbody>
</table>

F: feasible, \( \phi \): infeasible

In the distance of \( q_a^* < q_a < q_a^*' \) and \( q_b^* < q_b < q_b^*' \), the problem will be feasible stair-like.

4 Numerical example

Consider interval inequality system as follows:

\[
\begin{align*}
[2.3] x_1 + [1.3] x_2 + [-2, 1] x_3 & \leq [2, 6] \\
[1.4] x_1 + [-1, -0.5] x_2 + [3, 5] x_3 & \leq [-6, 5] \\
[-2, 1] x_1 + [-3, 0] x_2 + [1, 2] x_3 & \leq [-2, -1] \\
x_j & \geq 0 \quad j = 1, 2, 3
\end{align*}
\]

In accordance with the models (10) and (13), minimum \( q_b^* = 0.267 \) also \( q_a^* = 0 \), and if \( q_a^*' = 0.85 \) then \( q_b^* = 1 \).

<table>
<thead>
<tr>
<th>( q_a^* = 0 )</th>
<th>0</th>
<th>( q_b^* = 0.267 )</th>
<th>0.3</th>
<th>0.4</th>
<th>0.5</th>
<th>0.8</th>
<th>( q_b^* = 1 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>0.2</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>0.7</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>( q_a^*' = 0.85 )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>( q_a = 1 )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
<td>( \phi )</td>
</tr>
</tbody>
</table>

Having used the above-mentioned example, the approach is going to be compared with the approach represented in Leon’s article [3].
<table>
<thead>
<tr>
<th>Constraint</th>
<th>RHS in infeasible state</th>
<th>RHS in Leon’s model for feasible state</th>
<th>RHS in interval model for feasible state</th>
</tr>
</thead>
<tbody>
<tr>
<td>$q_a = 0$</td>
<td>constraint 1: 2</td>
<td>constraint 2: 4</td>
<td>$3.068(q_b = 0.267)$</td>
</tr>
<tr>
<td></td>
<td>constraint 2: 6</td>
<td>constraint 1: 4</td>
<td>$3.063$</td>
</tr>
<tr>
<td></td>
<td>constraint 3: 2</td>
<td>constraint 2: 2</td>
<td>$1.733$</td>
</tr>
<tr>
<td>$q_a = 0.5$</td>
<td>constraint 1: 2</td>
<td>constraint 2: 6</td>
<td>$3.068(q_b = 0.42)$</td>
</tr>
<tr>
<td></td>
<td>constraint 2: 6</td>
<td>constraint 1: 2.0623</td>
<td>$1.38$</td>
</tr>
<tr>
<td></td>
<td>constraint 3: 2</td>
<td>constraint 2: -1.9377</td>
<td>$1.58$</td>
</tr>
<tr>
<td>$q_a = 1$</td>
<td>constraint 1: 2</td>
<td>constraint 2: 19</td>
<td>$10(q_b = 2)$</td>
</tr>
<tr>
<td></td>
<td>constraint 2: 6</td>
<td>constraint 1: 3.166</td>
<td>$16$</td>
</tr>
<tr>
<td></td>
<td>constraint 3: 2</td>
<td>constraint 2: 0.1667</td>
<td>$0$</td>
</tr>
</tbody>
</table>

The determine of the right-hand side values to get a feasible answer in the represented model in this paper carries less distance comparing to Leon’s model. According above example, less changing in right-hand side can attain a feasible solution, in other hand, greater interval of right-hand side causes feasible solution for problem.

5 conclusion

This investigation proposed a method to solve infeasibility imprecise inequality problems by the concept of degree of inequality holding true. The discussions are accomplished on solution of linear inequalities and usually infeasibility has been removed with the use of change coefficients or right hand sides. But few works have studied infeasibility in imprecise linear inequality. In this paper, we have reviewed a method to solve interval inequalities, and then have inspected states of solution. In the later section, we have respected the problem while it was weakly feasible, and by proposed approach, the greatest intervals of technological coefficients and right-hand sides are computed to attain strongly feasible solution.

References


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