Inner addition and subtraction
vs.
Multidimensional RDM Interval Arithmetic
(A discussion related to IEEE Standard 1788-2015)

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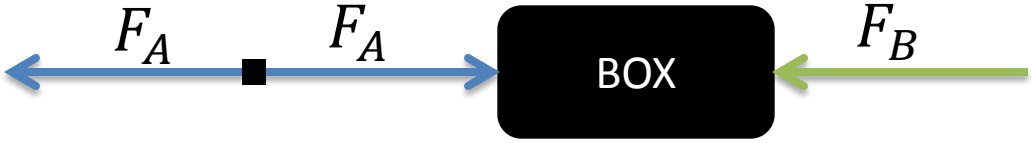
Inner addition and subtraction

Let F_A and F_B correspond to two different robotic arms force

F_A is about 2 and F_B is about 2. $F_A, F_B \in \overline{\mathbb{IR}}$

$F_A = [1\ 3], F_B = [1\ 3]$

$$F_B -^- F_A = 0$$



$$(F_B -^- F_A) +^- F_A = F_A$$

Restoration issue

$$F_B +^- (0 -^- F_A +^- F_A) = F_B$$

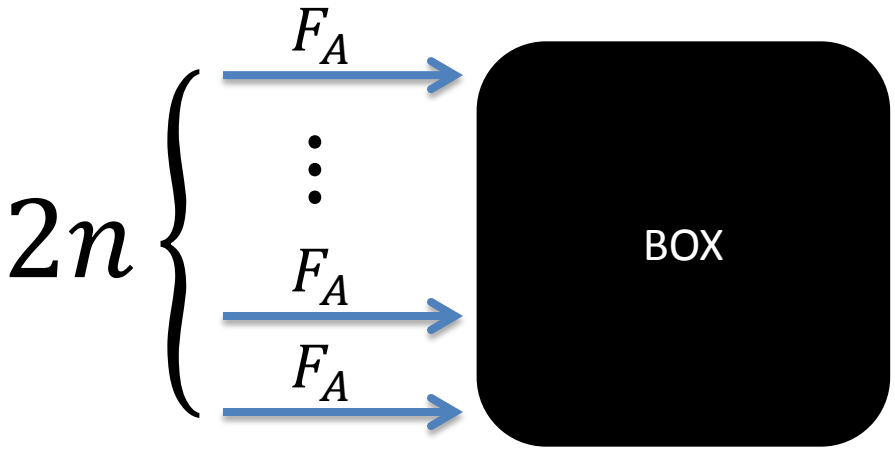
Second solution

Inner addition and subtraction

Assume we have $2n$ *robots* $(n \in \mathbb{N})$*which are of the same* $(or\ different)$*type. For the sake of simplicity let they are the same type* A. F_A *corresponds to a robotic arm force.*

F_A is about zero. $F_A \in \overline{\mathbb{IR}}$

$F_A = [-1 \;\; 1]$



The box does not move !!

$$F_A +^- F_A +^- \ldots +^- F_A = 0$$

Self-Reduction issue

Multidimensional RDM Interval Arithmetic

$Let\ F_A\ and\ F_B\ correspond\ to\ two\ different\ robotic\ arms\ force$

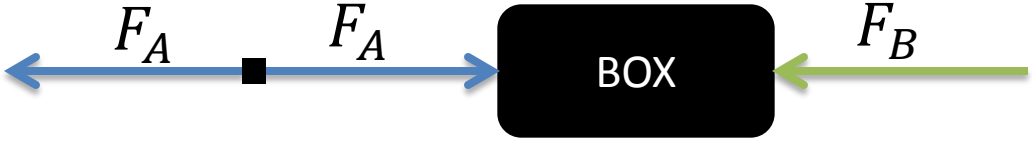
F_A is about 2 and F_B is about 2. $F_A, F_B \in \overline{\mathbb{IR}}$

$F_A = [1\ 3], F_B = [1\ 3]$

$F_B = 2\alpha_b + 1, F_A = 2\alpha_a + 1$

$\alpha_a, \alpha_b \in [0,1]$

$F_B - F_A = 2(\alpha_b - \alpha_a)$



$(F_B - F_A) + F_A = F_B + (-F_A + F_A) = 2\alpha_b + 1$

Unique solution, and there is no Restoration issue

Multidimensional RDM Interval Arithmetic

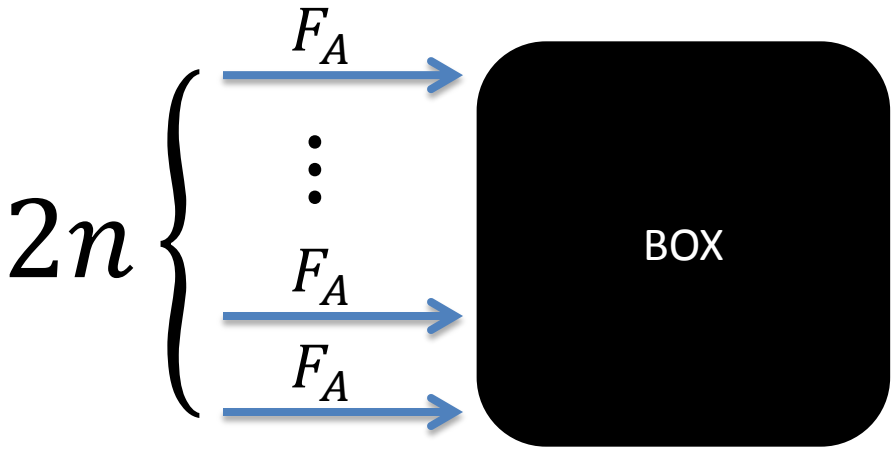
Assume we have $2n$ *robots* $(n \in \mathbb{N})$ *which are of the same (or different) type. For the sake of simplicity let they are the same type* A. F_A *corresponds to a robotic arm force.*

F_A is about zero. $F_A \in \overline{\mathbb{IR}}$

$F_A = [-1 \;\; 1]$

$F_A = 2\alpha_a$-1

$\alpha_a \in [0,1]$



Now, the box may move.

$$F_A + F_A + \cdots + F_A = 2n(2\alpha_a\text{-}1)$$

There is no self-reduction issue.