Towards a Block-based Language for Linear Programming

Hugo da Gião, hugo.a.giao@inesctec.pt
Jácome Cunha, jacome@fe.up.pt
Rui Pereira, rui.a.pereira@inesctec.pt

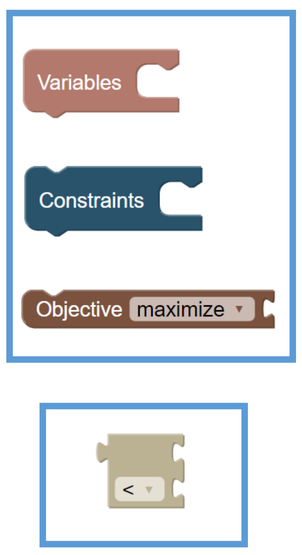
HASLab
HIGH-ASSURANCE SOFTWARE LABORATORY
INESCTEC

U.PORTO
FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

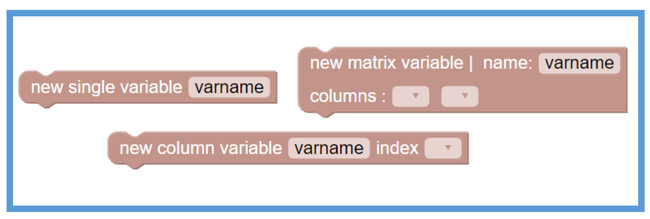
Universidade do Minho

Blocks

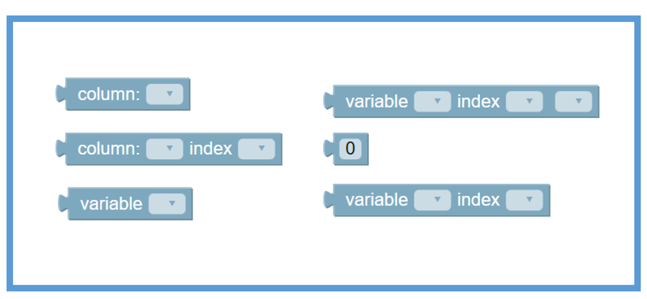
Main building blocks



Variable creation blocks



Value blocks



Operation block

Data

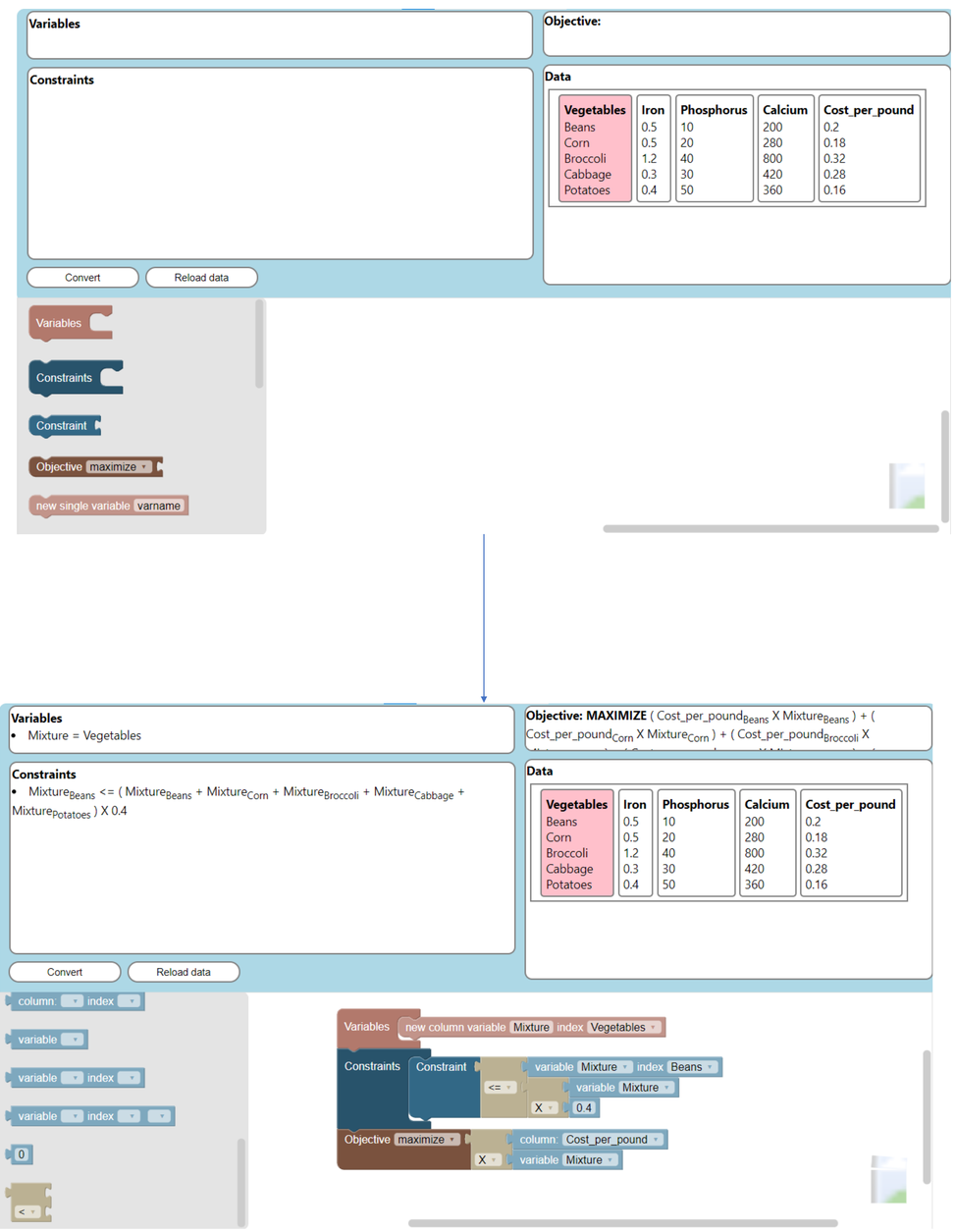
Compartment	Weight capacity	Space capacity	Empty column	Cargo	Weight	Volume	Profit
Front	10	6800		C1	18	480	310
Centre	16	8700		C2	15	650	380
Rear	8	5300		C3	23	580	350
				C4	12	390	285

Separator

Index | Data

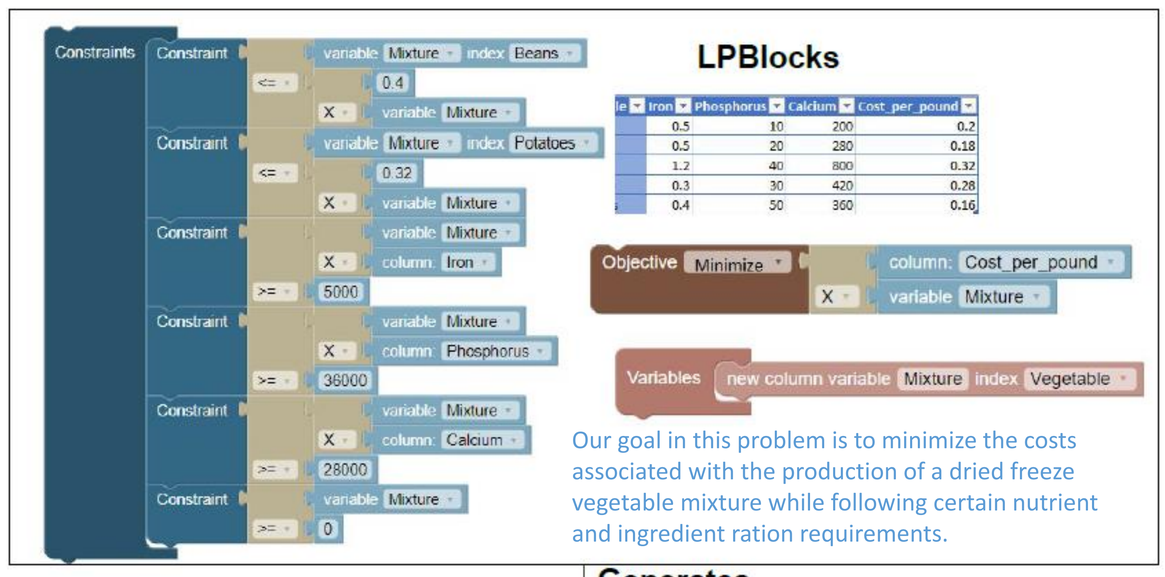
Vegetable	Iron	Phosphorus	Calcium	Cost_per_pound
Beans	0.5	10	200	0.2
Corn	0.5	20	280	0.18
Broccoli	1.2	40	800	0.32
Cabbage	0.3	30	420	0.28
Potatoes	0.4	50	360	0.16

Interface



Applicability

Vegetable mixture problem



Our goal in this problem is to minimize the costs associated with the production of a dried freeze vegetable mixture while following certain nutrient and ingredient ration requirements.

Generates

Constraints

$$10x_{Beans} + 20x_{Corn} + 40x_{Broccoli} + 30x_{Cabbage} + 50x_{Potatoes} >= 3600$$

$$200x_{Beans} + 280x_{Corn} + 800x_{Broccoli} + 420x_{Cabbage} + 360x_{Potatoes} >= 28000$$

$$x_{Potatoes} <= 0.32(x_{Beans} + x_{Corn} + x_{Broccoli} + x_{Cabbage} + x_{Potatoes})$$

$$x_{Beans} <= 0.4(x_{Beans} + x_{Corn} + x_{Broccoli} + x_{Cabbage} + x_{Potatoes})$$

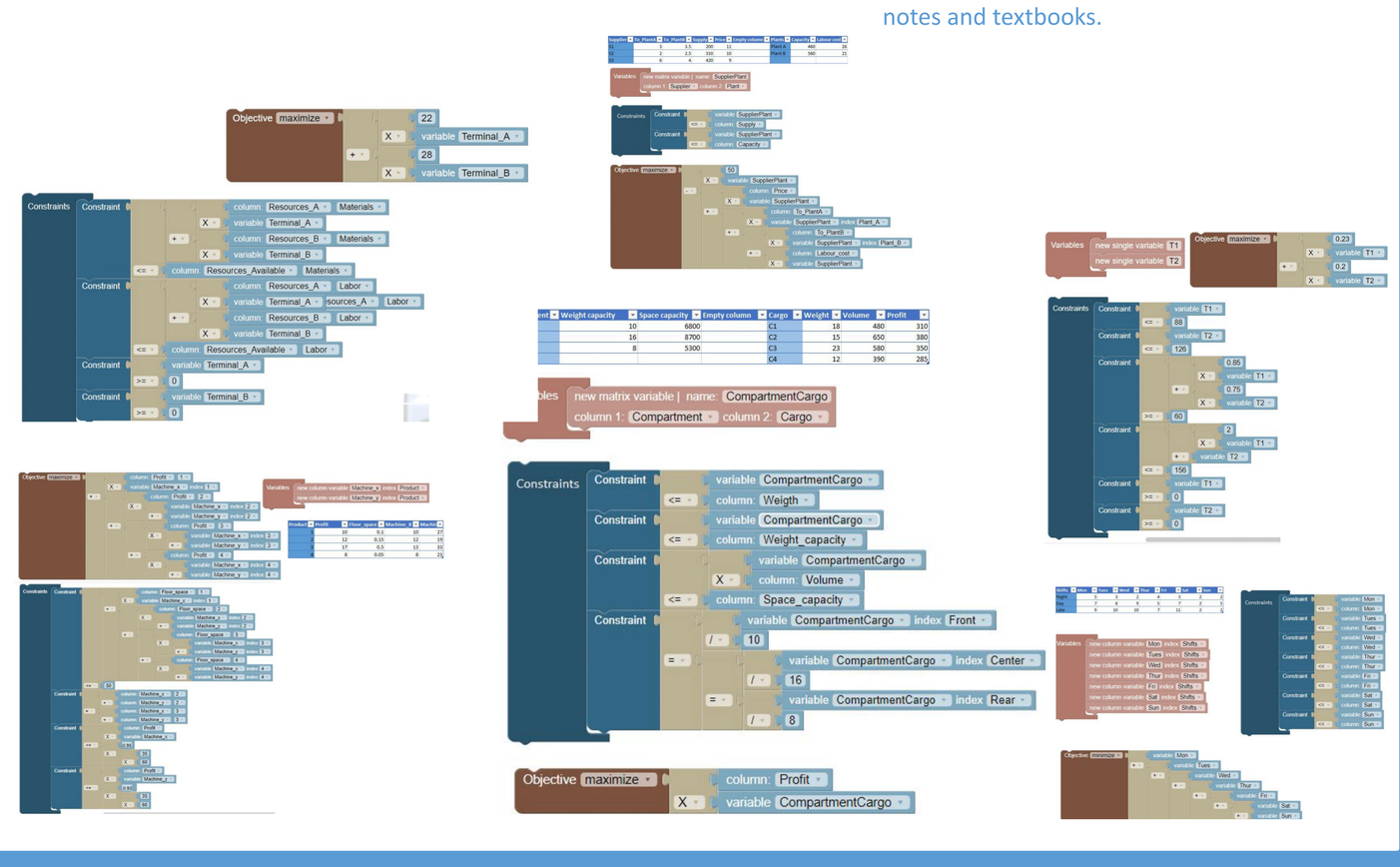
$$0.5 * x_{Beans} + 0.5x_{Corn} + 1.2x_{Broccoli} + 0.3x_{Cabbage} + 04x_{Potatoes} >= 5000$$

$$x_{Beans} >= 0$$
$$x_{Corn} >= 0$$
$$x_{Broccoli} >= 0$$
$$x_{Cabbage} >= 0$$
$$x_{Potatoes} >= 0$$

Objective

$$20x_{Beans} + 18x_{Corn} + 32x_{Broccoli} + 28x_{Cabbage} + 16x_{Potatoes}$$

To test the applicability and features of our language we solved 7 linear programming problems taken from operations research class notes and textbooks.



Goals

- Decrease errors
- Improve usability
- Better visualization
- Reliability

Source

The project source code can be accessed above.

This work is supported by the national funds through the Portuguese Funding Agency (FCT - Fundação para a Ciência e a Tecnologia, within project UIDB/50014/2020).

FCT
Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR