Fair Allocation of Indivisible Resources

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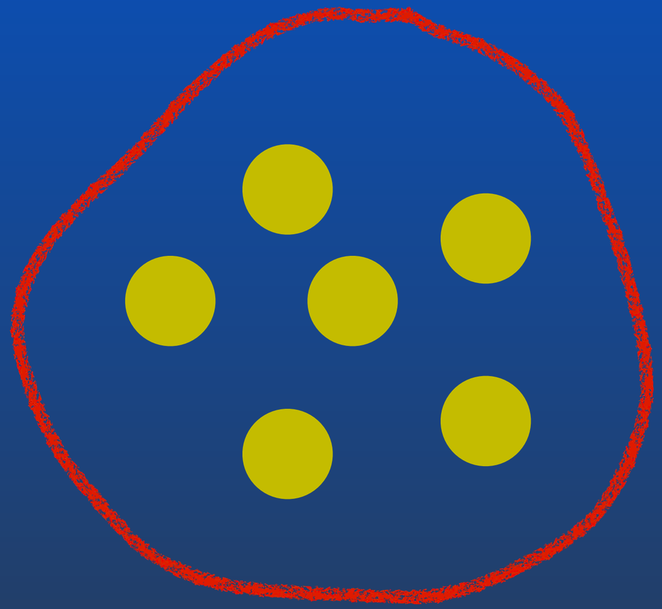
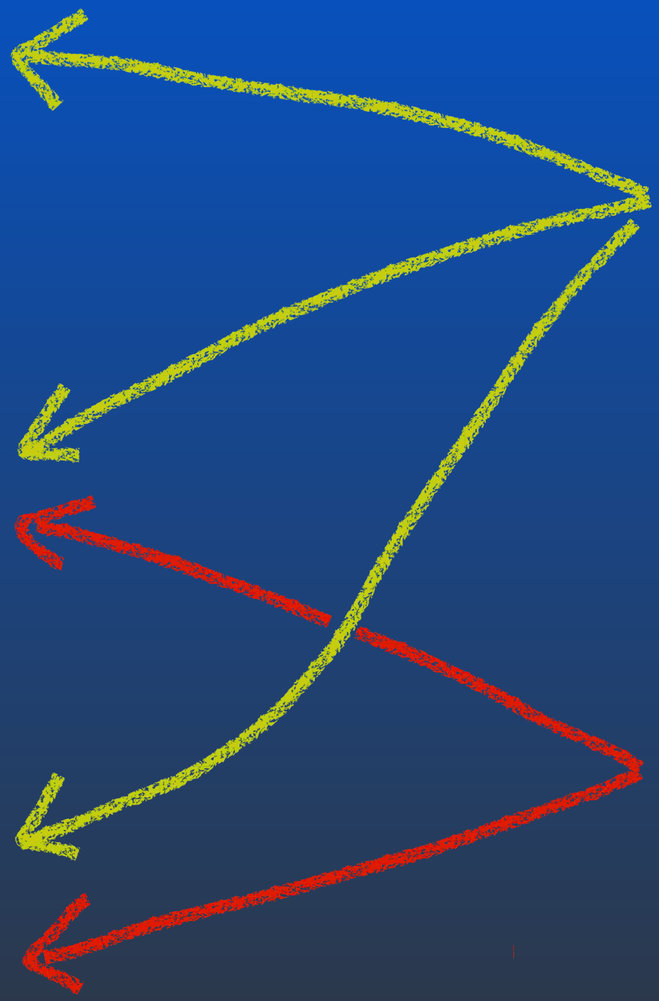
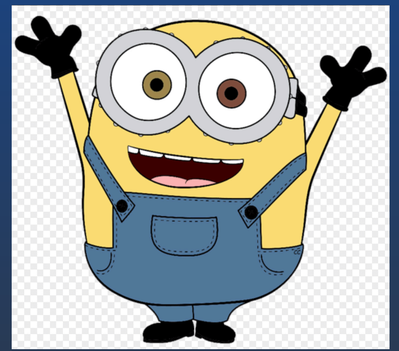


Resources

Players





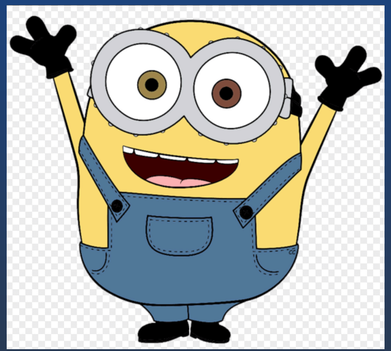
10

1

5

10

1



Resources

1 2 3 4 5 6 7 8 9

Players

1 2 3 4

Resources

1 2 3 4 5 6 7 8 9

Players

1 2 3 4

$C_1 : \{3, 6, 7\}$

$C_2 : \{2, 4, 8\}$

$C_3 : \{1, 9\}$

$C_4 : \{5\}$

v_{pr} : value of resource r for player p

Maximize

$$\min_{\text{player } p} \left(\sum_{\text{resource } r \text{ in } C_p} v_{pr} \right)$$

Fair Allocation

Arbitrary v_{pr}'s

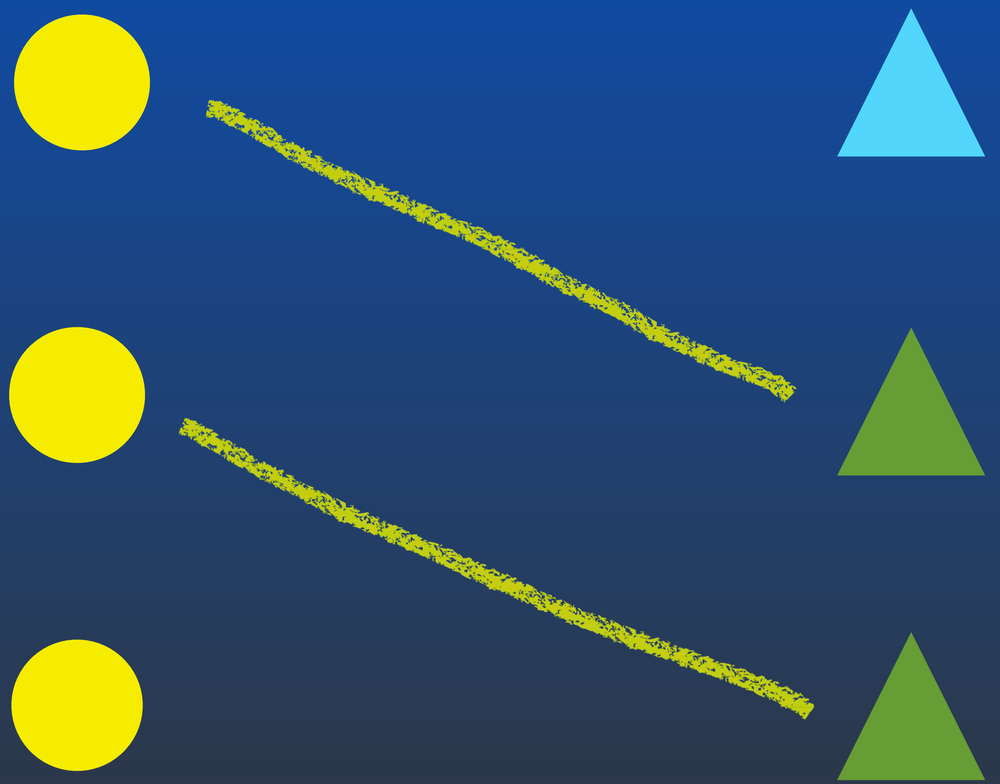
Hard to solve

or approximate

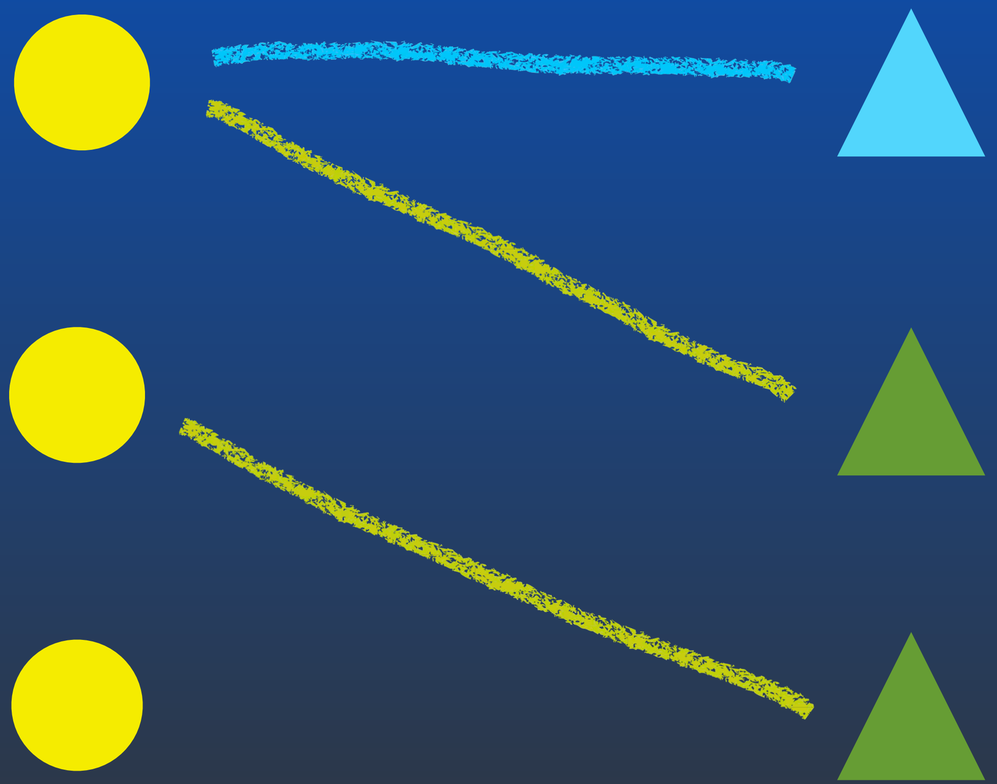
Resource r has value v_r

$$v_{pr} = \begin{cases} v_r, & \text{if } p \text{ wants } r, \\ 0, & \text{otherwise.} \end{cases}$$

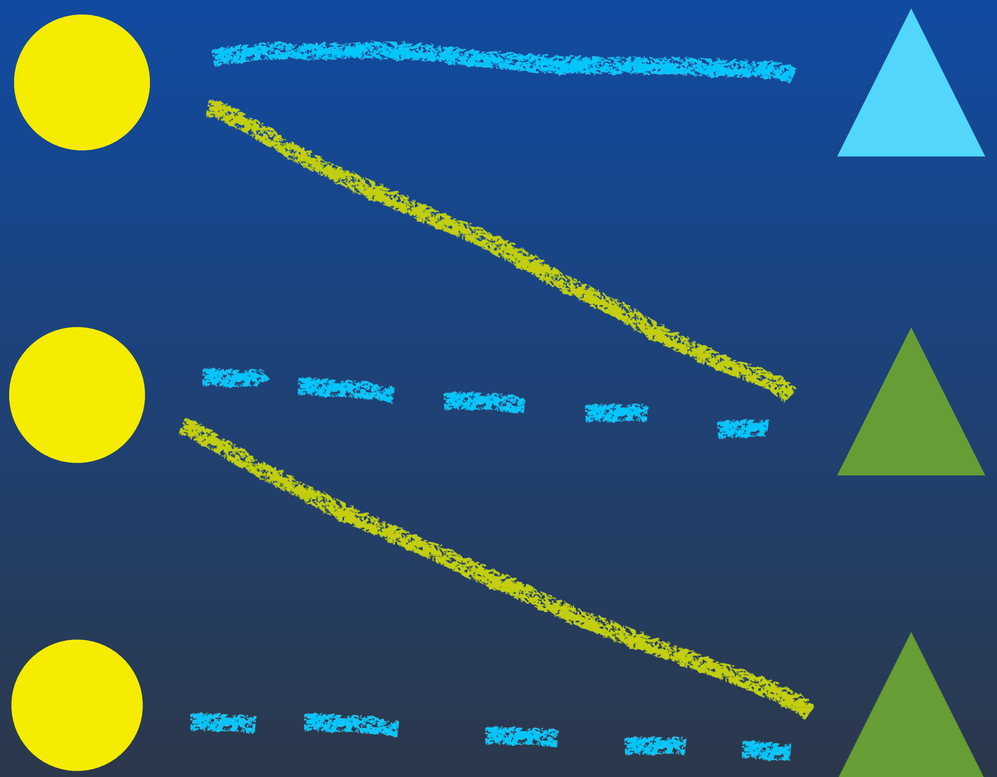
Greedy Local Search



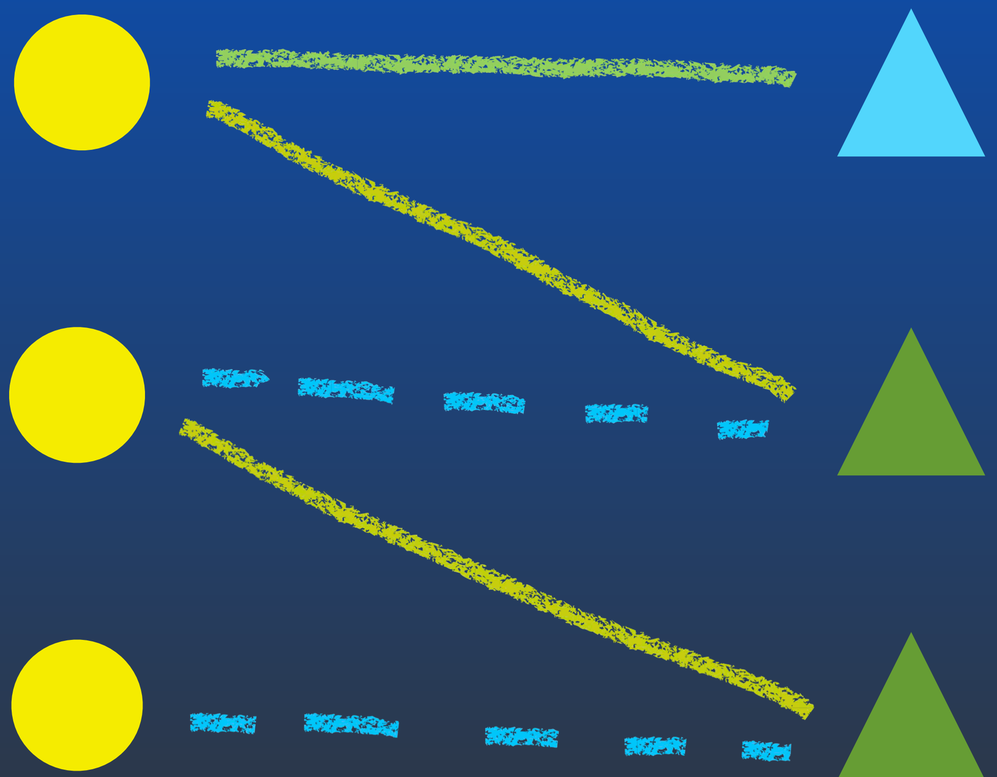
Greedy Local Search



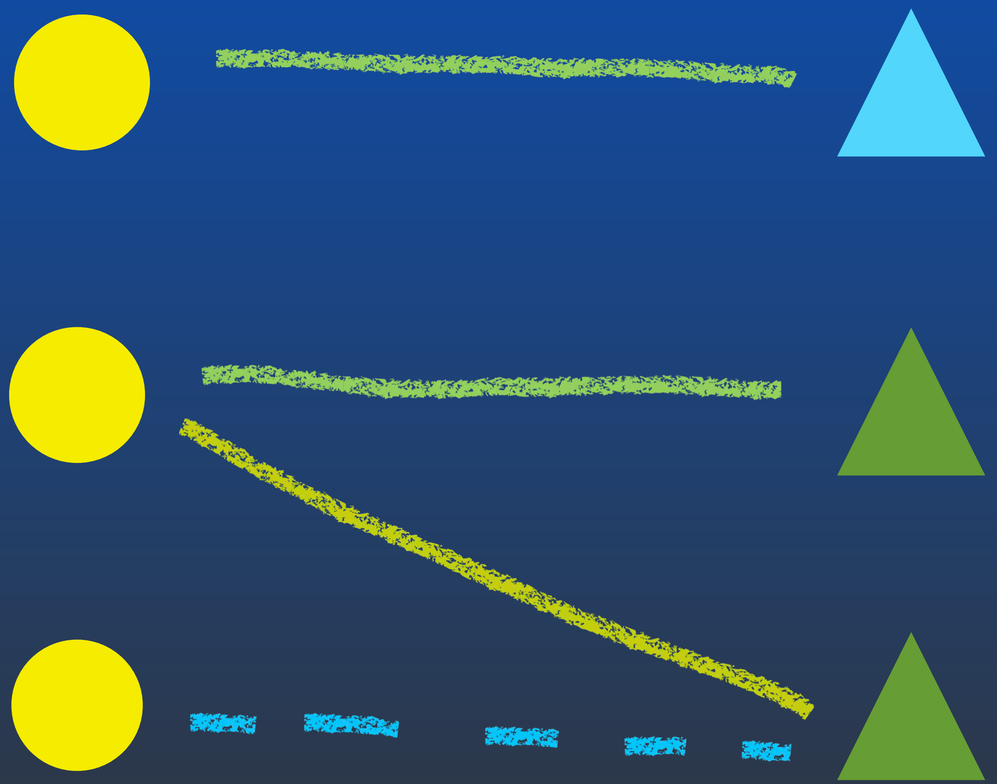
Greedy Local Search



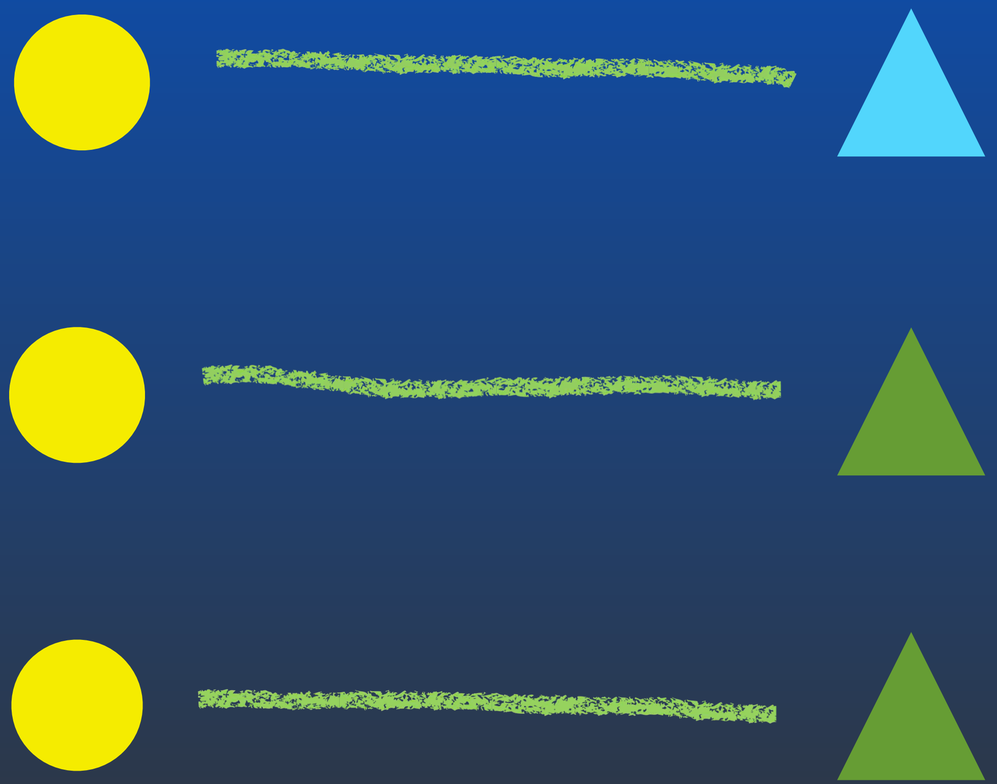
Greedy Local Search



Greedy Local Search



Greedy Local Search



* 4-approximation [ICALP 18 & 19]

* Better performance in experiments [FYT 20]

* Resource value v_r on a small scale, e.g. $\{0, 1, 2, 3\}$.

Path planning, optimization,
& geometric processing.

THANK YOU