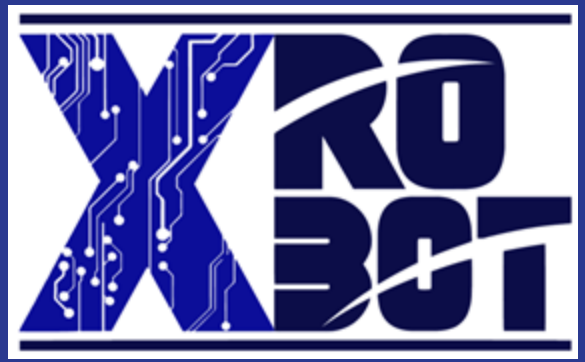
French Robotics Cup
TDR Requirements of System

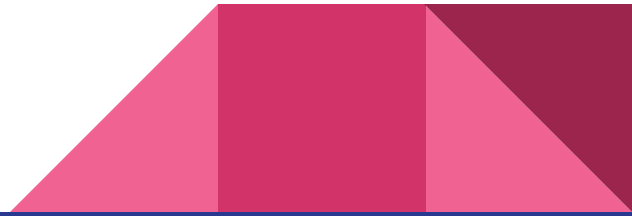


Objective of the TDR

How to score as many points as possible while being fiable ?

Contents

1. **Input**: *How to score points?*
2. **Constraints**: *At what cost?*
3. **Design**: *Which are the possible solutions?*
4. **Conclusion**: *What is our choice?*



1. Input - ***How to score points?***

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Action		Points
Moving atoms	place in wrong area	1 each
	place in good area	6 each
	place goldenium	6
Weight	red	4 each
	green	8 each
	blue	12 each
	gold	24 each
Bonus (only in final matches)	The more points in the weighing scale	30

New elements	place atoms in accelerator	10 each
	unlock	10
	extraction	20
Experiment	settle experiment	5
	activation	15
	success	20
Evaluation	Estimate your score	0.3*score-difference

2. Constraints - ***At what cost?***

- Classification of the atoms
  - Moving atoms → Friction, precision, grab?
  - Sorting atoms → recognition + extraction + moving without mixing already sorted atoms
  - Placing Goldenium → unlock + precision
- Weighing the atoms → move + climb
  - Redium 60g → light and common
  - Greenium 120g → heavier + ordinary
  - Blueium 170g → quite heavy + rare
  - Goldenium 340g → very heavy + unique
- Bonus (only in final stage)
  - Optimizing the atom in the weighing scale → recognition + optimisation

- Accelerator
  - Placing → grabbing + elevating + placing
  - Unlock → pushing an atom (already existing)
  - Goldenium extraction → unlock + heavier
- Experiment
  - Settled → little cost (before the match)
  - Activated → can be easy : mechanically
  - Achieved → if tested before, no costs
- Evaluation
  - Estimate or compute → predictable strategy or atom analysis (camera)

3. Design - ***Which are the possible solutions?***

- Experiment (up to 40 pts)
  - failure does not affect the robot
- Evaluation (> 0 pts)
- Focusing on atoms (up to 30 pts with 5 atoms)
  - finding and processing atoms (differentiating them with the camera)
  - getting back atoms to their spot
  - easy not to end with zero pts
  - harder with the number of atoms increasing

- Unlocking goldenium (up to 40 pts)
  - requires precise placement : our objective
  - high-ground manipulation and grabbing (for going backward and pull it)
  - Chaining of actions (small risk of 0 points strategy)
  - increasing the probability of meeting with the opponent
  - Does not depend on the atoms placement
- Interacting with the balance (up to 40 pts or 55 with gold)
  - need to use the inclined plane, or to lift atoms
  - requires a complex system (mechanical arm?) to grab and lift atoms
  - real gain only if able to put other than red
  - jackpot for finals
  - risk of 0 pts

3. Design - Using a robot arm to move Atoms

Pros

- Better control of Atom's trajectory
- Can put Atoms in the balance, especially the Goldenium
- Avoiding friction by pushing atoms

Cons

- More weight and less stability
- A lot of energy consuming
- The Atoms aren't easy to grab : can slip of the hand and create problems
- More computation for the arduino card

4. Conclusion - ***What is our choice?***

1. Activating the experiment
    - activation with no move would be good
2. Going for the goldenium
    - moving from and toward a known spot
    - precise position given by the camera
3. Investing the rest of the time to push atoms :
    - detecting the color and position of atoms with the camera
    - Using a snow plow to push the atom instead of a robot arm
    - optimizing the placement of atoms given the precision of manipulation
4. Evaluating the score
    - success control with the camera

- Points we intend to score

Action	Points
Experiment	40
Accelerator + goldenium	40
Placing atoms	20
Score evaluation	0,3*score = 30
Total	**130**

Conclusion

- Focus on **localisation** and **precision**: goldenium liberation
- Adapting to the possibilities of the **camera** (position of robots and atoms)
- Original strategy : no competition for atoms against the opponent