
Ideation Report

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Problem Statement

Suez has a need for a stable platform system capable of supporting a robotic cleaning arm inside water tanks. Requirements for the platform include stable construction to support the movement of the arm, horizontal movement around tank, and vertical position of arm to clean walls. The solution will be remotely operated and have visual feedback for positioning.

The project team's primary goals are:

1. Stability
2. Horizontal Mobility
3. Vertical Mobility

Suez Prototype

Issues identified:

1. Unstable/broken scaffolding
2. Poor position lock
3. No remote operation
4. No visual feedback



Idea 1: Roller Coaster Sliding Arm Cart

Description: The robotic arm is placed on a set of rails to move. The rail system can then be motorized to move around the tank.

Positives:

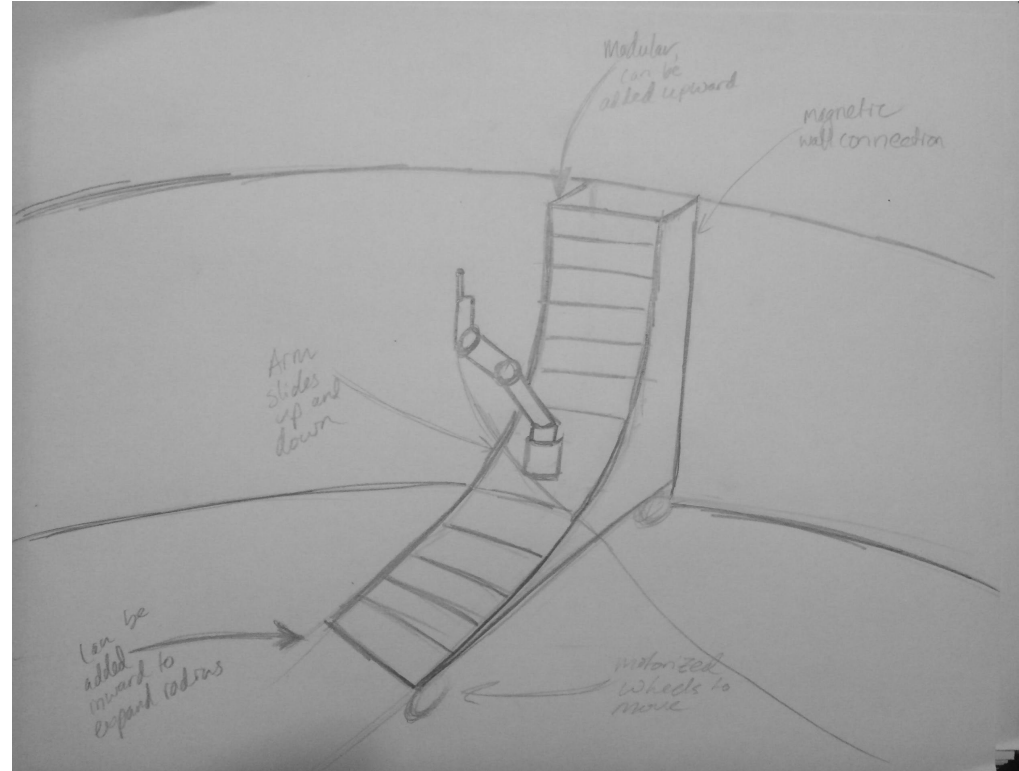
- Relatively easy locking
- Modular for different tanks
- Arm reaches multiple heights

Negatives:

- Requires decent assembly in tank
- Complicated build with many parts

Interesting:

- A different approach to the traditional 'rail system'



Idea 2: Wheeled Scissor Lift

Description: Scissor lift platform on a wheeled base for ground level movement with wheel locks for floor stability and electromagnets for stability when elevated.

Positives:

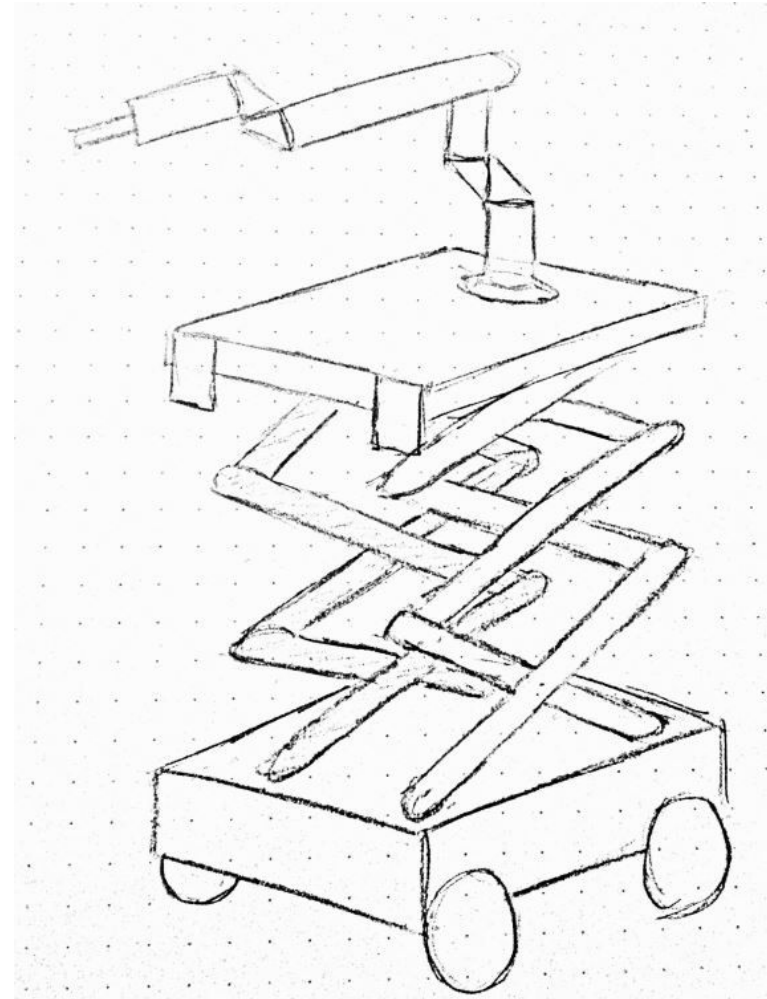
- Vertical mobility
- Controlled remotely from outside of the tank

Negatives:

- Compromised stability during blasting
- Difficult to apply to tall tanks
- Difficult to disassemble

Interesting:

- Scissor lift: employs existing and established technology
- Vertically promising design for ground tanks



Idea 3: Robotic Electromagnetic Worm

Description: Robot with electromagnets capable of moving on metal surfaces regardless of orientation.

Positives:

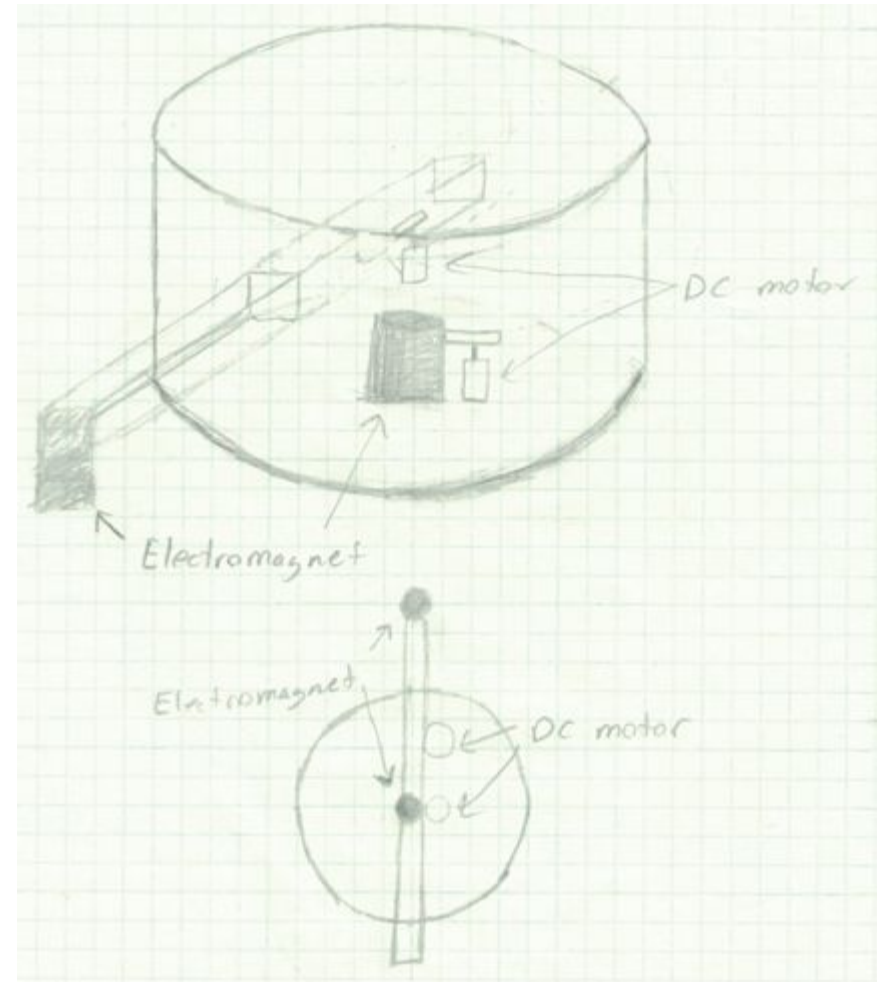
- Small, portable
- Access to all surfaces of any tank
- Limited human interaction required

Negatives:

- Relatively difficult to build
- Power failure will likely result in destruction of robot and arm

Interesting:

- Only 2 motors and 2 magnets required



Idea 4: Modular Scaffolding

Description: Solution consisting of motorized wheels and a top mounting plate allowing for modular construction.

Positives:

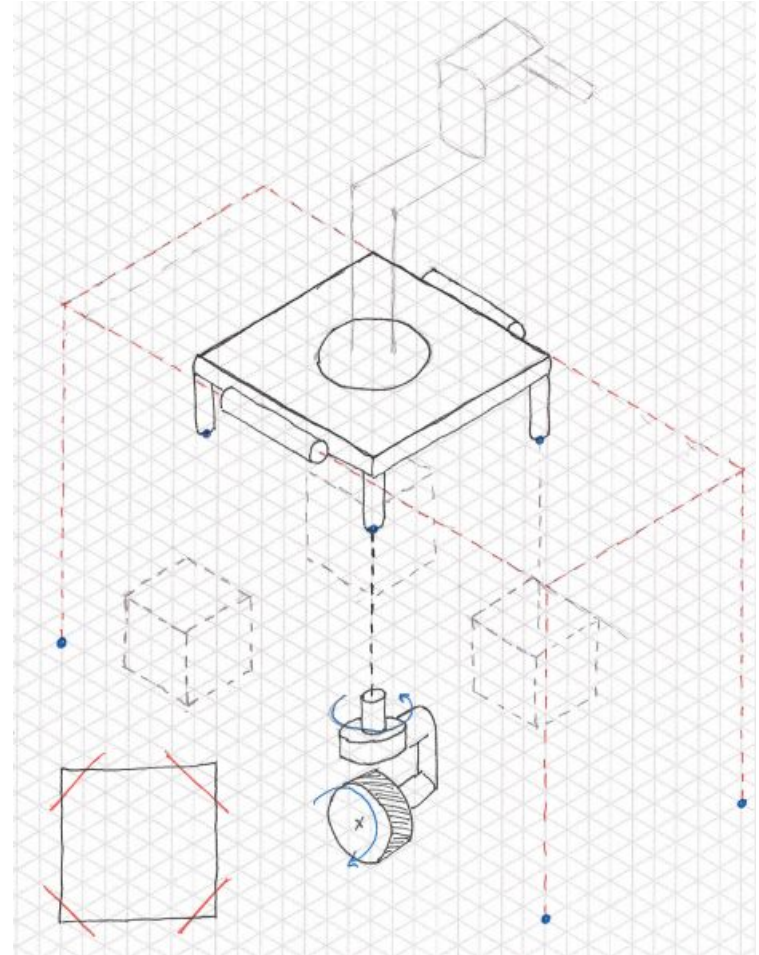
- Vertical mobility
- Modular system for height capabilities
- Breaks to small components
- Simple position locking with wheel positioning
- Commercially available components

Negatives:

- Manpower needed to build next level
- Arm needs to be lifted to next level
- Possible instability at tall heights

Interesting:

- Flexible solution allowing for adaptation to all tank sizes and obstacles



Idea 5: Spider Legs

Description: The robotic arm is placed on a platform with wheels and retractable legs to lift platform during operation of arm.

Positives:

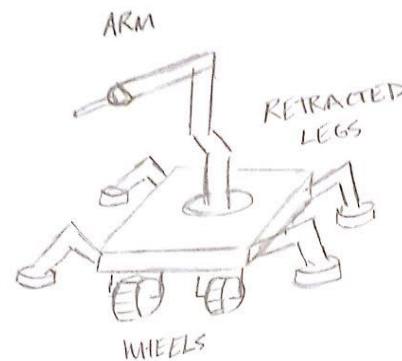
- Stability with multiple legs
- Relatively simple motions

Negatives:

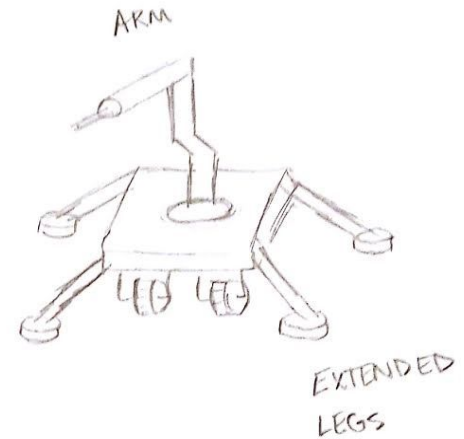
- Hydraulics to operate legs
- Limited vertical height capability

Interesting:

- Biomimicry
- Existing technology (crane outrigger, space landing)



MOBILE



STATIONARY

Conclusion

Next steps:

- Predict feasibility of design options
- Combine best aspects of ideas into one
- Feedback from Suez