#transparentbuckets

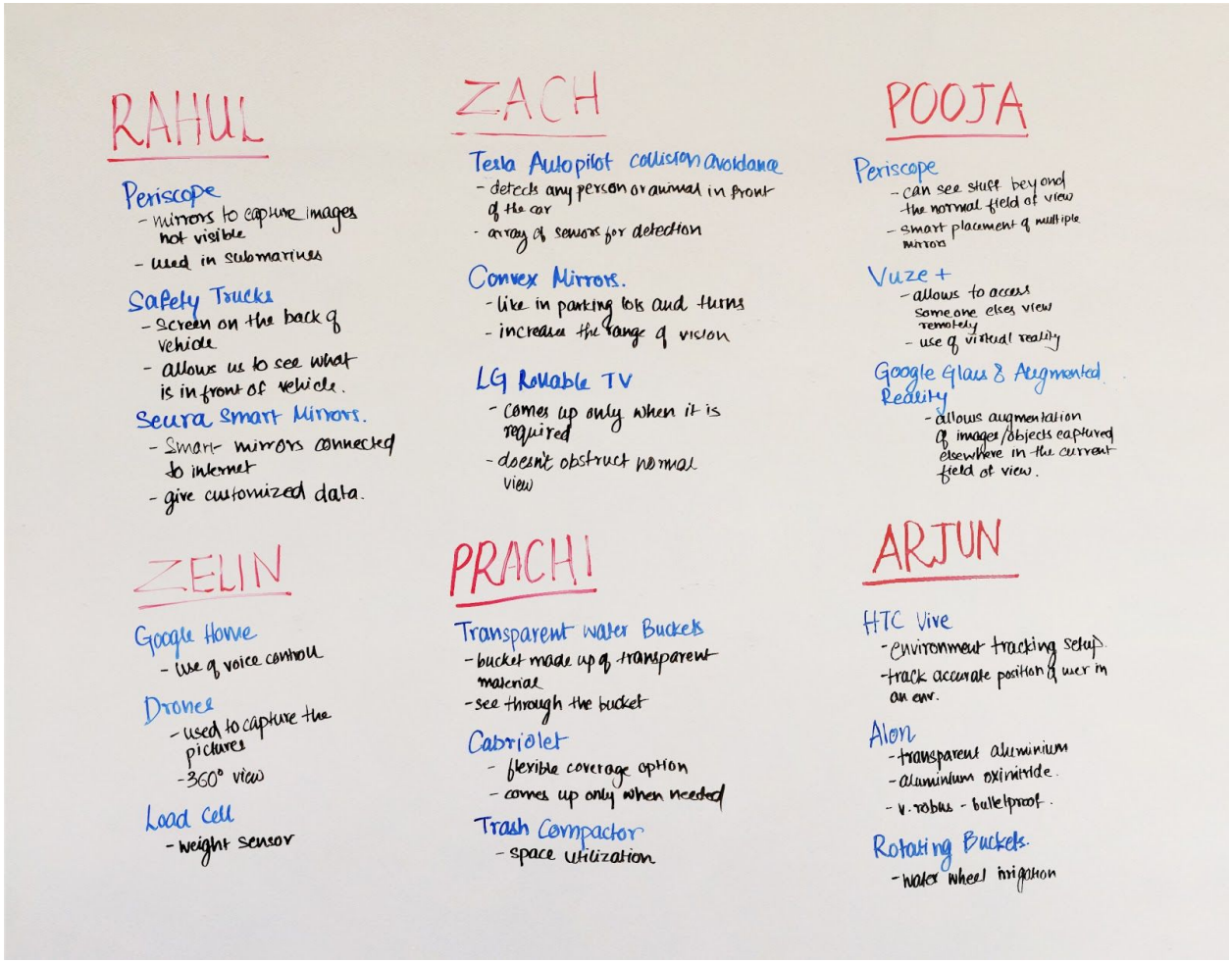
CSC 591, Spring 2019

Stage 2 - Generate

Team

#	Name	UnityId
1	Arjun Madhusudan	amadhus2
2	Pooja Patel	pkpatel5
3	Prachi Gupta	pgupta24
4	Rahul Sethi	rsethi3
5	Zachariah Mathews	zmathew
6	Zelin Sun	zsun12

Demos


RAHUL
Periscope
- mirrors to capture images not visible
- used in submarines
Safety Trucks
- screen on the back of vehicle
- allows us to see what is in front of vehicle.
Seura Smart Mirrors.
- Smart mirrors connected to internet
- give customized data.
ZACH
Tesla Autopilot collision avoidance
- detects any person or animal in front of the car
- array of sensors for detection
Convex Mirrors.
- like in parking lots and turns
- increases the range of vision
LG Rollable TV
- comes up only when it is required
- doesn't obstruct normal view
POOJA
Periscope
- can see stuff beyond the normal field of view
- smart placement of multiple mirrors
Vuze +
- allows to access someone elses view remotely
- use of virtual reality
Google Glass & Augmented Reality
- allows augmentation of images/objects captured elsewhere in the current field of view.
ZELIN
Google Home
- use of voice control
Drones
- used to capture the pictures
- 360° view
Load Cell
- weight sensor
PRACHI
Transparent water Buckets
- bucket made up of transparent material
- see through the bucket
Cabriolet
- flexible coverage option
- comes up only when needed
Trash Compactor
- space utilization
ARJUN
HTC Vive
- environment tracking setup
- track accurate position of user in an env.
Alon
- transparent aluminium
- aluminium oxinitride
- V. robbs - bulletproof.
Rotating Buckets
- water wheel irrigation

Arjun Madhusudan

List of ideas and inspirations

Ideas: Focusing on the user

1. Room scale, inspired by HTC Vive.
    - A dual-lighthouse environment tracking setup will detect the accurate positions of the buckets and the vehicle itself and can be presented to the user in a helpful manner.
2. Pair operation, inspired by pair programming models.
    - This creates a team of two operators, one to control the vehicle and one to help and guide the other.
3. Personal motivator and encourager.
    - A lot of IT industries have places where an employee can go to for emotional motivation and encouragement, so why not have one for an operator as well?
4. Adaptive manuals, inspired by media editing tools (Adobe Photoshop, After effects etc).
    - If operators understand all the features of the CAT vehicle, he will perform better. So if we could somehow get them to go through the big guide stuck to the back of the seats in the ROPS, it would help. Getting an adaptive manual system where only necessary information is presented to the operator rather than a huge book at once, they will be more likely to go through the manuals.
5. Laser projectors inspired by LAP Lasers
    - https://youtu.be/txKidzRyn8o?t=42
    - This can provide a detailed guideline system which the user can use for better efficiency.

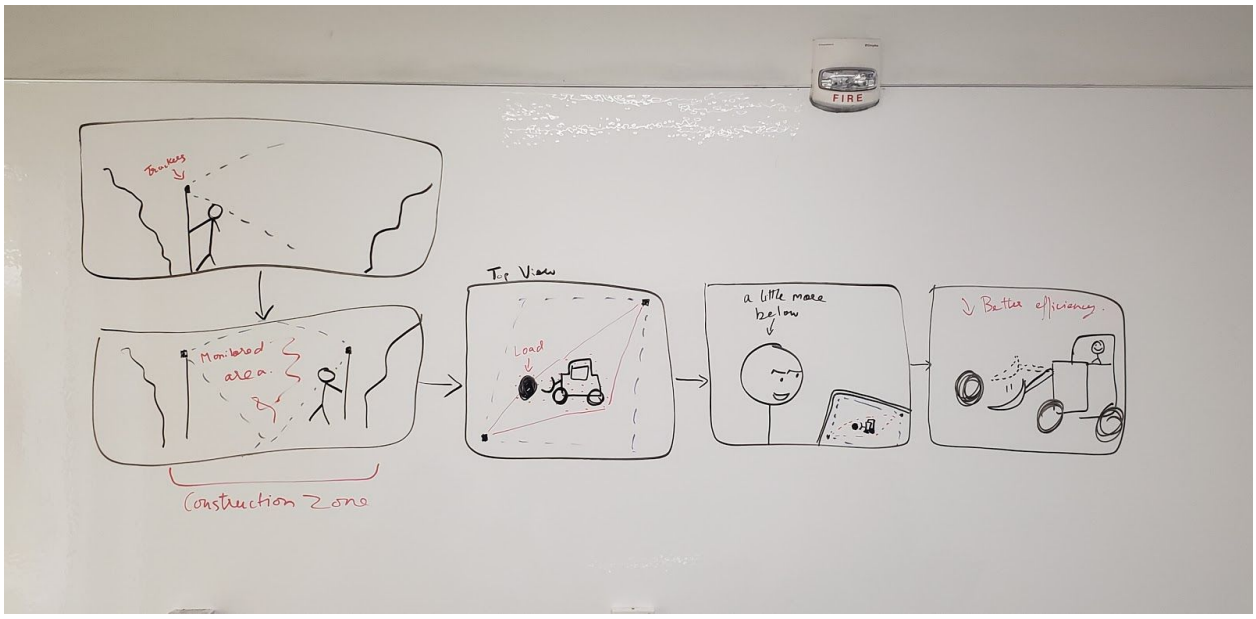
Ideas: Focusing on implementation

1. Rotating buckets - water wheel irrigation
    - Picking up the load iteratively using a bucket wheel (similar to a paddle-wheel irrigation system) and dropping it into a larger bucket container will help take the efficiency issue off the operator's shoulder and convert it to just a matter of time and a long run to pick up the maximum possible efficiency.
2. Aluminium Oxynitride, inspired by ALON from Surmet technology - http://www.surmet.com/technology/alon-optical-ceramics/index.php
    - This is a kind of aluminium that is completely transparent, that is even bulletproof to a good extent if used in an appropriate form. This can be used to replace parts that block the view of the operator.

Crazy 8


OK!
Stop there and dig
Sand
Pick iteratively & drop in bucket.
Dig Manuals
I'll now dig
DEPTH: 2.47m
STRENGTH: XYZ
ALON (Transparent Aluminium)
Steady Material
Just DO IT!!
Thanks Shiva, I'm motivated now

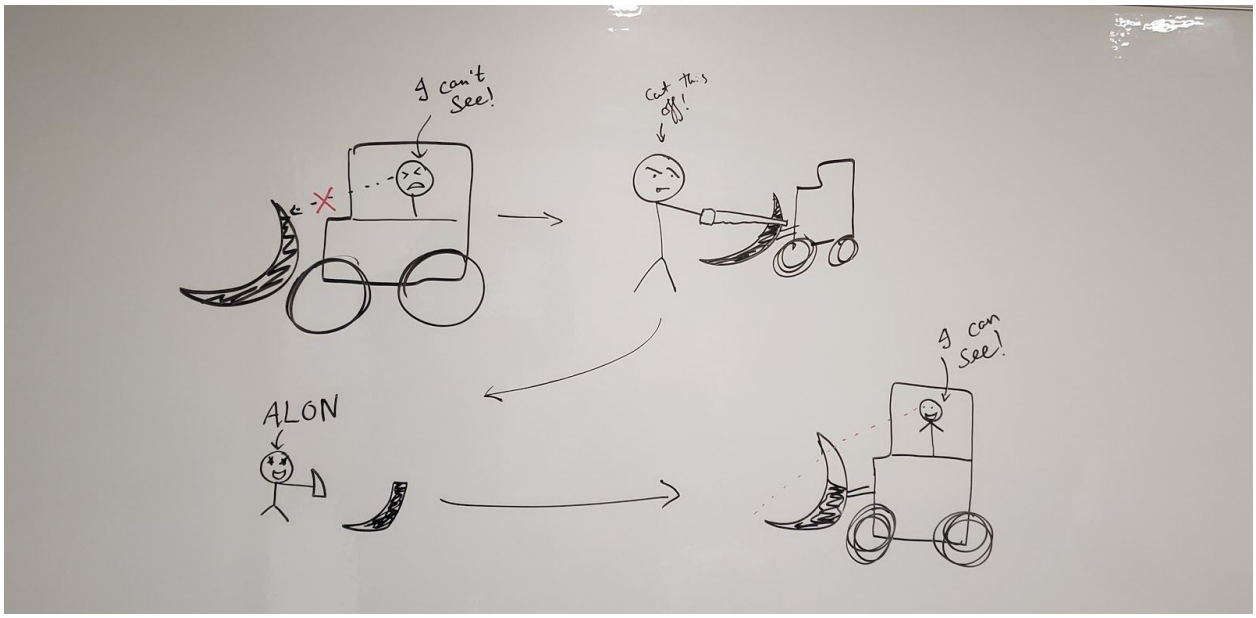
Storyboard 1:



Description

- The operator sets up the environment he will be working in, and creates a controlled and tracked room-scale kind of setup in the construction zone. Since this takes inspiration from the HTC Vive setup, it shows two sensors, but in a real world zone, there can be multiple sensors from multiple areas. Once that is done, the relative position of the CAT vehicle is now visible to the operator from a third person's perspective, which will give him a lot more control over his movements and the operations.

Storyboard 2:



Description:

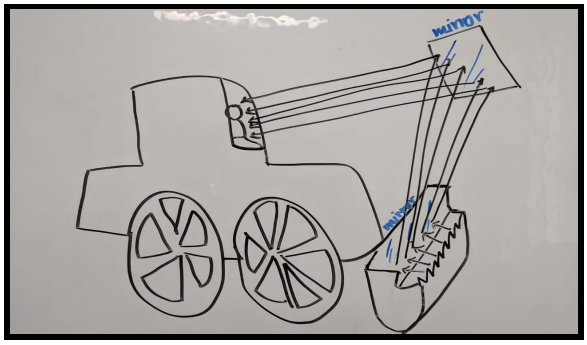
- ALON (Aluminium Oxynitride) is a metallic material that is transparent, even as strong as being bulletproof. The operator's vision is obstructed by the bucket itself, so this solution tries to solve that. Making the entire bucket out of this material would end up in losing strength and toughness of the bucket required to survive through the wear and tear, so the ideal idea would be to make only that part of the bucket transparent where there isn't too much stress, but this will clear up the operator's field of view a lot. This way, he can see what is happening inside/behind the bucket and will be able to get a better grasp of how much payload has he picked up.

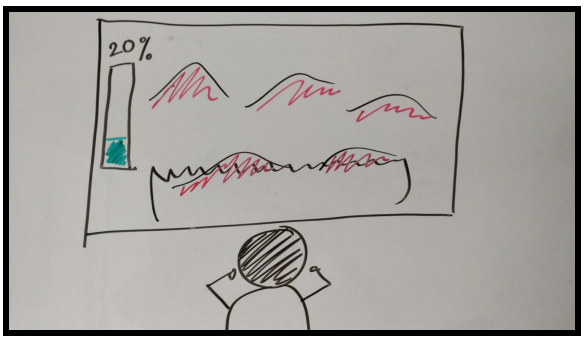
Pooja Patel

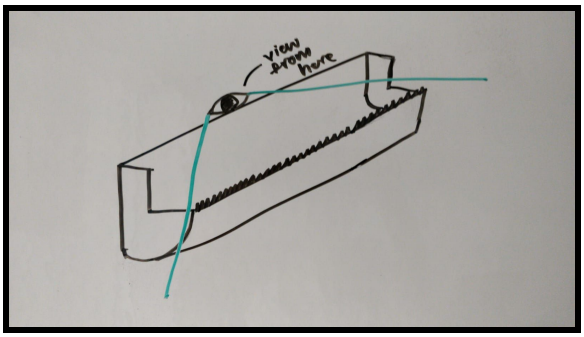
List of ideas and inspirations:

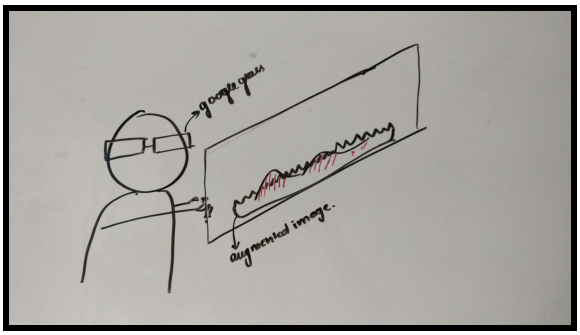
1. **Periscope:** The good old periscopes excellently used multiple mirrors placed very smartly to achieve a view above or below a certain surface. A similar concept can be used to provide the user with the view blocked by the bucket.
2. **Vuze+:** The Vuze+ not only allows a 360-degree view of the environment but also extends to augmented reality to provide one user with the complete view of another user. Such a technology can be incorporated to provide the driver with a view from a viewpoint outside of the vehicle, possibly from the head of the bucket.
3. **Google Glass:** Google glass can incorporate augmented reality to add objects to the user's view, this concept can be used to capture the view blocked from the user from elsewhere and then augment it to the user’s view.

Crazy 8:

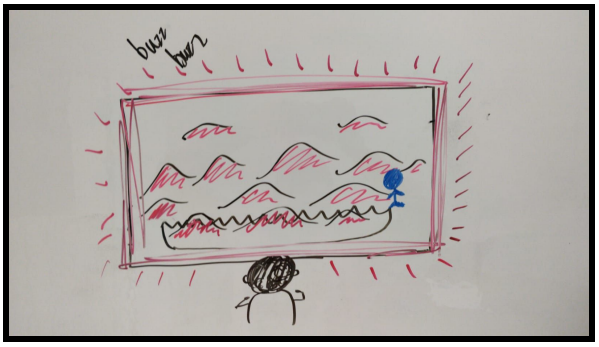

mirror
mirror

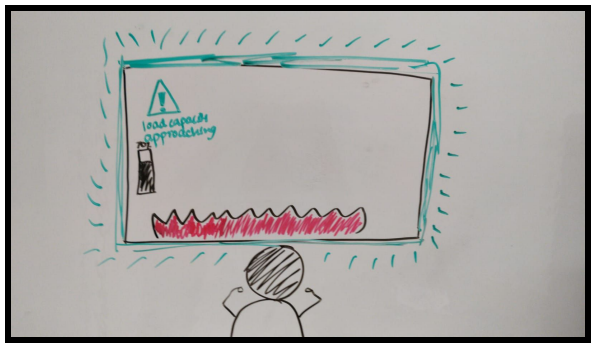

20%

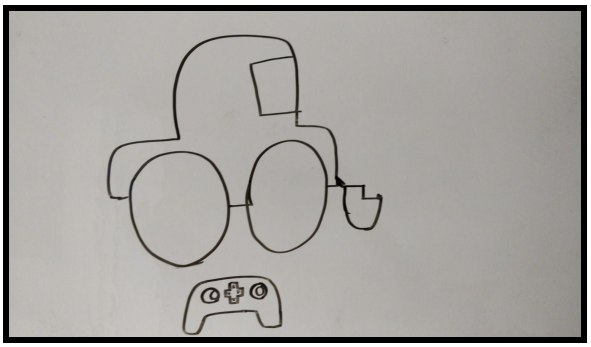

view from here


google glass
augmented image

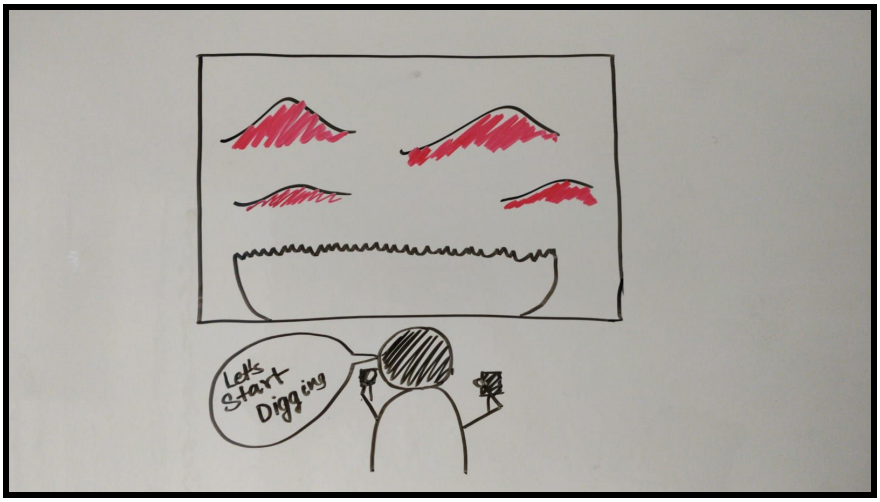

regular view
view from below

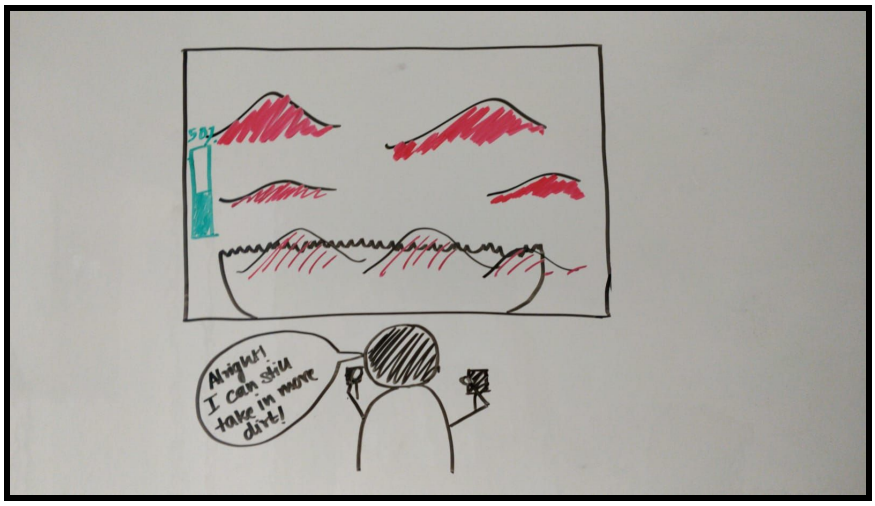

buzz buzz

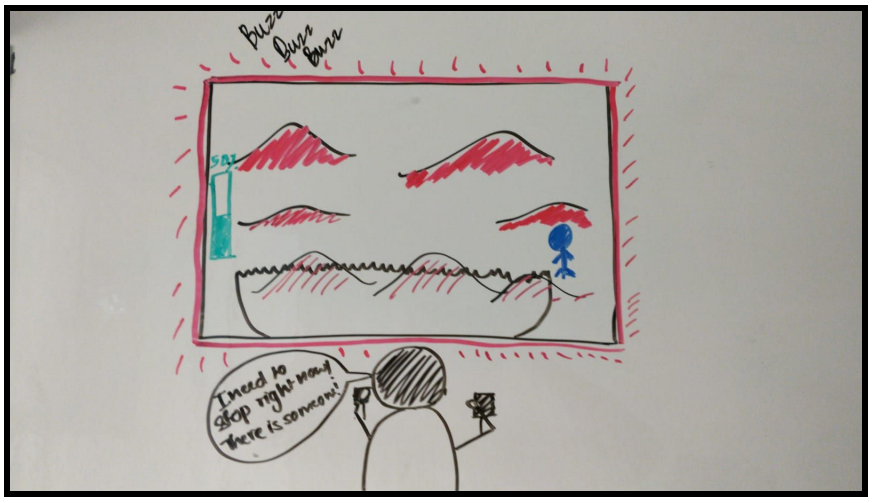

load capacity approaching



Storyboard:


Lets Start Digging


Alright! I can still take in more dirt!


Buzz
Buzz
Buzz
I need to stop right now! there is someone!

Description:

The storyboard depicts how augmented reality can be used to make the lifting experience more accurate, productive, easier and responsive for the user. An image of the view blocked by the user can be captured from elsewhere and projected in the user's view to aid in picking up more accurately and efficiently. Also, productivity can be increased by showing the user a real-time meter of the amount of load in the bucket. AI can be incorporated to detect and warn the user of any person/object in the way of the bucket.

Prachi Gupta

List of ideas and inspirations:

1. Inspiration: **Transparent water bucket**

   Use a transparent bucket to see bucket's content as well as increase the operator's visibility

2. Inspiration: **Cabriolet**

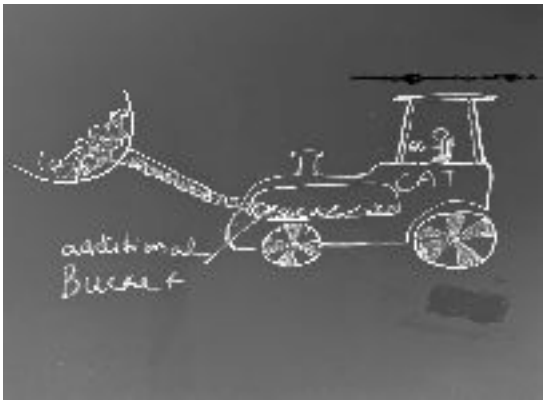
   Bucket with cabriolet will help to secure the sand collected when the bucket is moving.

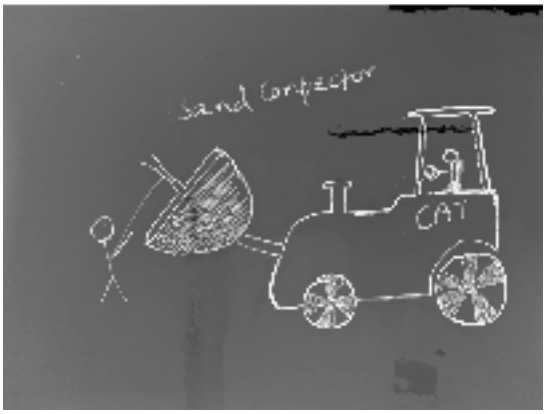
3. Inspiration: **Trash compactor**

   Press the sand collected for bucket capacity utilization.

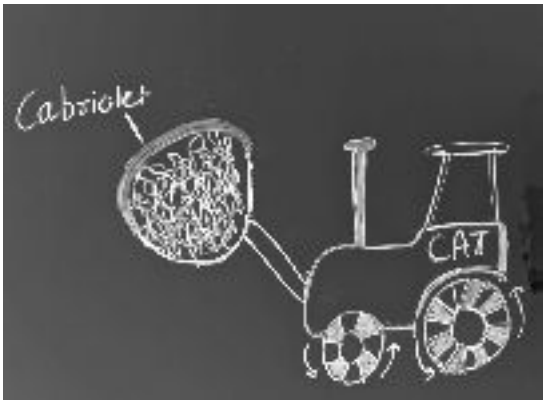
Crazy 8

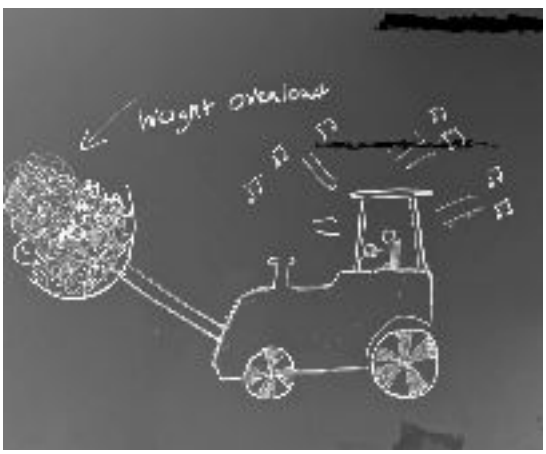

CAT


CAT
additional
Bucket


Sand Compactor
CAT

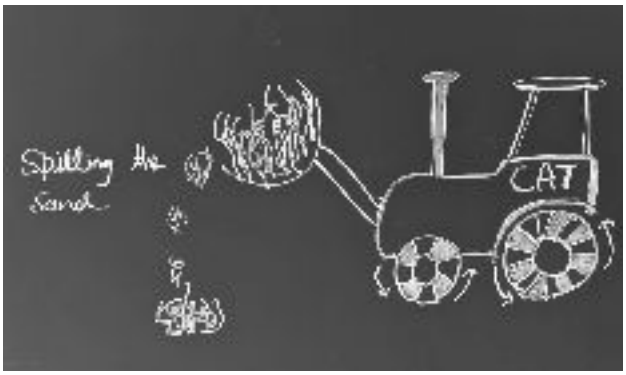

Interactive
Video

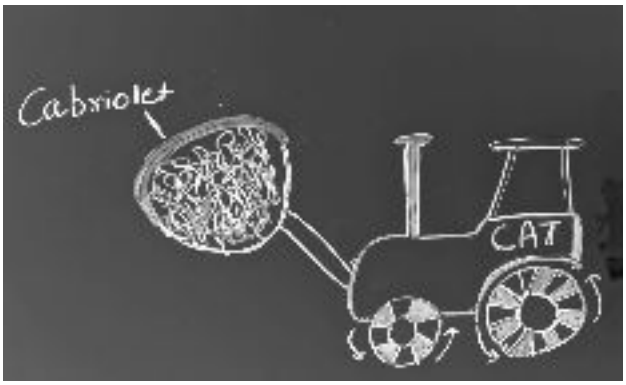

Cabriolet
CAT


Weight overload


Mirror

Storyboard:





Description:

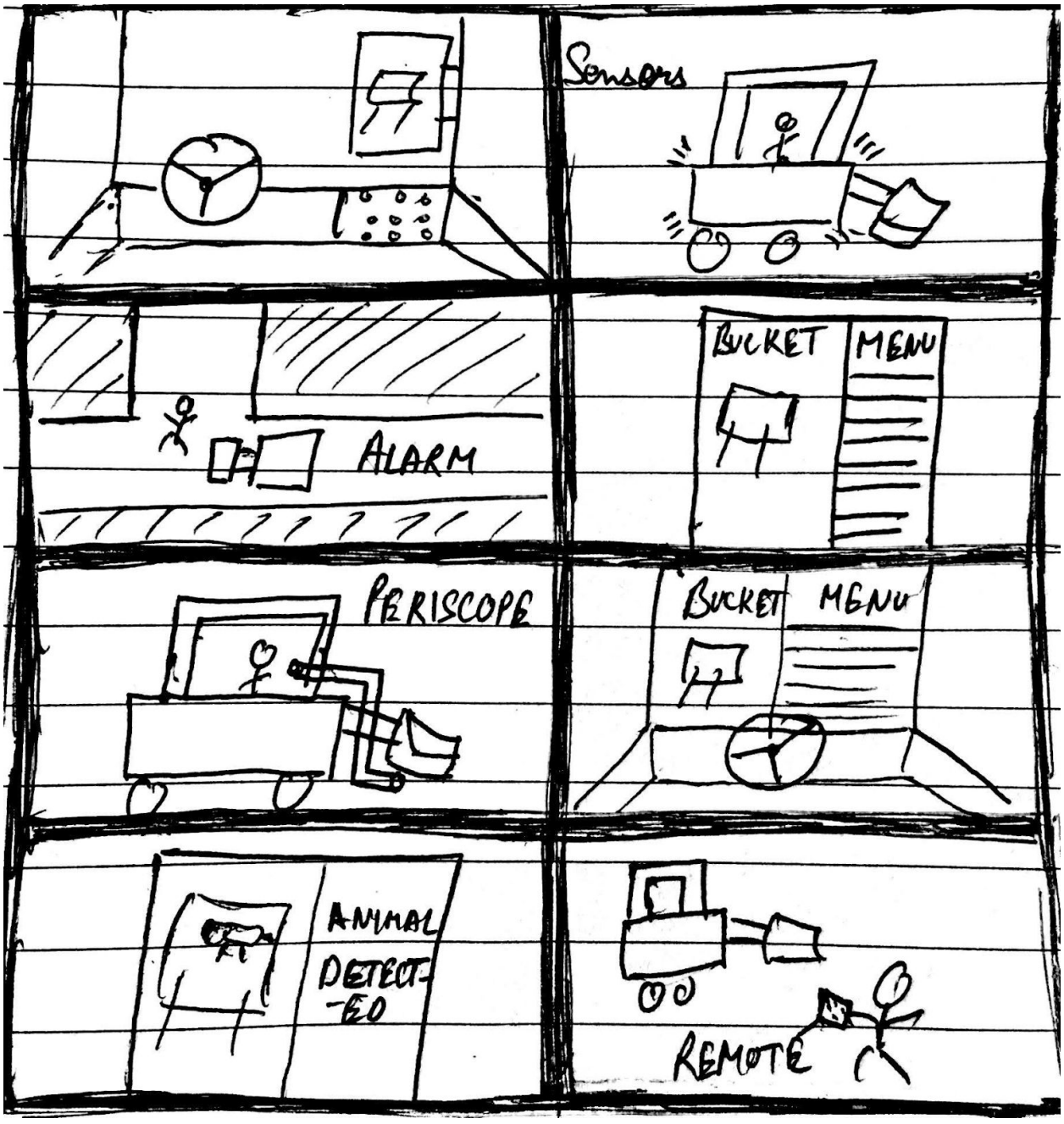
In the scenario when the bucket is full of sand and then if the operator moves the vehicle forward, backward or upward, it will result in spilling the sand on the ground. Using a cabriolet will help to secure the sand.

Rahul Sethi

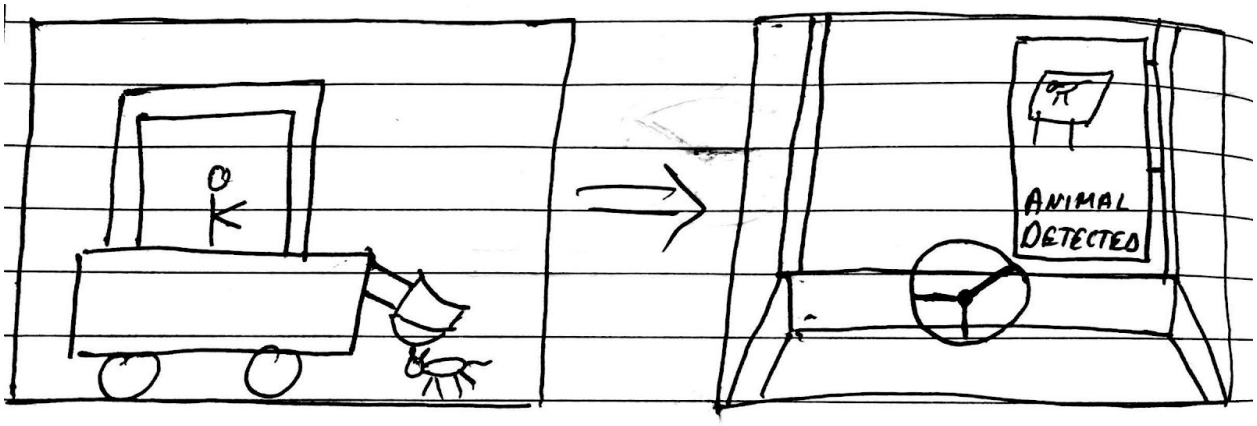
List of ideas and inspirations:

1. Mirrors to capture the portion not visible. Inspired by periscope.
2. Touch screen device on the windshield. Easy and intuitive to use. Inspired by Seura smart mirrors.
3. One option to install a screen on the bucket. Inspired by Samsung see-through truck.
4. Integrate AI to detect any kind of animal under the bucket. Inspired by https://www.pnas.org/content/115/25/E5716

Crazy 8:


Sensors
ALARM
BUCKET
MENU
PERISCOPE
BUCKET
MENU
ANIMAL
DETECT-
-ED
REMOTE

Storyboard:



Description:

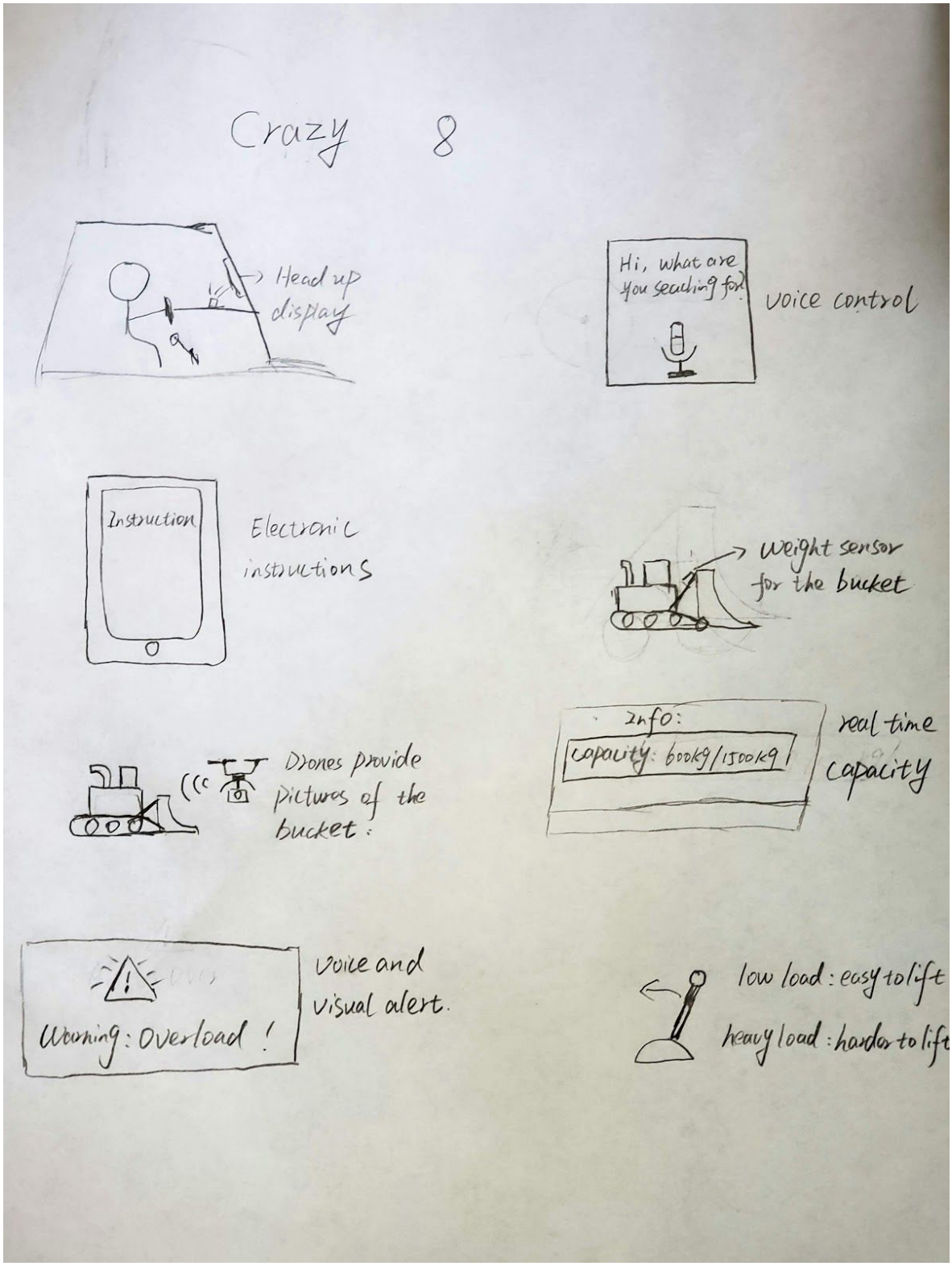
The above sketch shows how the idea of AI can be integrated to detect animals under the bucket. It will throw a warning on the screen that their might be an animal under the bucket and it is advised not to proceed. It will help to save wildlife, not too much extent but whatever little possible.

Zelin Sun

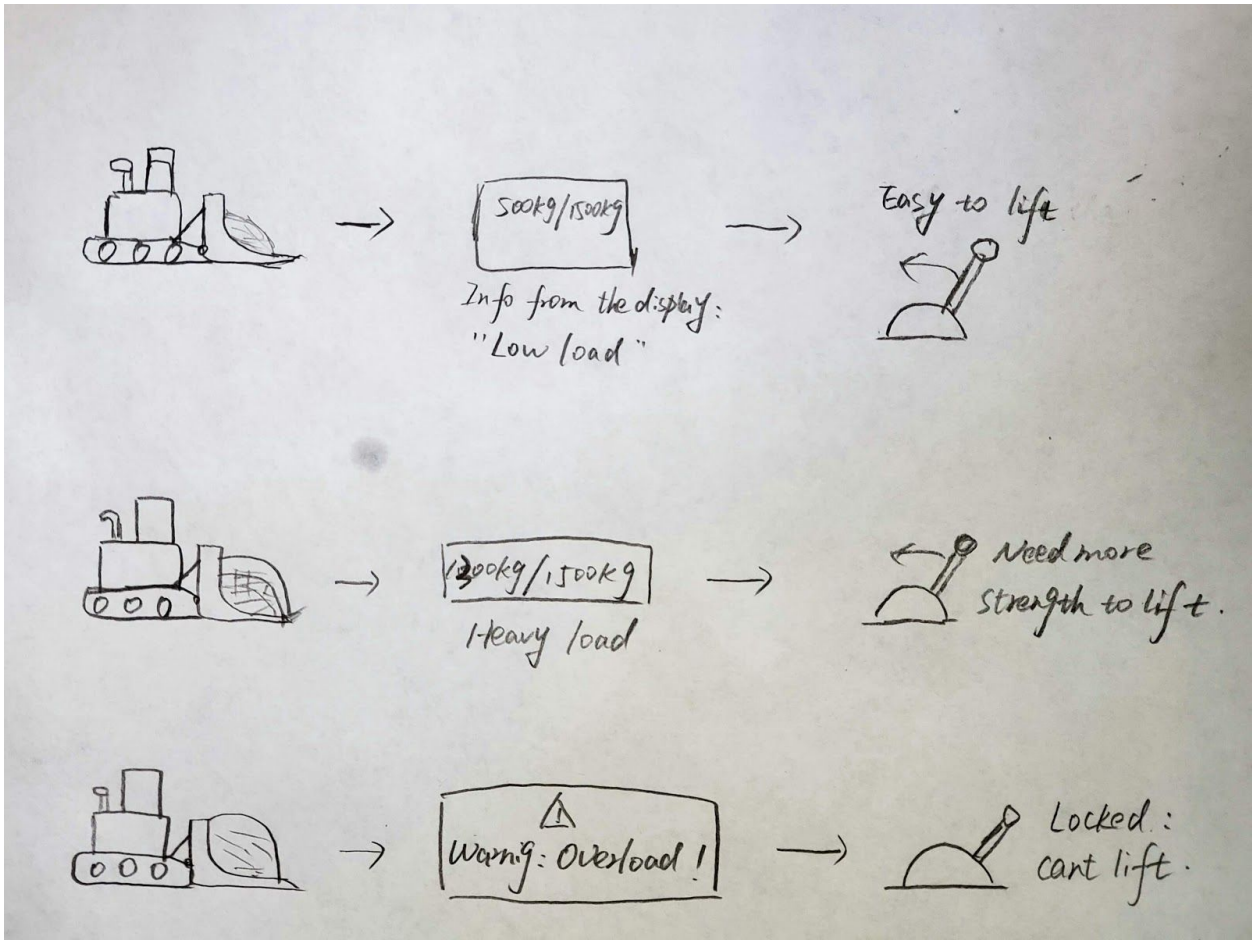
List of ideas and inspirations:

1. Provide digital instructions instead of paper made ones, it could be built in the machine showing on the display or built as an APP on mobile phones. Inspired by Benefits of digital work instructions.
2. Allow operators to use voice control. Inspired by Google Home.
3. Place weight sensors in the bucket or connections to the bucket. Inspired by Load Cell.
4. Head up display showing the bucket with DR. Inspired by Head up display and Samsung safety truck.
5. Show real-time capacity on the display. Inspired by showing speed on head-up display.
6. Use drones to capture the pictures inside the bucket. Inspired by Traffic monitoring by drone.
7. Voice and visual alert when the bucket is going to overload. Inspired by an elevator system.
8. Weight feedback to the steering letting operators feels the weight change which will improve the learning curve. Inspired by my personal experience from driving, I prefer to drive a car with more feedback about the road conditions to the steering wheel.

Crazy 8:


Crazy 8
Head up display
Hi, what are you searching for
voice control
Instruction
Electronic instructions
weight sensor for the bucket
Info:
capacity: 600kg/1500kg
real time capacity
Drones provide pictures of the bucket.
Warning: Overload!
voice and visual alert.
low load: easy to lift
heavy load: harder to lift

Storyboard:



Description:

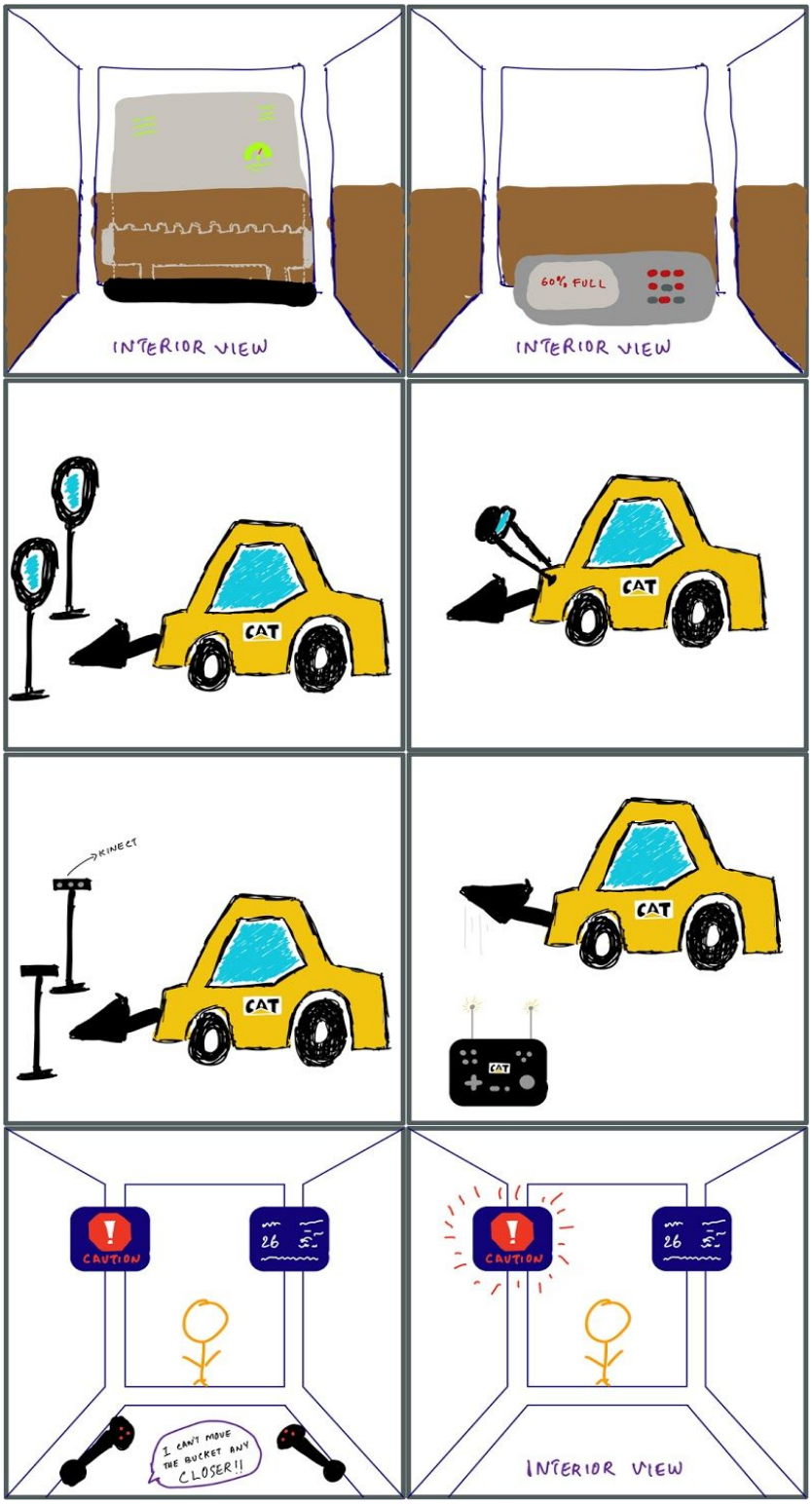
The point of the storyboard is that operators can feel feedback from the load of the bucket when lifting it. When the load is heavier, the operator needs to take more strength to lift the bucket **(Not too much, as long as the operator can feel the difference)**. And when the bucket is overloaded, the operator can not lift the bucket.

Zachariah Mathews

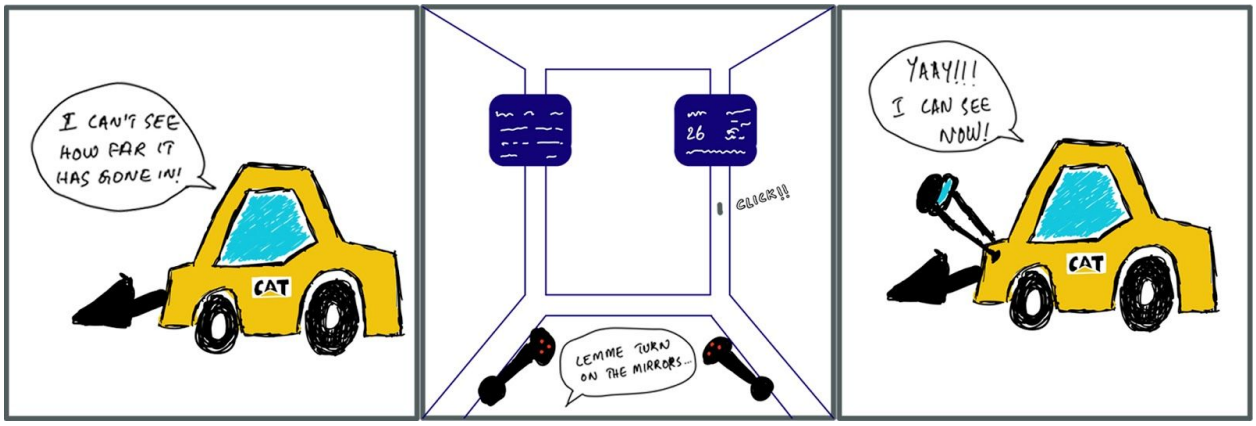
List of ideas and inspirations:

1. Inspiration 1 - Convex mirrors - Install portable convex mirrors on stands on either side of the field of view.
2. Inspiration 2 - LG Rollable TV - Install a rollable screen that displays a feed from a camera that captures the bucket but does not obstruct view normally when driving.
3. Inspiration 3 - Tesla Autopilot Collision Avoidance System - Detect and warn if there is a person or animal that could collide with the bucket. We can even avoid a collision by stopping further movement.

Crazy 8:


INTERIOR VIEW
60% FULL
INTERIOR VIEW
CAT
CAT
KINECT
CAT
CAT
CAT
CAUTION
26
I CAN'T MOVE THE BUCKET ANY CLOSER!!
CAUTION
26
INTERIOR VIEW

Storyboard:



Description:

The operator does not have a proper visual of the bucket and area where he is operating. This causes inefficiency in the load that is dug. To overcome this, a set of convex mirrors are switched on which will improve the field of view and thus the bucket and the area are well visible. This helps the operator to learn how far he needs to go in.