#transparentbuckets

CSC 591, Spring 2019

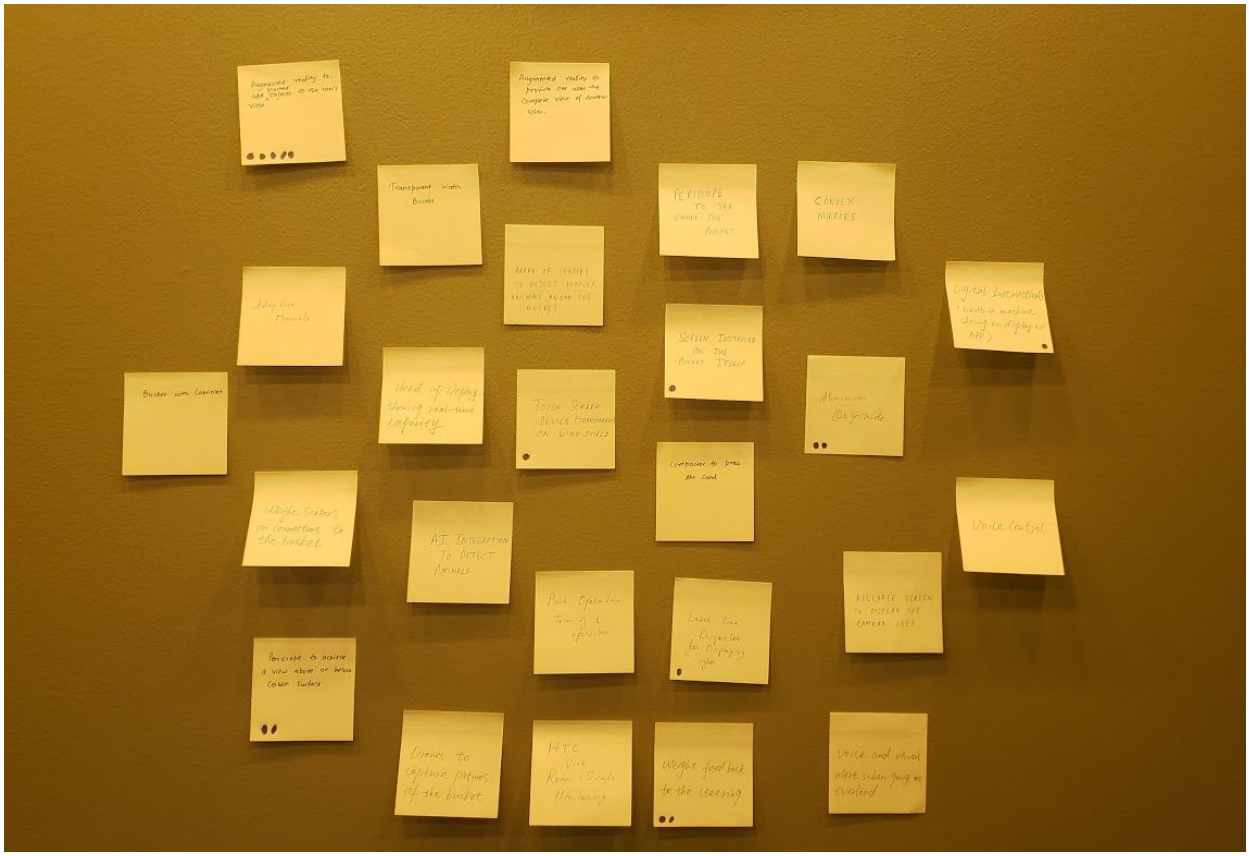
Stage 3 - Choose

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

Displays and Votes

The team met up and put down all ideas on stickys. We had an initial round of voting, without any discussion or explanation from other teammates or the owner of the ideas.



Although the votes were scattered amongst only a few (7, to be precise), there was still a strong bias towards one idea (above image, top left: using AR to add blocked objects to the user's view).

We discussed each idea in detail, including all the ones that received votes and the ones that didn't. The team members took turns pointing out what they liked about the idea, and what they did not, for each idea present.

The points that initially did not receive votes are listed, along with the discussion, below.

1. Voice and visual alert when bucket overloads

    a. Voice feedback is good in general because he doesn't have to look at someplace in particular.
    b. Bad to just look at overloading, this idea could be used all round.

2. HTC VIVE room-scale monitoring
    a. Setting up sensors in a dynamic and changing environment is difficult.
    b. Focused more on capturing info rather than presenting it to the user.

3. Drones to capture pictures of the bucket
    a. Complicated to implement, drones might be prone to damage in a construction zone. More work for the operator to control the drone.
    b. People liked it because it was a very unique idea. You have the control to move the drone to get a different view.

4. Pair operation - team of 2 operators
    a. Not efficient, not worth it, people work better alone.
    b. Can be combined with drone idea so it reduces overload on single operator.

5. Compactor to press the sand
    a. Increases efficiency of bucket, so good.
    b. This isn't UX oriented, this solves a different problem and not the focus that we're trying to solve.

6. AI integration to detect animals
    a. Don't have to be specific to just animals, can be used in a rather holistic sense.
    b. This can be combined with other ideas like sensors and voice control to provide extra information.

7. Bucket with cabriolet
    a. Focuses on implementation, not on user.

8. Convex mirrors
    a. The periscope idea is a more efficient way of using mirrors than this method. Prone to break, weather situation like fog might not make the mirror visible.
    b. Very simple to implement, and the operator does not have to 'learn' how to use mirrors.

9. Array of sensors to detect people or animals
    a. Can be combined with AI integration.

The next few ideas that are listed received one or more votes.

1. AR to provide the complete view of another user - ◙

   a. Provides operators an idea of where the others users are
   b. Confuses operators if he looks into other view, might be creepy to know that they're being watched by other operators.

2. AR to add blocked objects to the user's view - 🔴 🔴 🔴 🔴 🔴
   a. AR completely focuses on presenting info to the user, and that aligns with the motive behind this projects
   b. We are uncertain as to whether we should classify this as AR or DR.

3. ALON - Aluminium Oxynitride. - 🔴
   a. This is a simple, direct way of making the bucket transparent, and does its job best without any extra implementation.
   b. If the transparent material gets scratched or dirty, it might make it hard to see through it, making it completely useless.

4. Weight feedback to the steering - 🔴 🔴 🔴
   a. Provides a new field of feedback and input to the user, and does not compete with his vision. This would resemble the natural way of lifting objects, you get a good measure of how much you have lifted.
   b. This might be yet another task for an operator to get adjusted to and be able to confidently map the weight on the controller to the actual amount in the bucket.

5. Periscope to view under the buckets - 🔴 🔴
   a. Simple to implement, pretty innovative.
   b. We feel it has potential, but we cannot think of a definitive way of using it.

6. Head-up display showing real time capacity - 🔴
   a. Can be combined with the array of sensors idea to show what information is collected.

7. Screen installed on the bucket itself
   a. This enables the user to see the information being displayed while still looking ahead where the work would be done.
   b. Has issues such as safety of screen and durability, might have to think of other ways such as projections.

During the first phase, a few ideas which did not get any votes later gained a lot more support after the discussion.

This was mostly because the ideas were either not clear enough to the other members, or the discussion gave rise to ways of combining two ideas to come up with a solution which seemed effective.

1. Roll able Screen to display the camera feed
    a. A display is definitely necessary, a roll able screen is convenient to the user because it pops up only when he wants it.
    b. The need for a display is not high if there was a way to project onto the windshield itself (another idea).

2. Digital instructions + Adaptive manuals
    a. Can help operators find out new things that they might have missed about the device, helping them become more efficient.
    b. This tends more towards the VR Dashboard project than the transparent bucket though.

The Big Dots and the straw votes.

After the initial round of votes and discussion, the team members, much clearer with each idea, took another turn placing their “Big dot vote”. While at first glance all 6 votes seem to have landed on a different idea, on closer inspection we realized that all the ideas which received the big dots were had AR and user focus in common. The idea which did not get a vote were those related to implementation such as the periscope and the digital manuals.

The ideas which received the big dots are listed below

1. Displaying information on the bucket itself.
2. Using AR to add blocked objects to the user’s view.

3. Rollable screen to display the camera feed.
4. Using a transparent material to build the bucket
5. Weighted feedback to the steering.
6. Array of sensors to detect obstacles and an AI to determine what that is and how to react.

Since the majority, if not entirety, of the big dots are based on AR, the decider's influence will largely set the direction by telling us which of these concepts should we try to focus on, and which to be ignored.

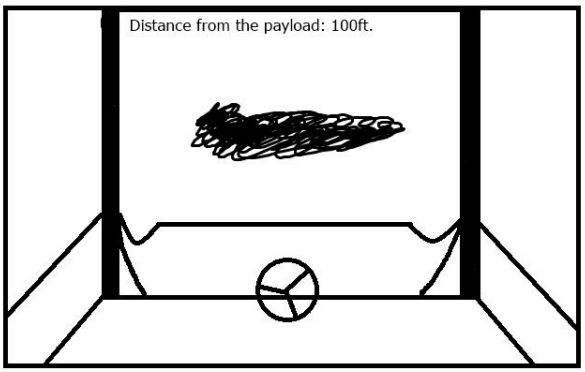
Deciders' votes

We had a meeting with our client from Caterpillar, Mr. David Hedley on 10th April, 2019. We realized that most of our ideas were based on implementation (how the data will be collected) rather than what information needs to be shown to the user and how it should be represented. With inputs from David, we brainstormed on the information that will be relevant for a novice operator to perform efficiently in digging.

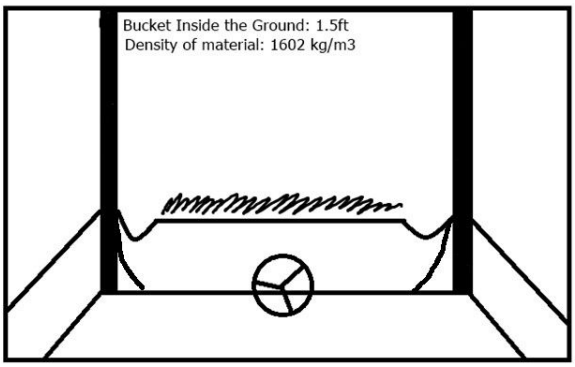
David gave us an industry perspective as to what information would be relevant and they are as follows:

- Fullness of the bucket
- How deep the bucket is inside the ground
- How far the Bucket is from the payload
- Density of the material
- Tire Grip and Wheel Spin Impact

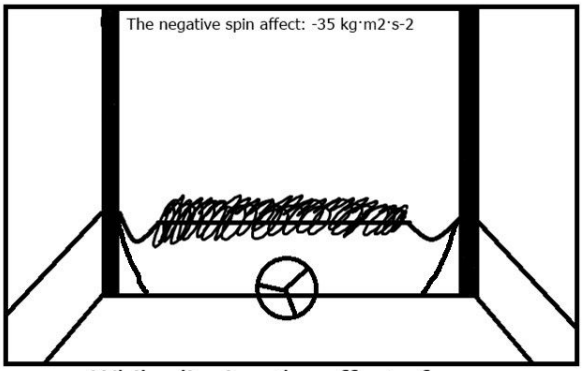
Storyboard



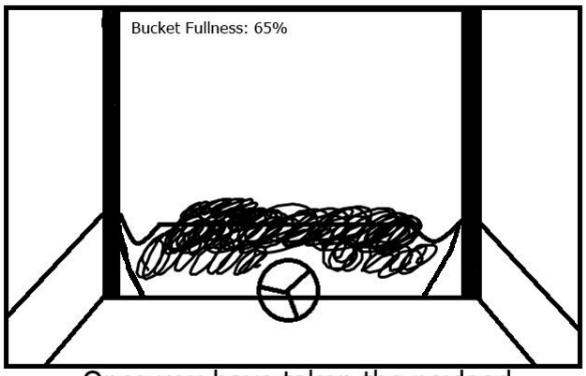
While Approaching the payload



While Digging the Ground



While digging the affect of friction caused by the wheels.



Once you have taken the payload inside the bucket.