Wabi Demeke Student ID: 20140936

Basically what we have done after first presentation (3/2~3/28)

This is the progress report of the "solid work group". For the past few weeks, our group had been preparing for our first presentation, which was held on March 30. As we know the aim of this first presentation was mostly to get feedback from professors based on our proposed model of ball collector robot. Therefore, the visual work(3D mode) was the most important part of the first presentation to convince the professors that our proposed model can be implemented practically.

To make this happen, My partner and I (solid group members) were met quite several times besides of the actual group meeting. When I break down what we have done so far. In our first week, we made our rough time tables according to the tasks we have to accomplish by the end of the semester, and since we were both new to solid work, we had to attend solid work tutorial session.

A Rough time table from 2nd week to the 13th week

	2	3	4	5	6	7	8	9	10	11	12	13
1. Specification measurement												
2. Component drawing (Solidworks)												
3. Assembling the parts (Solidworks)												
4. Office-hour visit for feedback												
5. Design scrutiny/improvement												
6. Design calculations												
7. Hardware shopping												
8. 3D printing												
9. Presentation preparation												

During the second week, all the group members assigned to different tasks such as, packaging and wiring, collecting balls, and storage.Our group(solid work group) had given a responsibility to take off the packaging and wiring. In the packaging part, we designed the best relative positions that each individual component of the robot should be placed. In the wiring part, as we were able to design best position for each component to be placed, the wiring had been to connect the components through the cables. During the third week, before we began our 3D drawing in solid work, we had made measurements for each component of the robot (motors, Nuc, Lidar, camera, myRio and battery).

We made our first drawing on solid work for different components, and later be assembled together to serve as a support for packaging, and also received feedback from group members for our drawing. Other members(the group responsible to design collector) designed different kind of collectors based on the ideas generated during the brainstorming period, so (solid work) group had to chose the best collector which would combine with our drawing and we did assemble it with our drawing.

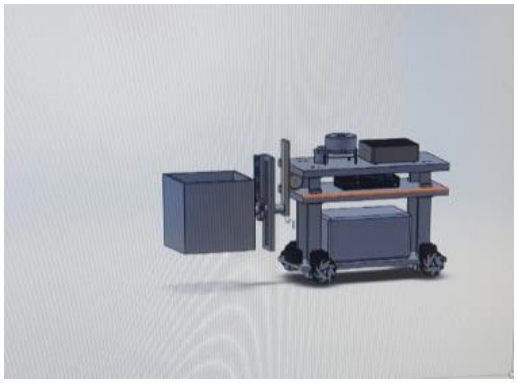

Figure 1 Assembly

By this time, we were a few days away from our first presentation, and we got a suggestion from our group members to include simulation video to show our mechanism of collecting and putting the ball inside the basket. Doing so, We had presented our video simulation to our adviser and received strong feedbacks. One of the main feedbacks was our simulated video was not clear enough to explain our mechanism, so we had to do it again which took us quite large time. Finally, we were able to show our first simulation during first presentation and received feedback from the professors.

Our future plan will be, to modify our first design based on the feedbacks we got during the presentation and finalize our design. Adding a few details on our already developed 3D drawing.

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Basically what we have done after first presentation (4/2~4/14)

Our rack and pinion system as it was mentioned in the feedback of 1st presentation, it's complicated and inefficient ball collecting mechanism.So, we had to change our method of ball collection,therefore,we made brainstorming sessions for better design.

After spending long brainstorming sessions we had come with three mechanisms of ball collecting.

1. Instead of using a rack and pinion for vertical motion of the box which collect the ball we suggested to use rotary to linear motion converter system
2. Linkage system which slide along the rails to move the box vertical up and downs

My colleague and I drew the new conceptual collector design on the solid work as it

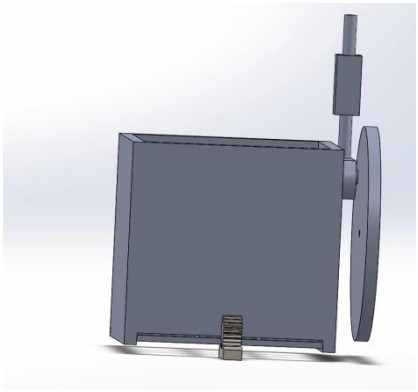


Figure 2. rotary to linear

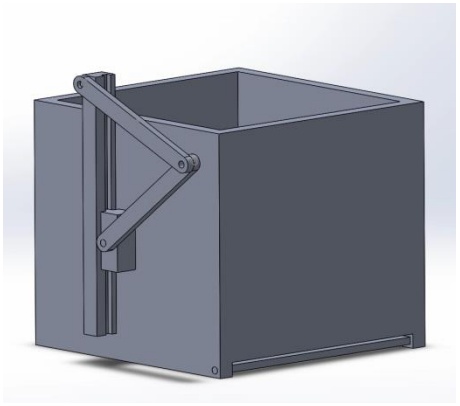


figure 3. Linkage system

Meeting with our adviser, professor, we received feedback on our new design. The design has much frictional surface and this is inefficient for power management , and also using our current design would be a problem of collecting the second and third balls due to first collected ball might block the way for the latter ones. As a solid group member I only focused on the feedback which was given to design, but professor suggested us to see in more a broader frame of point of view, Since we were focused on one problem which was collecting the ball.

To solve the friction problem, each of us came up with a completely new concept design and through a long discussion, we decided to choose the best conceptual design . The chosen concept was the arm mechanism and with inclined surface to send the ball to the basket at the end. Solid group members draw it on solid work

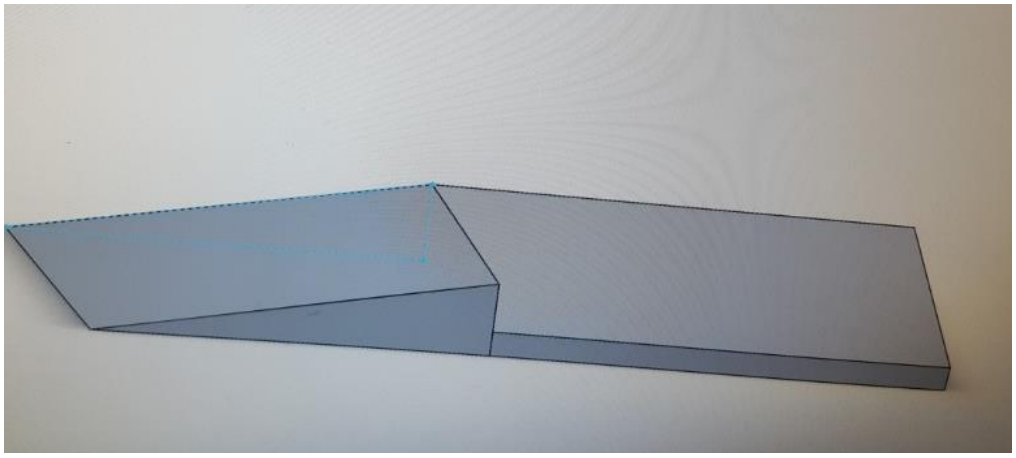


Figure 2 Inclined Plan

Our future plan will be to start the manufacturing of the bodies which support parts of the robot and the 3d printing arm and the inclined surface(ball collector)

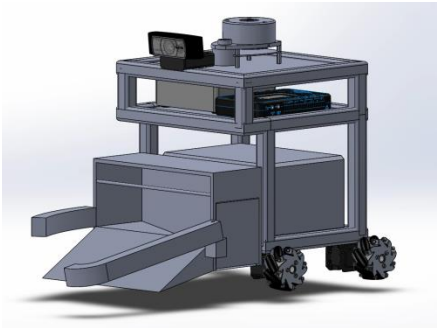


Figure 3 New final assembly

Progress Report

Name Wabi Demeke. ID 20140936

Basically what we have done after first presentation (4/15~5/29)

After we have changed our final design from our first conceptual design we started our manufacturing process. Our main goal of the manufacturing was to reduce the weight of its body as much as we could. We have made actual measurement of the 2 by 2 cm aluminum profile to build a frame for a profile. The base aluminum profile length is considered to accommodate the battery on the back side, storage and inclined surface on the front side, which has length around ~40cm. We also use acrylm which slide in the aluminum profile to support and to make walls when we put components of the robot. The first level of aluminum profile has a height of around 16mm which has enough space to put the battery and allow air circulation for cooling of the battery during operations. The Second/top level of the profile considered to put other components of the robots such as my Rio, CPU, webcam, etc. Using nut and bolt we attached body part to fix the motors, on the bottom side of the aluminum profile.

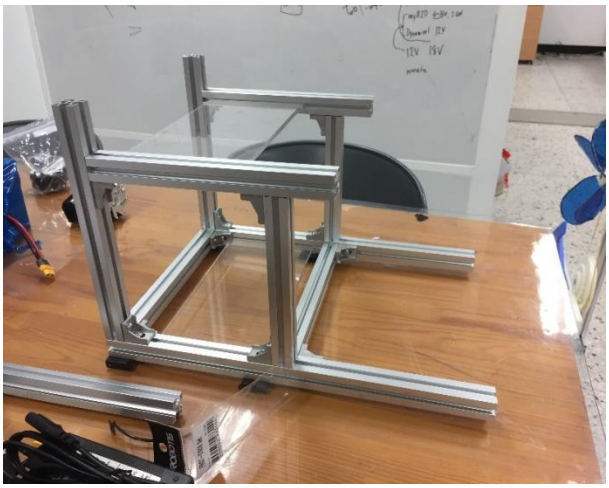


figure 1. Aluminum frame profile

figure 2. Wheels attached to the profile

After we finished our profile as we can see in the above, we proceeded to manufacturing of the incline surface that use to send the balls to the storage, and another incline surface inside the storage that use to remove the balls from the storage to the basket during delivery of the balls. Based on our manufactured aluminum frame profile we made second measurements and decided a slightly new dimension for the height of the incline and width. Then We made rough hand drawing on the paper and made the actual drawing on the solid work. Our design focused ways to reduce the weight of the robot as much as possible. Finally ,based on our complete solid work we 3D printed our design

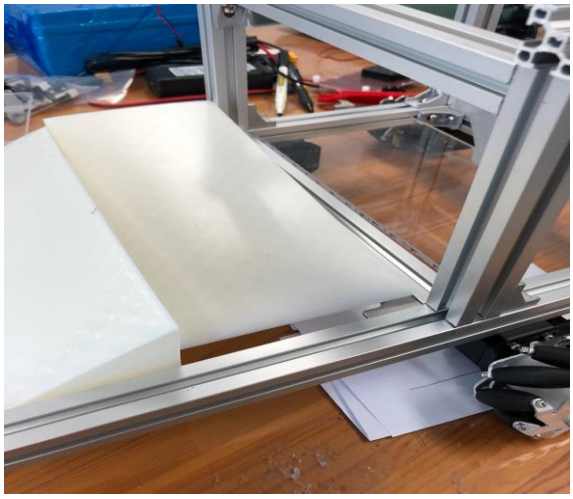


figure 3. Unclean surface inside the storage

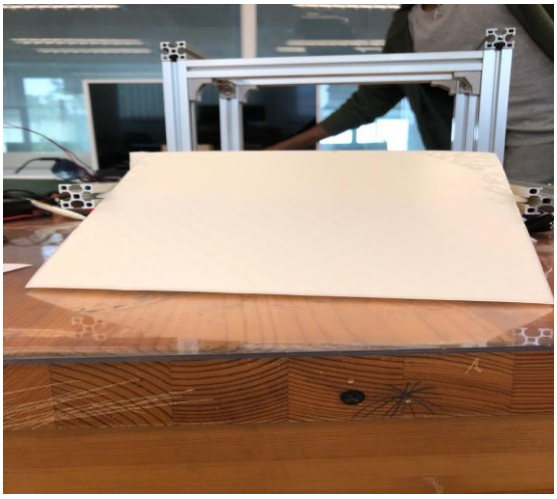


figure 4 incline surface in front of the robot

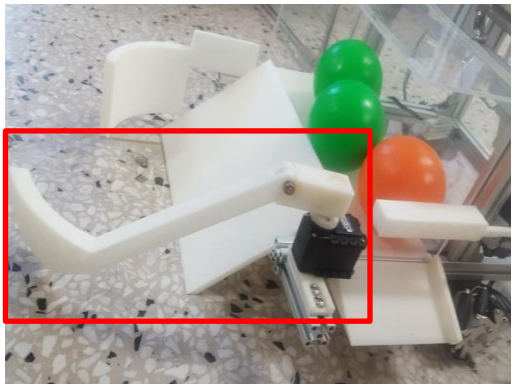
Name Wabi Demeke. ID 2014093

Basically what we have done after first presentation (4/30~5/13)

Since for the past 3~4 weeks we have been working on the actual manufacturing of the robot. Most of our time was spent on the re-designing, 3d printing, and assembling the robot. During the previous week, we did the incline surfaces to send the ball to the storage and the incline surface to remove the ball from the storage to the basket. These two weeks we had been manufacturing and assembling the actual storage, the arm(which collect the balls) and the door mechanism to release the ball to the collector.

1. **Storage**
   For storage we used acrylm plate and we made a box using plastic welding.

2. **The arm**
   We designed and printed out the arm in such way, it has two bar connected through pins which rotate like an arm when it push the ball all the way on the incline surface to the storage.



3. **Door mechanism**

We have made releasing mechanism of the ball to the basket.

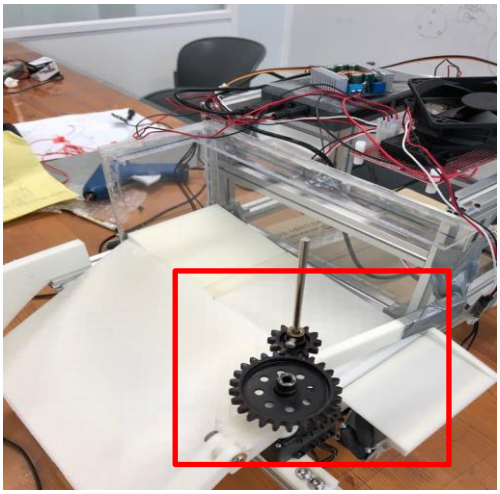
Future plan

Since we are using 2 extra motors, one for collecting the balls and one for releasing the balls, therefore, this is not an energy efficient mechanism, so we are planning to find a mechanism that uses one motor do do both the mechanisms at the same time. And we have limited time from our final demonstration, we will not have any significant changes in our design.

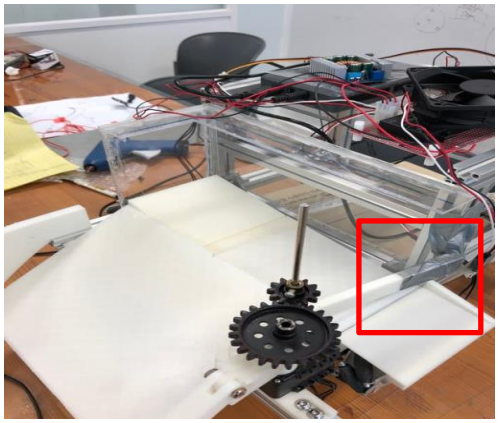
Name Wabi Demeke. ID 2014093

Basically what we have done after first presentation (5/14~5/26)

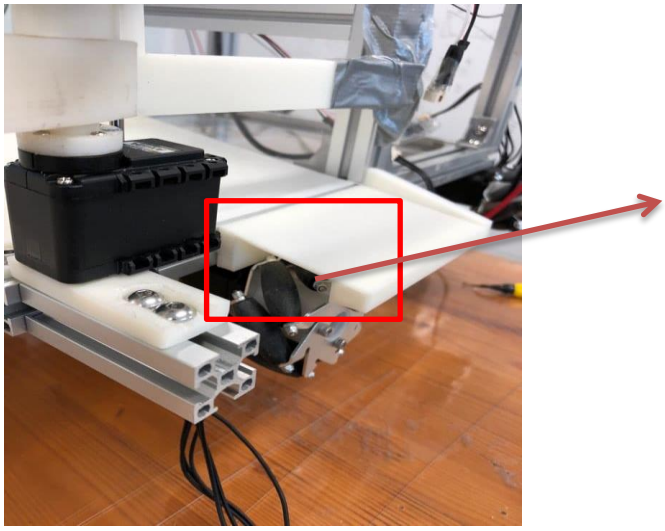
In the previous progress, our mechanicsm of balls collecter(the arm) and the ball releasing to the basket(the door) both require two motors separetly. During our progress report to our professor ,we got feebback that using two motots is not an enegery efficient mechanism. To solve this problem , we had been working on the mechanism that manuplate clockwise and counterclockwise rotation of one motor for separate mechanism. To do so, we came up with lock mechanism that connects with motor and the door through gears. For around 120 degree when the motor rotates clockwise direction it doesn't rotates the gears which attached to the motor axis, but when it rotate in clockwise direction the lock mechanism activate and the gears strats rotate to open the door.



To keep the ball releasing arm closed unless we want to release the balls to the basket, we used a magnet to fix the door at initial position.



We encountered vibration when we runned our robot vechicle for vibration testing. So, to reduce the vibration we moved the front wheels to the front and that forced us to modify our guidance becuasue it touchs the wheels. Do do so, we made few modification in our previous solid work design and printed it again.



Future plan

We have almost one week away from our final demo, therefore we are planning check all the components are properly integrated to avoid any kind of unwanted problem due to system failure. We are planning to attach all the caples and fix them on proper postion.