Project Report

Hi, this is Delsius, Jun Song, Thomaz, and Xuan Rui. We are a group of creative, innovative, and energetic programmers who have analysed a software challenge and have come up with a software solution to the challenge.

Remember the days when you were rushing to complete the homework or rushing to do an assignment or rushing to meet your group mates for your group project during the lunch time. However,when you reach the canteen, all that is greeting you is the extremely long queue and long waiting time for you to get your food. Since the beginning of Semester 2, the queues for food in Nanyang Polytechnic's (NYP) canteens were always very long and that frustrated us. Due to these long queues in NYP, students have an extremely small window of time to complete their work. A scenario is our very own break time. Most of the time, we end up rushing to eat our food as the queuing time is extremely long – since our break is only an hour long. Eventually, by the time we finished our food, the one hour was almost time up and we had to rush back to class. This could be bad as this may cause students, who take their time to eat, to have a possibility of having indigestion.

However, I understand that there are other classes and schools that have longer break time. But, what if they wanted to spend more of their time doing things that are more productive? The way that the South Canteen is currently is so backwards and traditional that it does not keep up with the new way of living. These days many people and many things are so fast-paced and people just want to be able to conveniently collect or order their food.

On top of that, research has shown that standing up in a queue could pose a few health issues. It is difficult to focus on standing still due to the weight distribution being uneven. People who are able to stand up still for long periods of time have great weight distribution, which does not come naturally to everyone and anyone. In addition, standing causes our hip flexors, which are part of the musculoskeletal system, to extend and lengthen. As the hip flexor extends and lengthens it will start to feel strenuous and fatigued. When one starts to feel fatigue, they are likely to have poor posture, which could frustrate them. On top of the fatigueness and frustrations that come with it, injuries may occur to them. Finally, standing for long periods can reduce focus and concentration, leading to decreased productivity and mental clarity in students.

The following is a summarised list of issues that standing up in queues for long poses:
- Difficult to focus on standing still
- Musculoskeletal pain
  - Hip flexors extend and lengthen
  - Fatigue
    - Poor Posture

- - - Frustration and customer dissatisfaction
  - Increased risk of injury
  - Reduced focus and concentration

In summary, the problems with NYP's South Canteen are that the queues are too long, which causes them to have close to little time to complete their work and take time off to relax. On top of that, what if students' breaks are only an hour long and they have to queue for 20-30 minutes for their food and drinks, that would mean that they result in a remaining 30 minutes or less; this could potentially cause them to have indigestion. In addition, the canteen is outdated – it does not keep up with the fast-paced lifestyle that people have. Finally, the frustration that students/staff may have due to the long periods of queuing and all the effects that it brings.

Therefore, this leads us to our four business needs. Firstly, we believe that South Canteen is short staffed, this suggests that automation is required and becomes essential. Moreover, there is a need for better customer satisfaction due to how students get frustrated for standing up in a long queue. As stated above, there are possibilities of student's/staff suffering injuries from queuing up for long periods and hence, the next business need is the need to start caring for the overall welfare of the students/staff. Finally, due to how outdated and traditional South Canteen is, the need to further digitalise South Canteen with an application and IoT Robot can drastically help. In summary, the four business needs are the need for automation, the need for better customer satisfaction, the need to start caring about the overall welfare of people, and the need to further digitalise South Canteen with Application and IoT robots.

Our goal was to create a positive eating experience for all in NYP. Our group has proposed to create an application, through Scratch, and a Cozmo robot that will help us in tackling the four business needs. Firstly, the application will allow users to order food from the convenience of their phones. The app will allow users to order from the two most popular stalls in South Canteen – which are the Chicken Rice stall and the Ban Mian stall.

We have programmed the Scratch to first show a scenario of a student that sees a long queue at the South Canteen. Through this scenario, the boy that enters the canteen is frustrated by the long queue and decides that he should order from the app that we have created. As the user launches the app, the app will show the user a button that allows him/her to start ordering from the two stalls. Next, he/she decides between chicken rice and ban mian and selects. Let's say that the user wants to eat chicken rice, the app will then show the options for the chicken rice stall, which ranges from the whole chicken to a plate of chicken rice. After the user selects what he/she wants they will click on a button that allows them to add-on. In the instance that the user does not want to add anything they can simply check out in the add-ons page without choosing anything. After the user decides to add on or to not add on they will be led to a page where the page allows them to order more – if their decision changes at the last minute –,

delete their order – if they want to remove anything from their cart –, and check out. In the check out page, the user will be prompted to pay using a QR code. On the page after payment has been done, they will be allowed to choose whether or not they would like to head down to the store to self-collect or to use the table service.
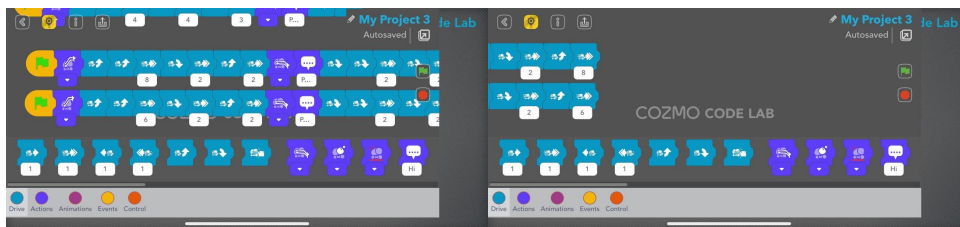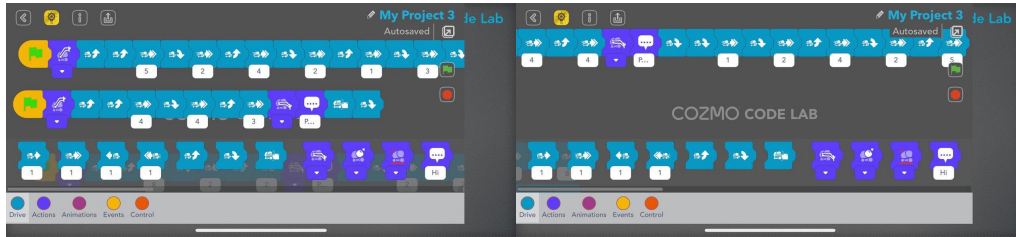
If the user selects self-collect, a scene of the student will be shown collecting food from that stall while a scene of the Cozmo robot will be shown delivering food, if table service is selected.

As stated if table service is selected the Cozmo robot will deliver the food to the table. Hence, we have coded the robot to follow a certain amount of steps to deliver to the specific tables. However, something worth noting is that we have programmed the robot to deliver according to the table layout we have in the computer lab, representing South Canteen. Firstly, the robot will start from a start point in the classroom that represents the stall in South Canteen. The robot will pick up the "food" and send it according to which table it is ordered at. For example, if the food is ordered from table one, the robot will then send the food to table one according to the amount of steps required to reach table one. Once the food reaches table one, it will announce to remind the users to collect their food. Once it is delivered, the robot will return back to the "shop" using the same amount of steps it took to go to table one.
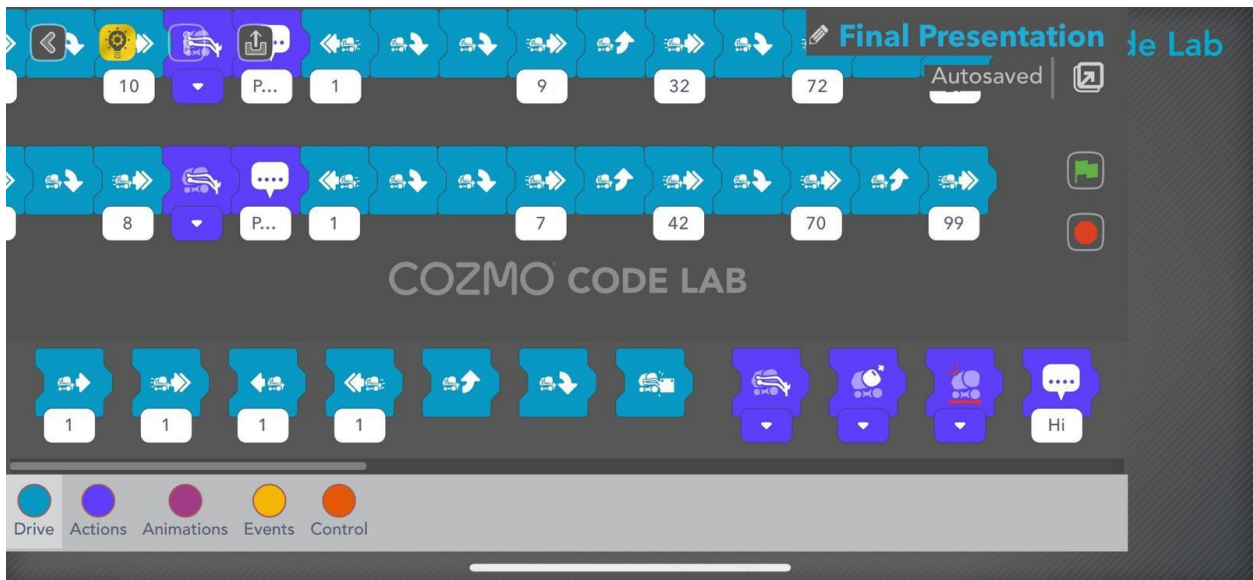
The first prototype of our Scratch app turned out alright. The idea behind it was to allow others to conveniently order food through it. However, despite the usability we felt that it was too simple and had no real usability. This is a description from our proposal. Scratch will be able to tell students the time when the food will be ready. As the order goes in, the waiting time increases. The waiting time increases by 6 for every 1 new order and for every 2.4 seconds gone, the waiting time will change by -1. When an order is finally served, the food count will decrease by 1; this prototype that we initially drew up works but it was limited in the sense that it did not allow the user to actually choose the food that they wanted and so we completely redid it and now it is functional and real.
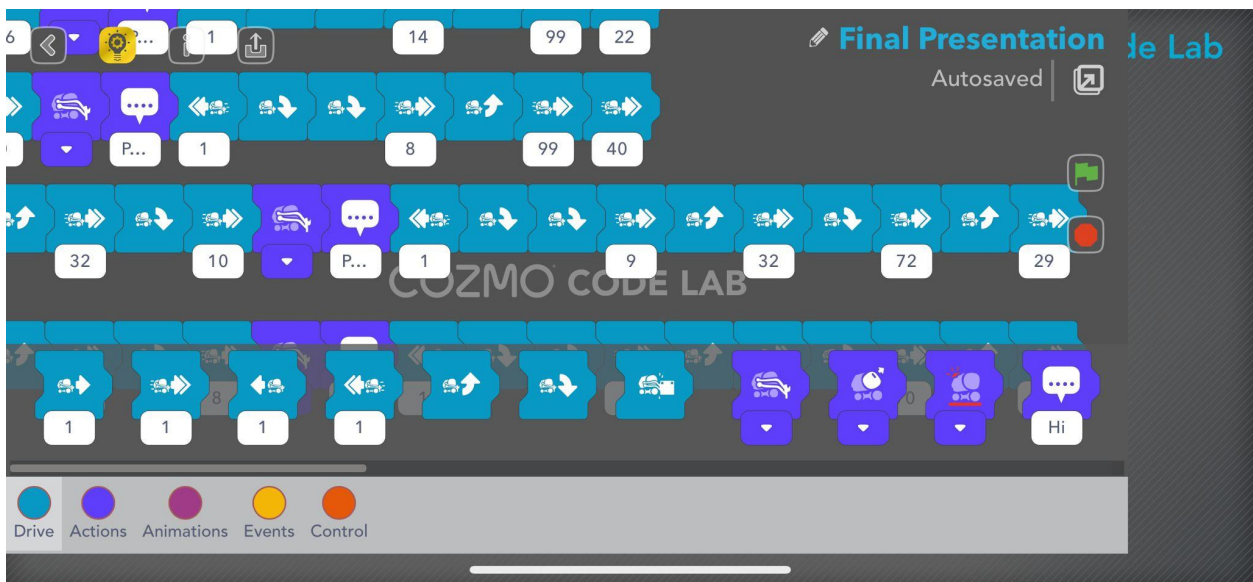
For our Cozmo robot, we initially planned that it follows a path within a tile in the computer lab. However, when we did that it was pretty unrealistic and we were quite disappointed when we were presenting it. We then came up with a solution to change it to follow the table layout within the computer lab. It was more realistic which allowed for a more representative robot. Hence, we brainstormed into thinking how many steps were required for the Cozmo to move one tile. We discovered that 15-20 steps was one tile and so we coded accordingly. Previously, our Cozmo was only coded to move within one tile and now it is able to move from table back to the store.
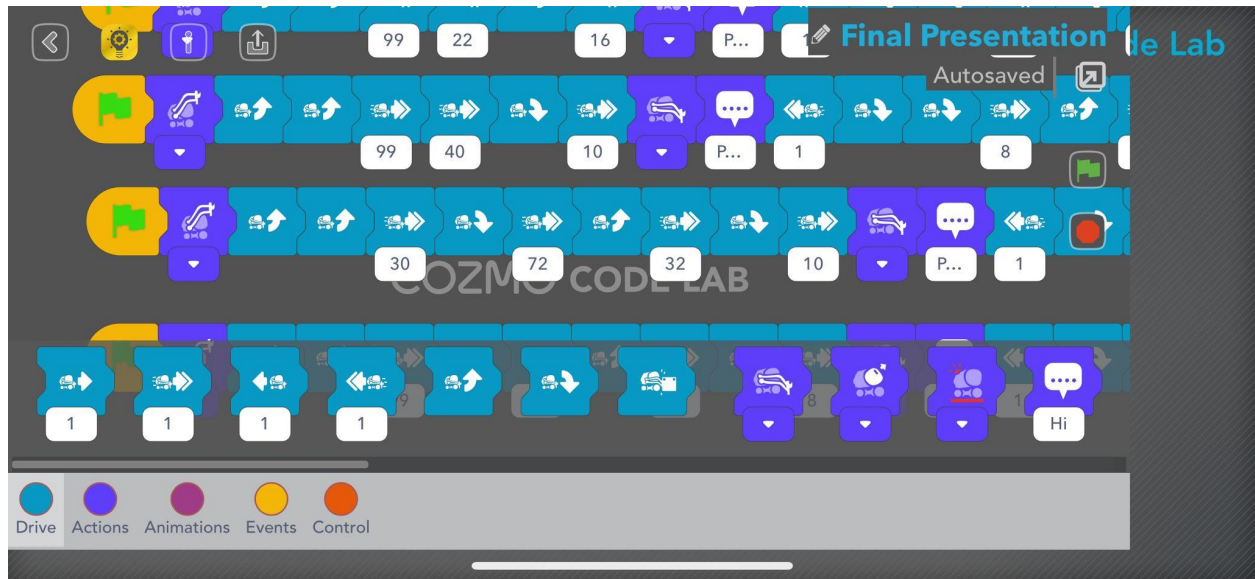
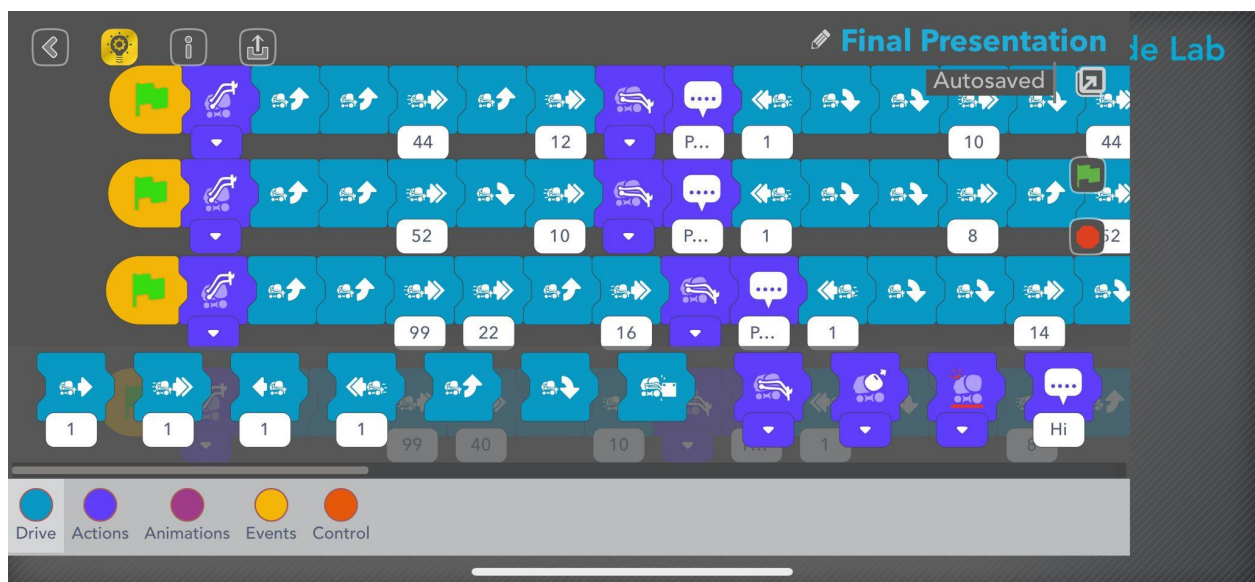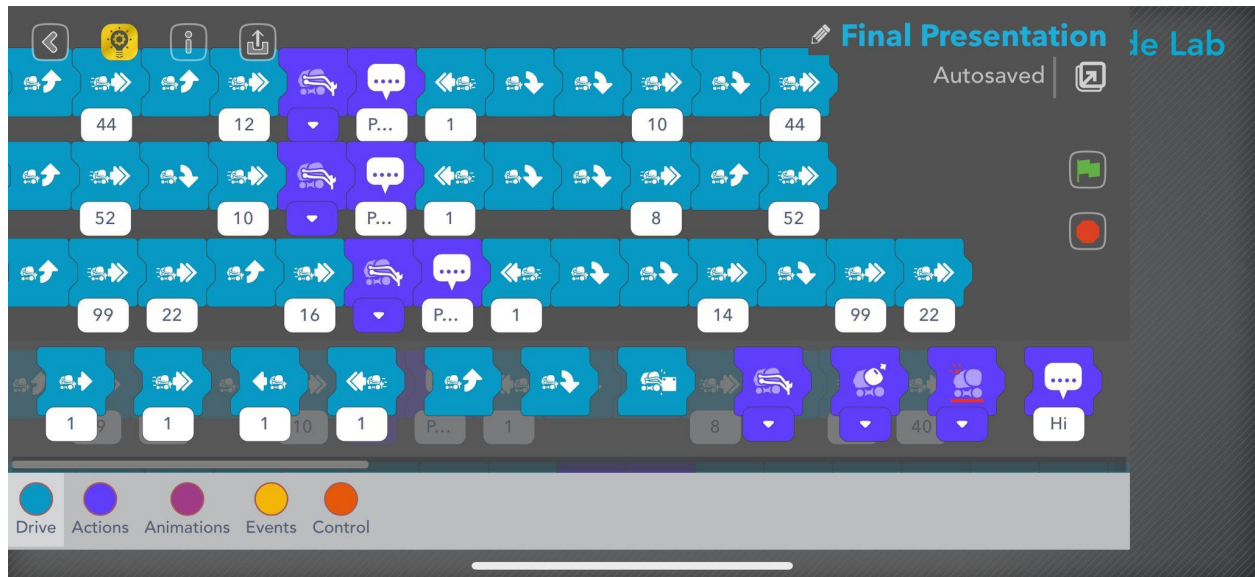These are screenshots of the prototype of what our Cozmo does:

While the following are screenshots of how our Cozmo works now:

COZMO CODE LAB

| 30 | 72 | 32 | 10 | P... |

| 99 | 70 | 42 | 8 | P... | 1 |

| 1 | 1 | 1 | 1 | | | | | | | Hi |

Drive Actions Animations Events Control

| 14 | 99 | 22 |

| P... | 1 | 8 | 99 | 40 |

COZMO CODE LAB

| 32 | 10 | P... | 1 | 9 | 32 | 72 | 29 |

| 1 | 1 | 1 | 1 | | | | | | | Hi |

Drive Actions Animations Events Control

Drive   Actions   Animations   Events   Control

Hence, through comparing our before and after, I believe that our group has done an exceptional job in utilising and enhancing the Cozmo and Scratch. Now allow me to tell you more about our discussions.

Our group discussed that if we were taught more knowledge, given more time, and resources, we would have been able to make this Cozmo a life-size robot that has the capability of delivering food like that. However, we would definitely, probably, not use this Cozmo tool as it is very limited in what it can do and deliver. We do not know what we can do with Python if there is a case of an obstruction. What if there was someone standing in front of the robot? Would the robot continue moving? We do not know if through the use of Python if it is possible to allow it to recognise that there is a figure in front of it so we discussed that if given the power of Artificial Intelligence in the palm of our hands, we would be able to recognise and perhaps

avoid the person. Moreover, we can programme to follow the canteen layout instead of the robot carrying out a number of steps. This would be better as if there were people obstructing the robot's path, the robot through the use of artificial intelligence will be able to reconsider and recalibrate its route to that table.

As for the Scratch program, we have discussed that it will be better if we are not limited to only two stalls in South Canteen and limited to South Canteen only. We believe that if we were given more time and more resources we perhaps could expand this idea and concept into the different canteens in NYP – namely Koufu, North Canteen, Foodgle, and more. Moreover, if such an idea is already being carried out in other polytechnics, we believe that NYP should not fall short too since Nanyang Polytechnic is The Innovative Polytechnic.

Finally, when we were testing out Cozmo's path, it did not return to where it initially started – the store – due to a couple of reasons. Firstly, the tiles in the computer lab were not levelled. Secondly, there are some bumps in between the tiling and hence, the little changes in angle and direction affected where it would finally return to. Lastly, the inability to fully utilise the sensors; if we were able to use the sensors that we believe that Cozmo comes with, we would have been able to avoid such an error and potentially solve another one of our problems we had mentioned earlier – to avoid humans.

[2044 words]

References

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