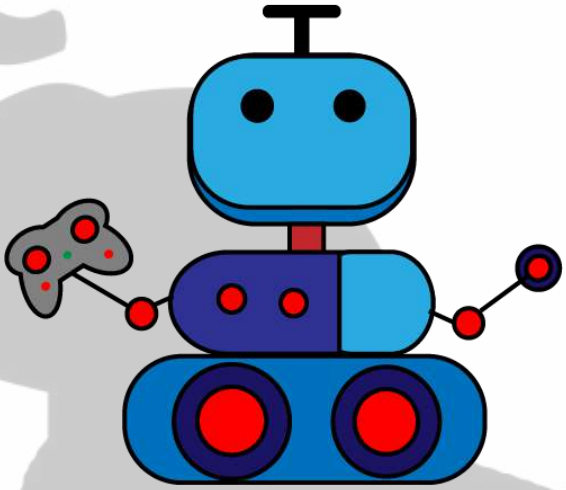

2019 MAKEX NATIONAL CHAMPIONSHIP - THAILAND

TIN MAN XE136066

CITY GUARDIAN

ELEMENTARY GROUP

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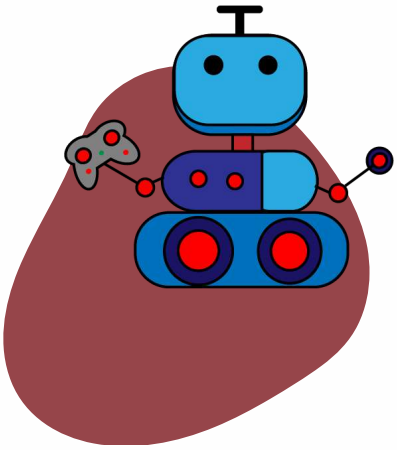
New!

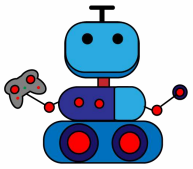
1 --- ***National Championship Competition Overview*** ***NEW***
2 --- Score Card
3 --- Team Schedule ***UPDATED***
4 --- Design Inspiration
6 --- Technical Principle
7 --- Production Step by Step
12 --- Problems and Solutions
22 --- Structure and Function
24 --- Technical Innovations
25 --- Competition Strategies
26 --- Team Introduction
27 --- Achievement Sharing
28 --- Daily Report
34 --- ***Team Strategy*** ***NEW***
35 --- ***My Mixed Emotions*** ***NEW***
37 --- ***Lesson Learnt from Regional Competition*** ***NEW***
39 --- ***Thank you*** ***NEW***



TIN MAN BY

Phacharaphol & Phacharaphorn Somboontham

OVERVIEW



2019 MakeX National Championship - Thailand: Starter City Guardian has two sections of the competition.

The first section is the automatic competition where the robot has to complete each mission itself and solely relies on its code.

The second one is manual, where we can control the robot ourselves. We can't touch it, just only controlling it via a Bluetooth controller.

There are 4 minutes to complete a match consisting of 2.30 minutes for the Automatic stage and 1.30 for the manual stage. The automatic competition consists of nine missions (2019), while the manual merely has one mission, which is called "Garbage Recycling - M10".

Although there are nine missions in the automatic stage, in practice, the team has to complete just five tasks. By this, it means that the referee is going to select below mission for each team randomly.

M01 or M02; 1 of them will be chosen randomly by the committee.
M03 or M04; 1 of them will be chosen randomly by the committee.
M05 or M06; 1 of them will be chosen randomly by the committee.
M07 or M08 or M09; 2 of them will be chosen randomly by committee.

As per above, there will be five missions in which 3 of them are independent, and two are an alliance mission. However, for this National Championship competition, contestants have to code all tasks on site. The committee will announce two independent missions and two alliance missions before the competition date one week. And the last independent mission will be announced on-site. The participating teams should build projects and write programs to complete the mission within a given time.

That is a brief overview of the 2019 MakeX National Championship - Thailand - Starter City Guardian Elementary Group.

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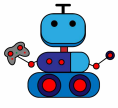

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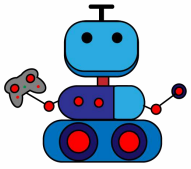
SCORE CARD



LEVEL	STARTER CITY GUARDIAN

MISSION FOR AUTOMATIC STAGE	SCORE
M01: ENERGY-SAVING SWITCH	60 points
M02: CHARGING STATION	60 points
M03: AGING POWER PLANT	60 points
M04: CHIMNEY DISMANTLING	60 points
M05: ROAD INSPECTION	50 points
M06: OBSTACLE REMOVAL	50 points
M07: WASTE SORTING	60 points
M08: FOREST PLANTING	60 points
M09: CITY PARTY	10 points

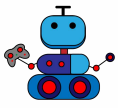
MISSION FOR MANUAL STAGE	SCORE
M10: GARBAGE RECYCLING	100 points

REMARKS

Independent Mission

Alliance Mission

TIN MAN BY



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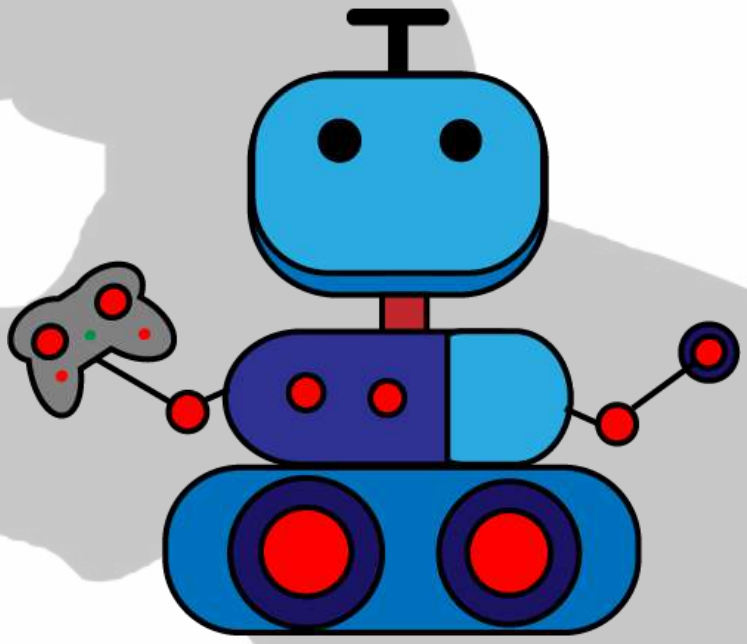

PROCESS RECORDS

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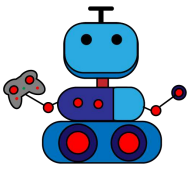
TINMAN SCHEDULE



Team Meeting

14 Sept

Understand competition rules

15 Sept

Conceptual design

21 Sept

1st prototype implementation

21-22 Sept

Starting Mblock5 programming

21 Sept - 6 Oct

Experiment on M01, M10 - Testing and Fixing

28 Sept

Experiment on M02, M03, M04 - Testing and Fixing

29 Sept

Experiment on M05, M06, M07 - Testing and Fixing

6 Oct

Experiment on M08, M09 - Testing and Fixing

7 Oct

Simplified code and practicing

1-7 Nov

9-10 Nov

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DESIGN INSPIRATION

ROBOT REQUIREMENT

- Robot size (Maximum) : 280mm (L) x 280mm (W) x 300mm (H)
- Max Robot weight : 2 kg
- Any part of chassis can't be out of the starting area
- There are only 4 ports.

TEAM STRATEGIES FOR DESIGN

- Symmetric robot need to be concerned in order to stay in the starting area plus have a great ability to drive with more balance.
- Electronic Modules chosen : RGB Line follower, Color Sensor, Ultrasonic Sensor and Servo Motor

RGB Line follower

Color Sensor

Ultrasonic Sensor

Servo Motor

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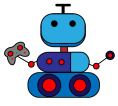

Phacharaphol & Phacharaphorn Somboontham

DESIGN INSPIRATION

- Electronic Modules for each mission
  - Mission M01 : Line follower and Ultrasonic Sensor

	Line	Color	Ultrasonic	Servo	Joystick
M01	√		√		
M02	√				
M03	√				
M04	√				
M05	√	√			
M06	√				
M07	√	√			
M08	√		√	√	
M09					
M10				√	√

DESIGN SUMMARY

- Main concept : Defined position of robot to reduce errors by following the line and using time control.

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TECHNICAL PRINCIPLE

Principle of Least Surprise

- We designed our robot to be as simple as possible.
  Each part performed its functions. It helps our team quickly build the robot on the competition date.

Creativity of Constraints

- Since there is only Nine G, servo Constraint, we try to design our robot to make the best use of it by completing mission M08 and M09 sucessfully. We create a part of our robot as an elephant's trunk to push the ball (M10) as well as to hold and move the tree (M08)

Accidental Complexity

- We cut the process of scanning block from line A for mission M01 to save time and reduce the robot's error.

Convention Over Configuration

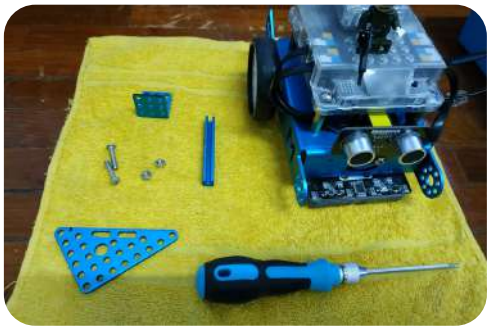
- We code 3 independent missions altogether to minimize repetitive of putting the robot at the starting area for each mission. It helps our team save time and also reduce the robot's error.

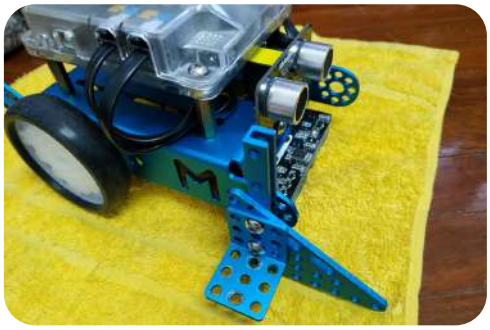
Design for Scale

- Our robot is designed to be useful for many missions.
  - The long beam is designed to be part of our robot's wing to complete both mission M03 and M04
  - The Ning G. Servo is designed to use for both mission M10 and M08

PRODUCTION STEP BY STEP

Step 1





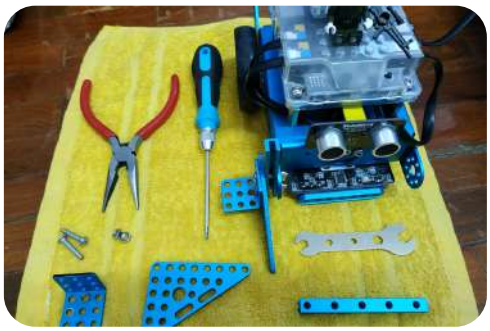
The first thing that we do is we put a beam on the front of the robot followed by a triangle plate and a bracket.

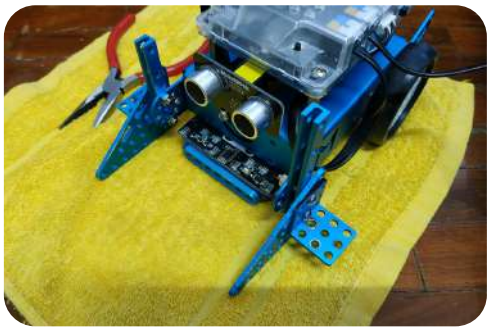
Step 2

We put a beam on the RGB Line Follower so that when it pushes cubes it will be straight.

PRODUCTION STEP BY STEP

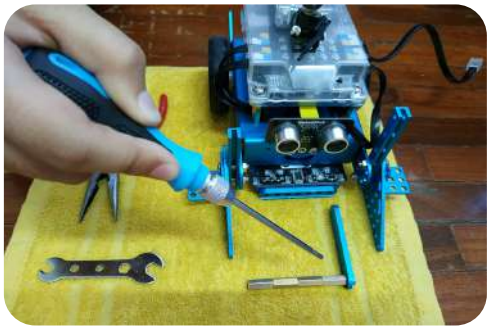
Step 3





We did the same thing as step 1 but on the other side and with a longer pole.

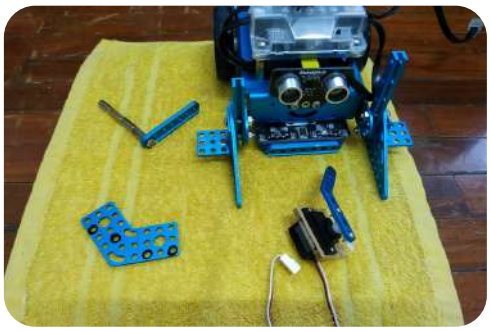
Step 4

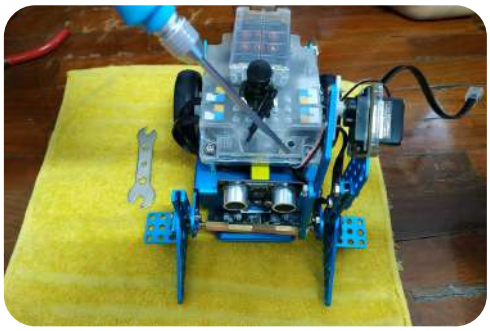


We connected 4 brass studs together and then screwed that onto a beam.

PRODUCTION STEP BY STEP

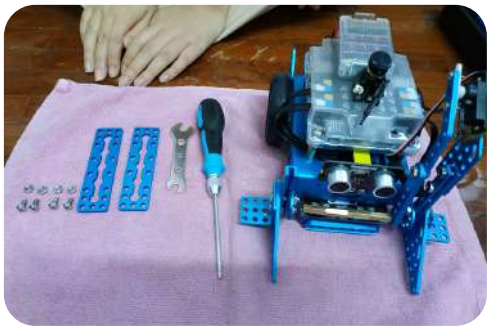
Step 5

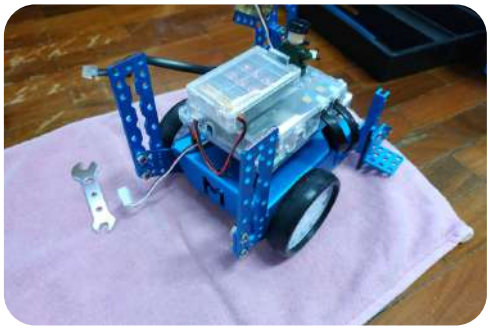




We took a Micro Servo and attached it on two plates, and then we screwed it onto the brass studs and beam that we just made

Step 6

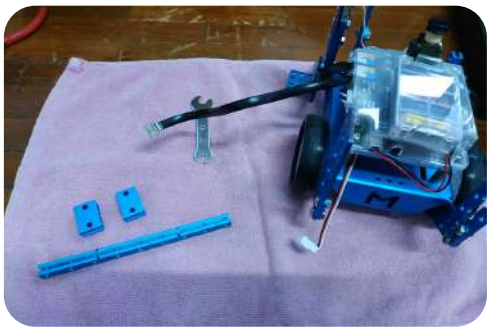


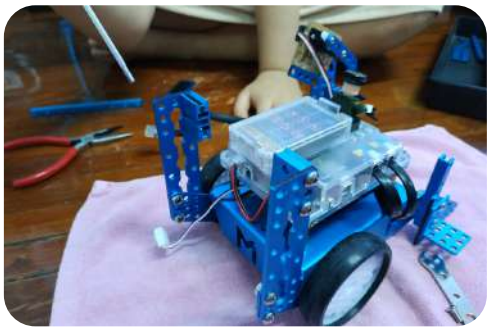


We put two knots and nuts on each of the two plates and then we put it at the back of the robot.

PRODUCTION STEP BY STEP

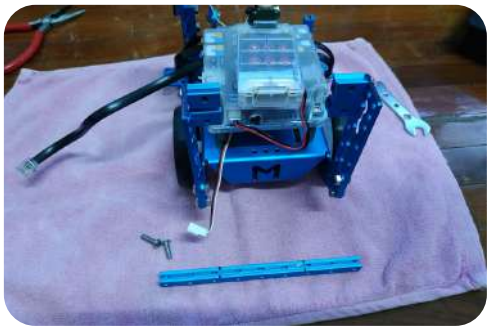
Step 7

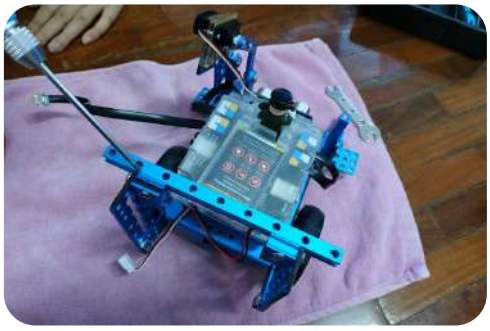




We took two slide beams and screwed them on to the insides of both of the plates that we just put on.

Step 8

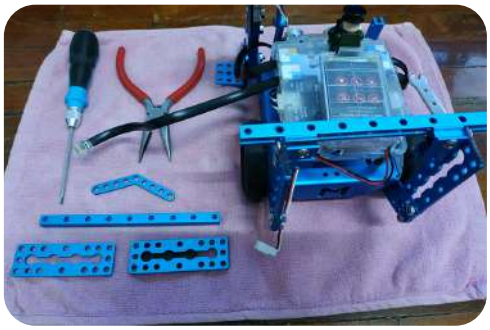


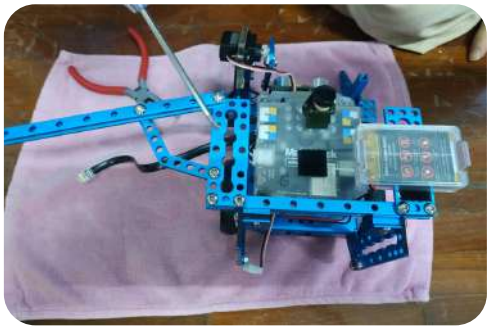


Then we take a beam and screw it on the slide beams in the middle.

PRODUCTION STEP BY STEP

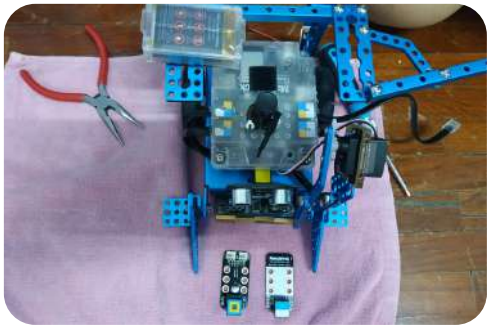
Step 9

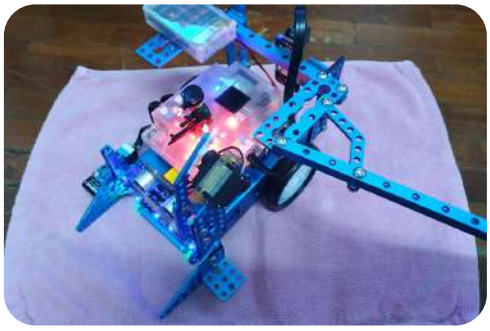




We screwed two plates on both sides of the beam and added Velcro on one of them and put another sheet of Velcro on the battery, and then we stick it on the beam that has Velcro. Next, we take another beam and screw it on top of the plate that doesn't have Velcro.

Step 10

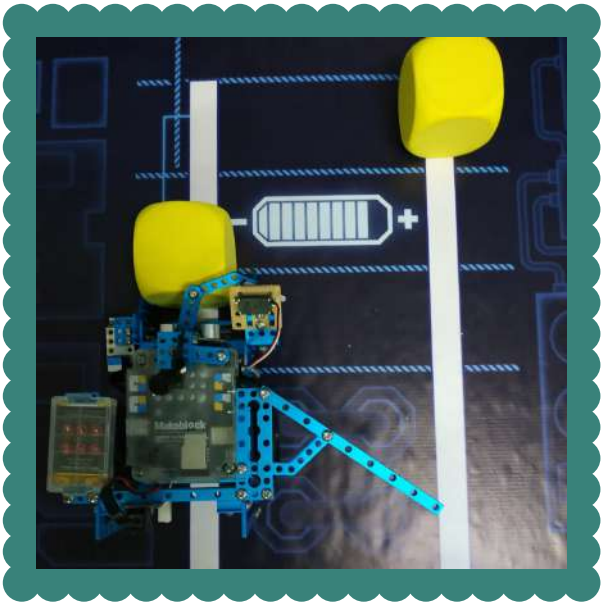




Then we screw on another plate in the middle of the beam and the plate so that the beam can hold up. We then screw in the servo adapter at the back of the robot and screw on the color sensor to the front of the robot.

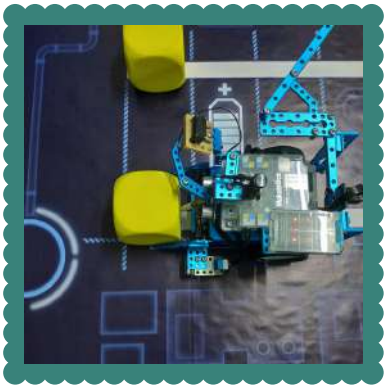
M01

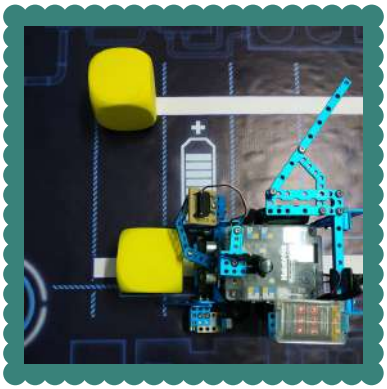
PROBLEMS AND SOLUTIONS



Problem: When you scan with the ultrasonic sensor, it slows you down a lot.

Solution: We skip scanning block B because we already know where it is. So, we push block A to the designated area.



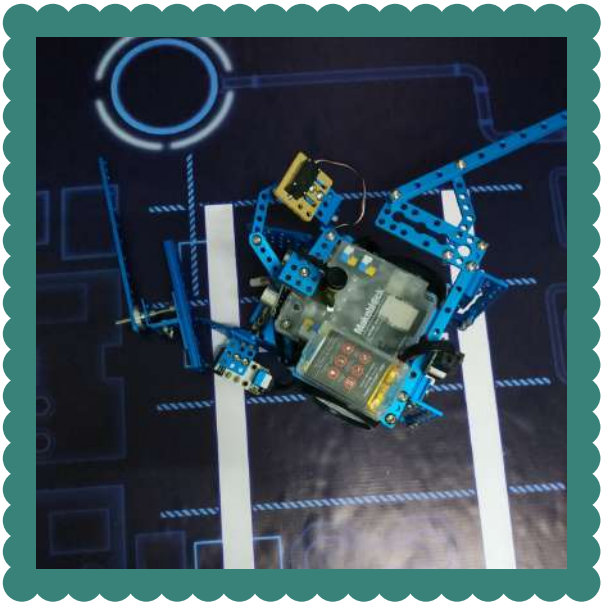


Problem: The length values not only from the timer but also from the battery. So, if you push the block for 1 second with full battery to an area it won't go as far if you do it with a low battery.

Solution: Test when your battery is mostly full.

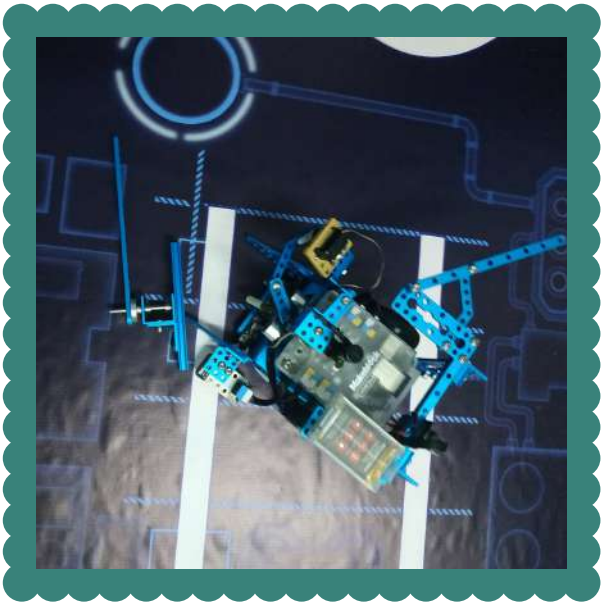
M02

PROBLEMS AND SOLUTIONS



Problem: If you go on lane B it has high risks that it is going to hit the whole switch down.

Solution: We go on lane A because it heeds away from the switch.

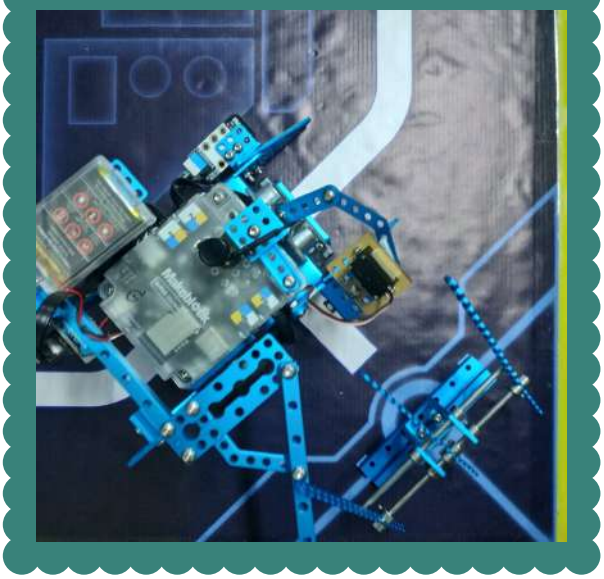


Problem: When we spin and hit the switch with our servo tail it often hits our servo and it doesn't turn the switch more than 90 degrees.

Solution: We decided to hit the switch head-on.

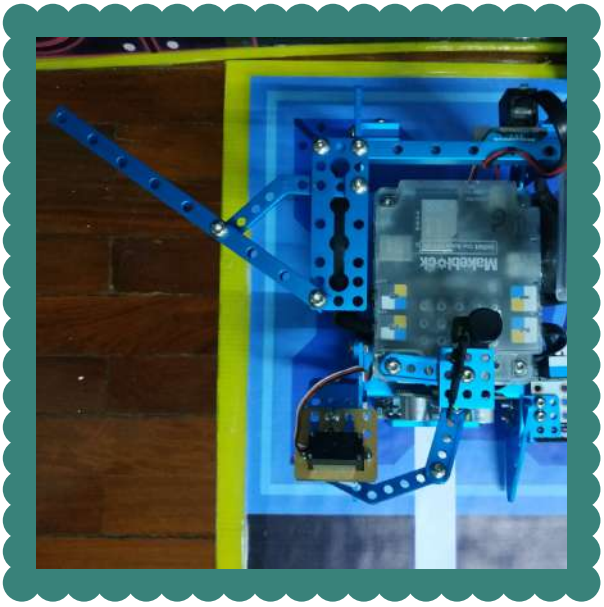
M03

PROBLEMS AND SOLUTIONS



Problem: Our angle for the peak isn't good because we need to share it with M04. And some of the power plants don't fall down.

Solution: We seperated the pole's angles for each mission.



Problem: Our pole sticks out of the starting area when we put our robot in the middle of it.

Solution: We put our robot to the side of the starting area.

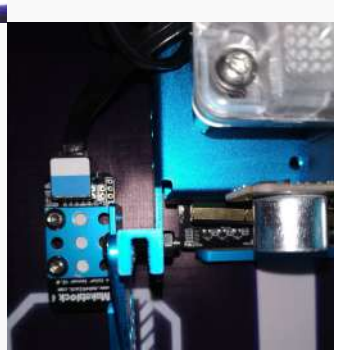
M04

PROBLEMS AND SOLUTIONS

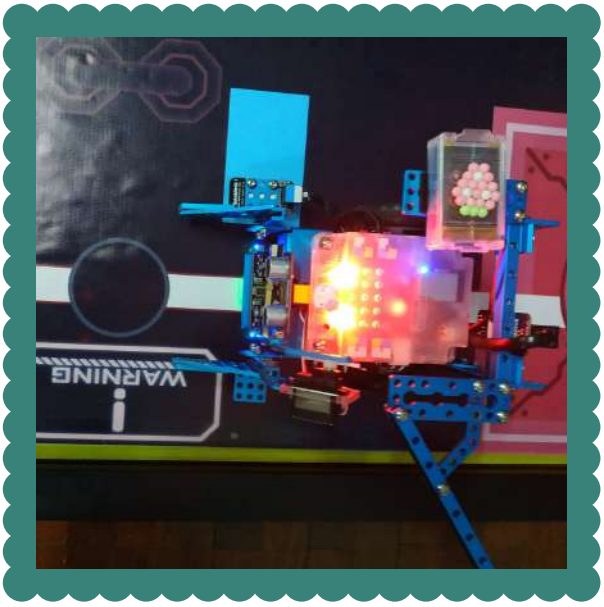
Problem: The angle of the pole isn't wide enough to knock the chimney down.
Solution: We extended the angle of the pole to the limit so that it knocks the chimney down.

M05

PROBLEMS AND SOLUTIONS



Problem: When we switch sides from red to blue or from blue to red, the color cards are going to be on the opposite side of the color sensor and it is extremely hard to unscrew the extension with the color sensor and put it on the other side.
Solution: We added another extension on the opposite side. Now we only need to unscrew the color sensor which makes it a lot easier.

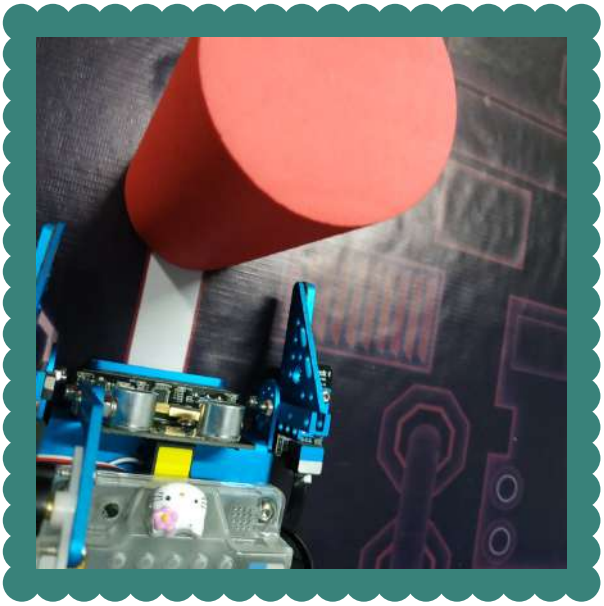


Problem: When the color sensor tries to sense the color blue, it is not always accurate.

Solution: So if there is a blue card, the robot will not check if it is blue. Instead it will check if it is red or green because those colors are accurate.

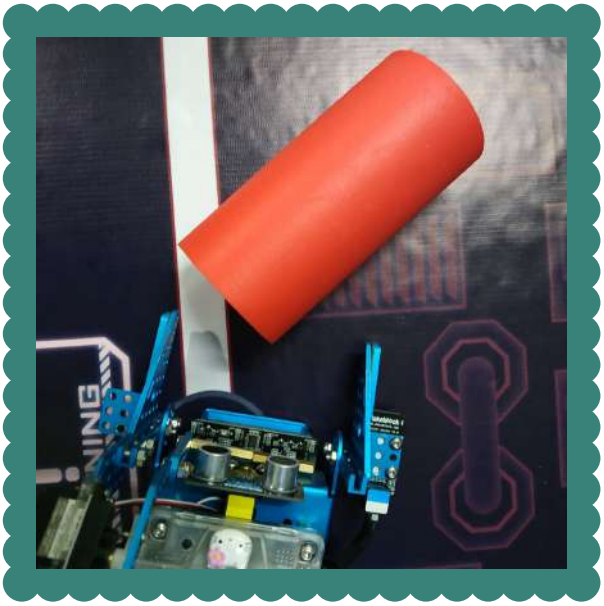
M06

PROBLEMS AND SOLUTIONS



Problem: When we push the obstacle forward and stop, the obstacle is in our path. So we can't go anywhere on that path.

Solution: So we programed for it to turn 90 degrees and then it's out of the path.

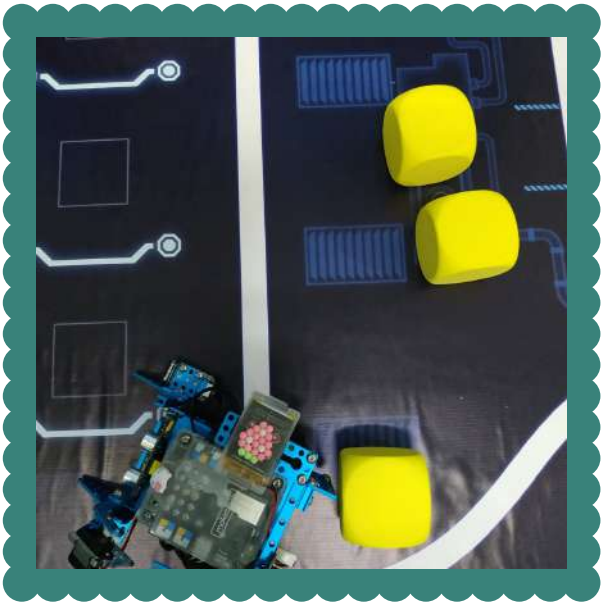


Problem: When we hit the obstacle directly to move it out of our way, it falls down.

Solution: We used the servo tail to wrap around the obstade which will make it more secure so it doesn't fall down when we move it.

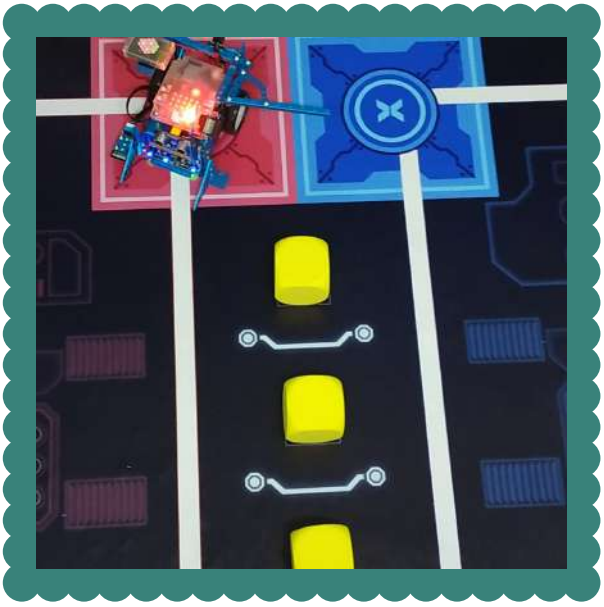
M07

PROBLEMS AND SOLUTIONS



Problem: When we push the block to the designated area, it goes crooked because our turn is not straight. We can't turn straight due to a line to follow and make sure where we are.

Solution: We depended on our timer and changed the value until we got a pretty decent value. Then we used that value to push the block.

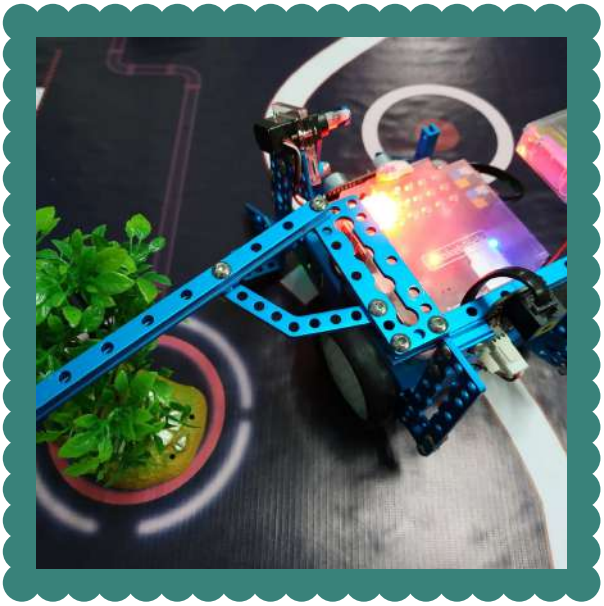


Problem: When our robot is leaving the starting area, it detects the area color like blue and red, so it picks up the wrong color.

Solution: We set a timer, so that it doesn't scan until the timer is up. That way, it won't get confused between the colors of both places.

M08

PROBLEMS AND SOLUTIONS



Problem: When we move to collect the plant from the transit area, our wing and our tree will collide together. This action will make our tree fall and ruin everything in M08.

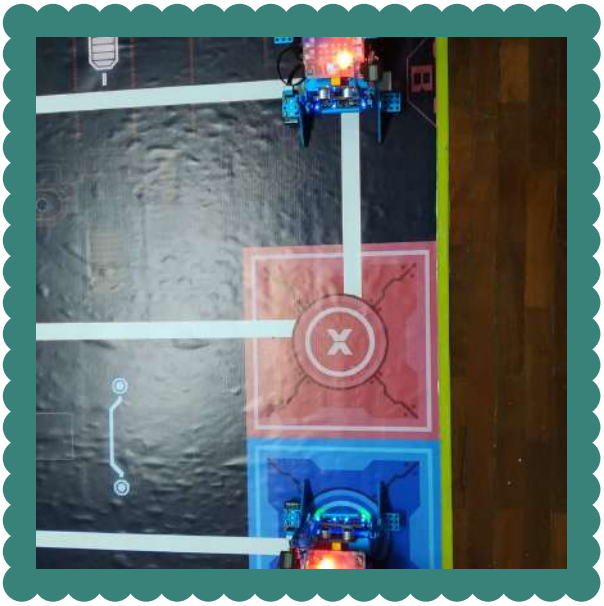
Solution: To get past it, we have to perform a 360 while moving; it is kind of like a roulette turn in soccer.

Problem: If the tree is positioned at a specific angle, our bot can't move it. This event happens due to our pincers hitting the tree and pushing the tree to where our bot can't reach.

Solution: We back up so that when we turn to recieve the tree, it doesn't hit it. It is kind of like M01 where we avoid the block, but instead of a car turn, we just back up.

M09

PROBLEMS AND SOLUTIONS



Problem: The problem with City Party is that it needs to do it on time with your alliance. Other alliance missions can be done separately, but City Party has to do it together.

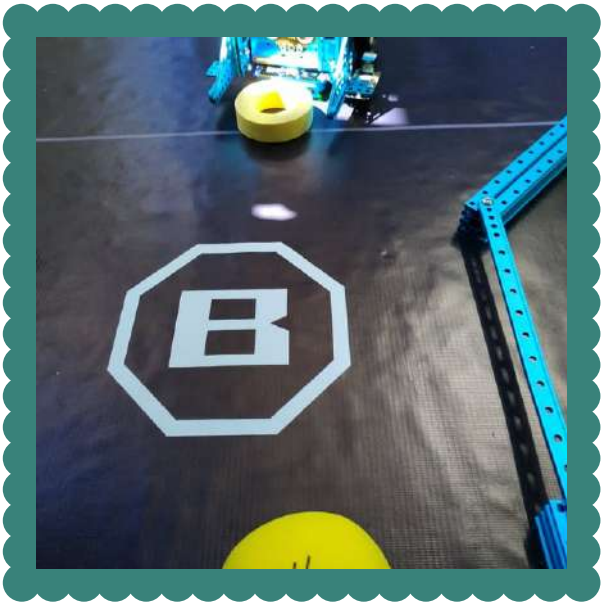
Solution: We discuss with our alliance to do M09 first, then do our independent mission later; this way, we do it on time, and we don't have to wait for the other team.

Problem: When our robot does a 360 dance, it hits the other team and goes insane. Plus, doing a 360 is not cool and is definitely not a dance move.

Solution: So we wiggle from left to right and back and front, this dance move will not hit the alliance's robot, and is quite energetic.

M10

PROBLEMS AND SOLUTIONS

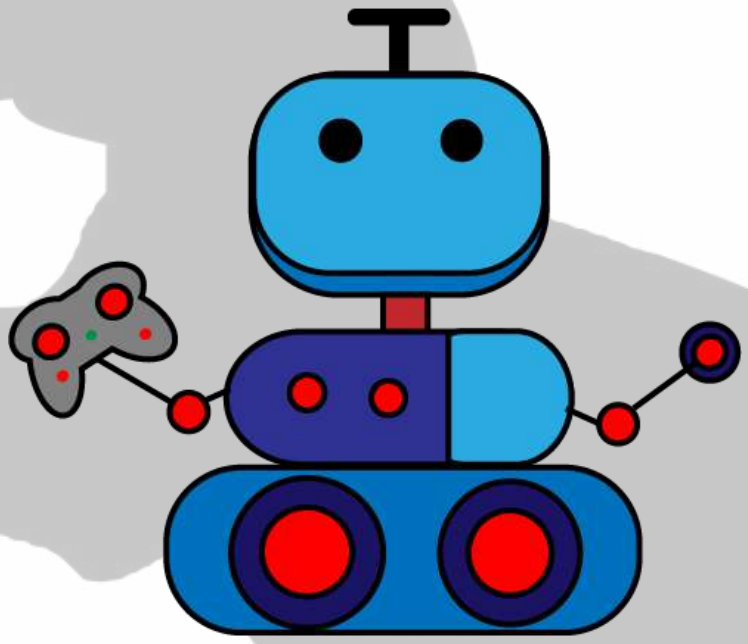


Problem: When we push the garbage to section B and stop so that the ball rolls into its designated area, we risk the violation of the donut going into the wrong section.

Solution: Instead of stopping abruptly for the ball to roll, we made a servo trunk in front of the robot to flick the ball into section B.

Problem: When we turn to maneuver the donut to section A, it sometimes gets stuck underneath the pincers.

Solution: So we attached beam 0412-044 to both pincers. And we lowered the beam down a little bit so the donut cannot get through.



PROJECT SUMMARY

Visit MakeX-Tin Man at

https://tinyurl.com/codingforkidschannel

STRUCTURE AND FUNCTION

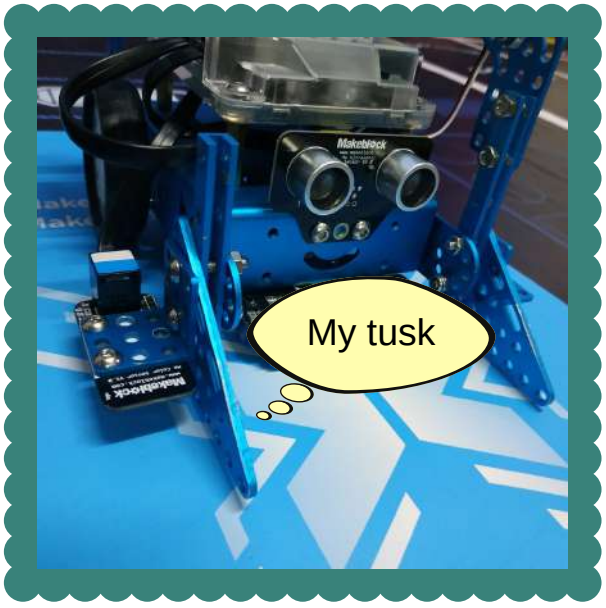
Flying Elephant Robot

Elephant's Trunk

We used 4x brassstuds connected with 9g Micro Servo to make an elephant's trunk. Its functions are the following:-

1. To push the ball in mission M10

2. To control the tree when it is moved to the designated area in mission M08



Elephant's Tusk

We use 2x triangle plates to make as our elephant's tusk. It is beneficial as you can see its functions below:-

1. To control, move, and push rings to the designated area in manual mission(M10)
2. To control blocks in mission M01 and M07
3. To manage and move the tree in mission M08
4. To move an obstacle in mission M06

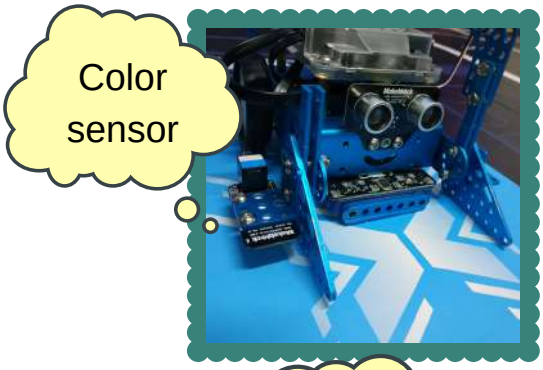
STRUCTURE AND FUNCTION

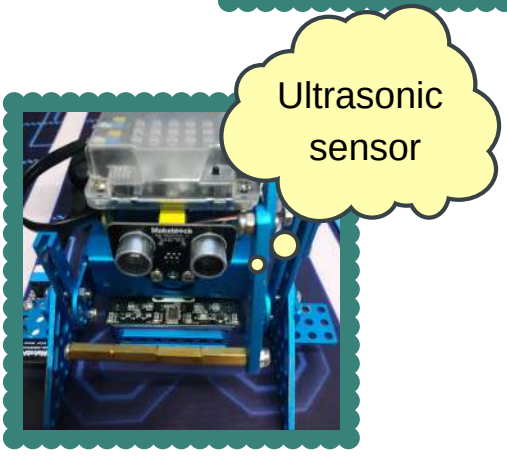
Flying Elephant Robot

Elephant's Wing

We use a long beam to make as our elephant's wing. It functions as the following:-

1. To hit the powerplants in mission M03
2. To hit the chimney in mission M04





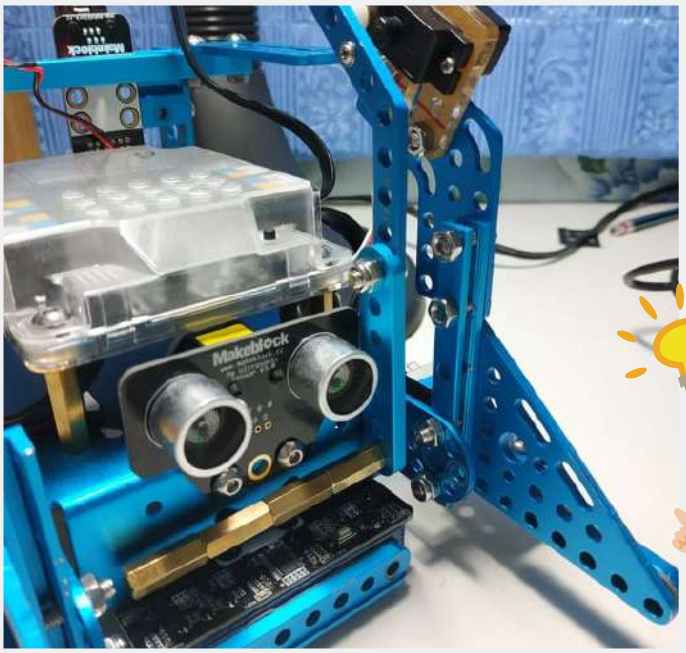
Elephant's Sensory System

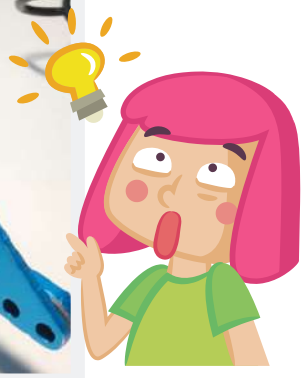
There are two sensor systems in our flying elephant robot.

1. Color Sensor
   - It helps us check the colored cards in mission M05 and M07
2. Ultrasonic sensor

It helps us scan the tree's position in mission M08 and scan the correct spot of a block in mission M01

TECHNICAL INNOVATIONS

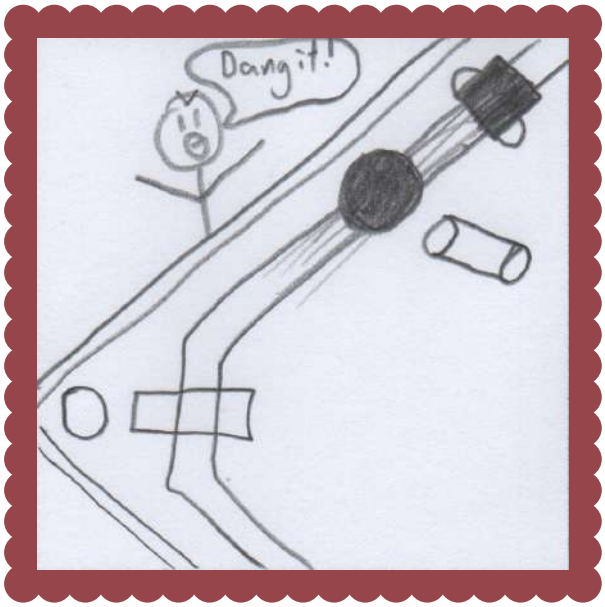




Truck: Our main innovation is our servo trunk. Usually, people think that all we can use for a servo is only for hitting things like balls in manual mode. Our team used the servo to build a golf club looking trunk. This trunk consists of Plate 45 degrees, a Beam 0412-060 and 4 Brass Stud M4* 16+6.

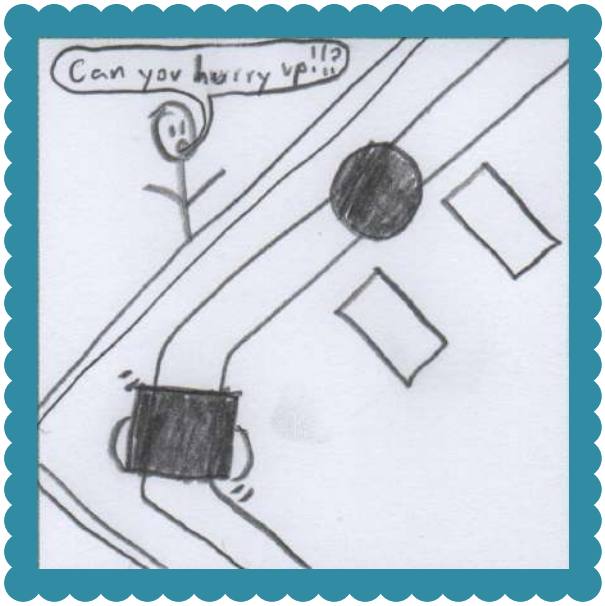
We realized that if our trunk can extend out, it can also fold back in. So we used the trunk to the best of it's abilities. In manual mode, we're able to hit the ball, which will roll precisely to the spot we wanted it to go to. In missions that we have deliver and transfer stuff, we clamp the trunk over the object to securely transfer it. That's why our servo trunk is our chief innovation.

COMPETITION STRATEGIES



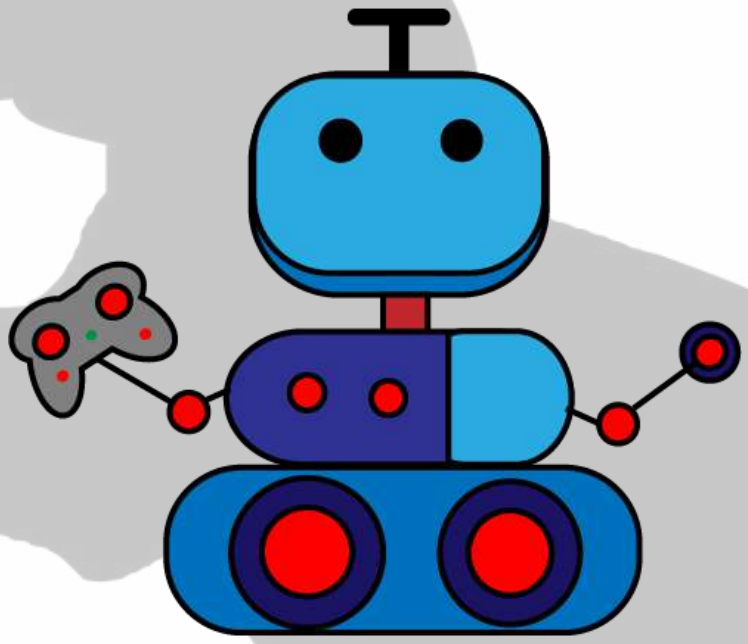
Scoring startegies

- Highest score with least error
- Firstly complete all independant missions.
- Line follower is our team's main key to keep the robot to detect and follow the line



Defensive startegies

- Slow and steady wins the race
- By this it means that there are many pathways for our robot to reach the prop, but we will always follow the line in order to play safe that the robot will not go beyond our control.



TEAM INTRODUCTIONS

Visit MakeX-Tin Man at

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TIN MAN TEAM

Phacharaphol Somboontham
Grace International School
Age: 10 years old
Tin Man Programming Head
"Curiosity always gets the better of me, and that's what built me up."

Phacharaphorn Somboontham
Grace International School
Age: 9 years old
Tin Man Program Testing
"I like to draw because it lets my imagination run wild!"

Phahol Somboontham
Tin Man's Mentor

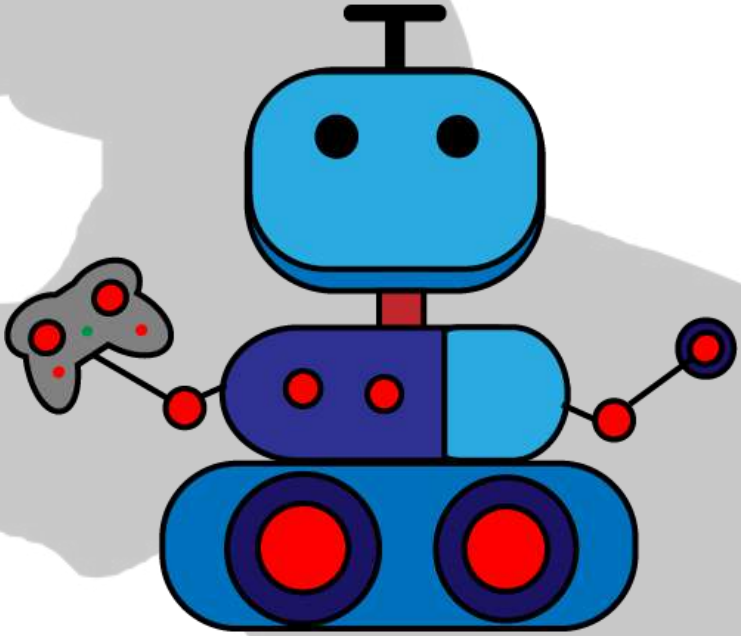
TIN MAN BY
Phacharaphol & Phacharaphorn Somboontham

ACHIEVEMENTS SHARING

We achieved to complete every mission within the given time, and we also didn't give up either. There is an essential role in this achievment; it is looking at the whole picture. If we concentrate on only one of the missions and make it perfect, then look at another mission when we realized that we need to change it. After we changed it, it doesn't work on the first mission, so we have to look at the whole picture. Another key to our achievment is not giving up. There are times when we think that there is no way out, but if we try, we will find the way.

TIN MAN BY

Phacharaphol & Phacharaphorn Somboontham



DAILY REPORT

Visit MakeX-Tin Man at

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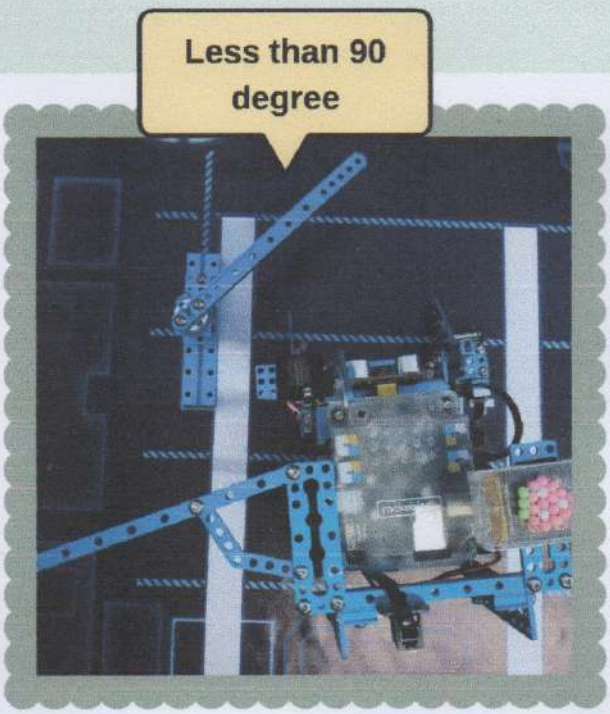
DATE: 14 SEPT 2019

Today we had a team meeting about our game plan. First, our team was looking at each mission and devised a strategy. We would handle all the independent missions starting from Starting Position 1, including Waste Sorting (M07).

The only mission that starts from Starting Position 2 is Forest Planting (M08); this is because the mission is closer to that Starting Area, which spends less time. Next, we designed a new bot to conquer all the missions.

DATE: 15 SEPT 2019

We learned the competition rules like how to earn points, and how to avoid violations. After we learned all the rules, our bot turned out to not be able to perform each task. For example, we didn't know that the power switch (M02) needs to turn more than 90 degrees. We had to change our robot big-time!



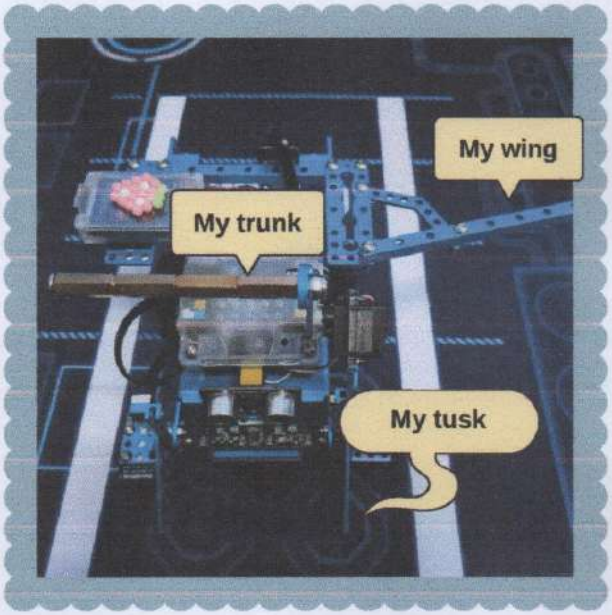
DATE: 21 SEPT 2019

We made our 1st prototype implementation robot has a servo tail that is used for grabbing, moving, and hitting stuff. Like planting the tree from place to place. It can also help bring the chimney down by grabbing it and pulling it down.

When we play manual mode, we use a little plate to shift the ball and stop so the force would knock it down. This much force can send it tumbling into the goal, but it also has high risks of screwing up.

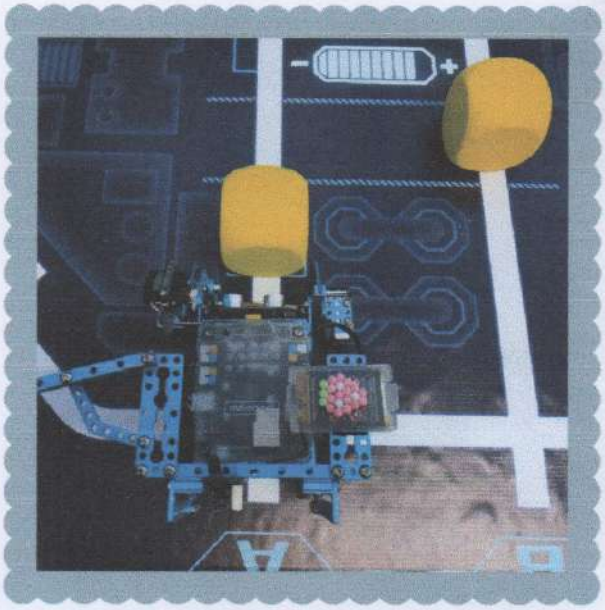
DATE: 22 SEPT 2019

We designed our bot to look like a flying elephant. The tusks are useful in many ways, such as hitting the switch in M02, moving the obstacle in M06, controlling the tree to the designated area in M08, and spearing the ring in M10. Another useful innovation is the servo trunk; this trunk can be used for making transferring the Forest Sapling a lot more secure by folding over it. It can also flick the ball in manual mode to roll into section B.



The wing is also an essential piece in this robot because it takes care of mission M03 and M04. In M03, we can knock all power plants down with our wing, and for M04 we can hit the chimney down. That's why our robot is a flying elephant.

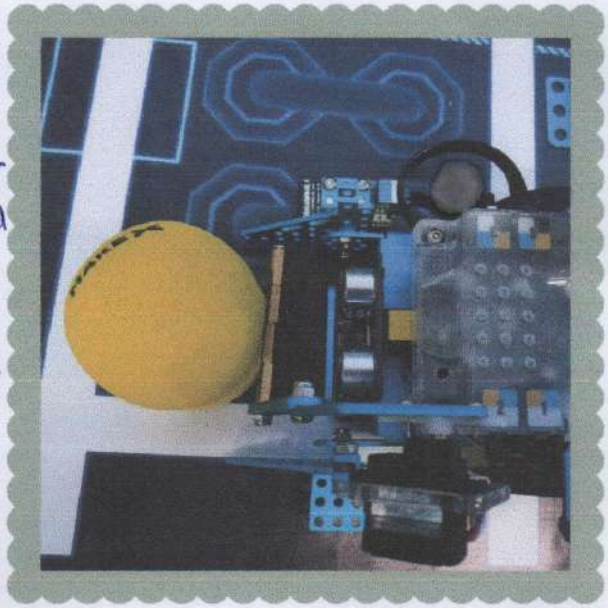
DATE: 28 SEPT 2019



Today we started coding in MBlock 5 after we designed our strategy. We started programming M01. It was quite hard because we had to adapt to programming robots, which is very different from regular programming.

We decided that when our team was done programming M01, we would program M10 and work on that.

DATE: 29 SEPT 2019



Today we tested M01 and M10; there were a lot of problems to fix. The first problem from M01 is that sometimes, when we push the block, it's either too close or too far. So we have to keep on fixing and fixing, and it will eventually get better. There were alot of problems for M10 such as, our robot got stuck when trying to spear in the donut and that sometimes the ball rolls away when we are trying to deliver it to section B.

Both of those problems will strongly affect our time. We only have 1 minute and 30 seconds, so if any of those problems happen, there is a substantial chance that we won't do it in time. So we added a servo trunk to the front to make things easier. We can flick the ball instead of having to use momentum and force.

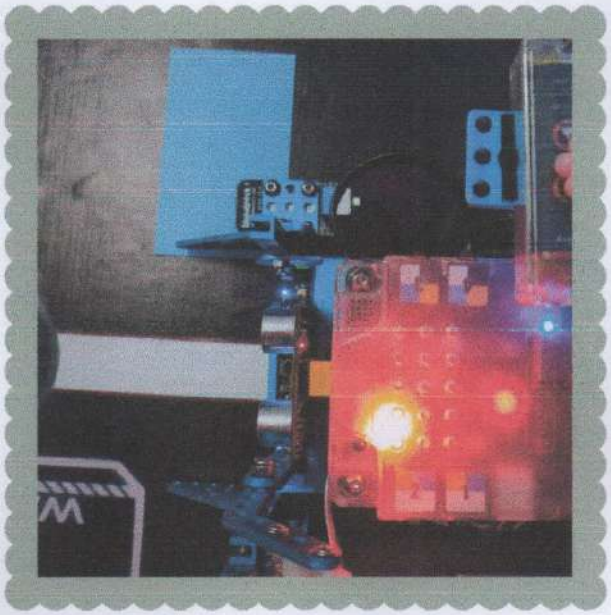
DATE: 5 OCT 2019

After we programmed M01 and M10, we continued programming. M02 had a problem when we removed the tail; We have to run off the track and hit it head-on. Another problem is if you go on the wrong path, you mess up the whole thing.

The problem with M03 is that the wing was sticking out of the starting area. We fixed it by putting the robot on the side of the starting area. That way, the wing doesn't poke out. The dilema for M04 is that the angle of the wing for this mission isn't the same as M03's. We made seperate angles for both of them.

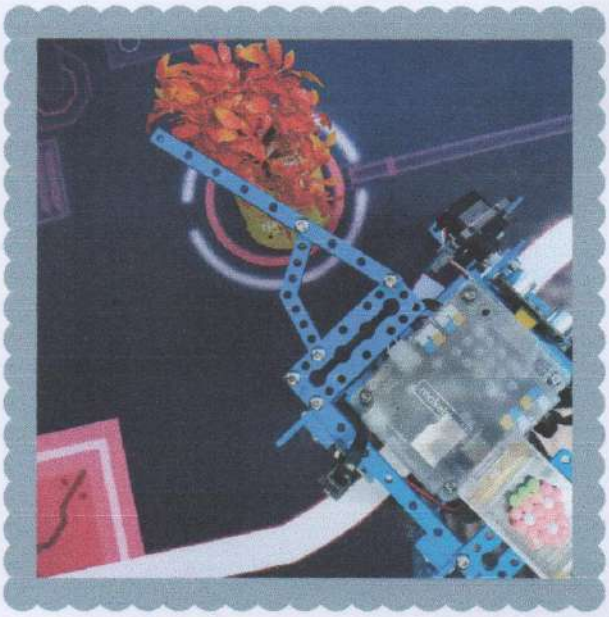
DATE: 6 OCT 2019

A difficulty with M05 is that if we check the color card blue, it is not always accurate, although red and green are. We fixed it by verifying the cards as either green or red; Finally, if it is neither of those colors, then our bot assumes it is blue. A problem with M06 is that when we move the obstacle straight out of the circle, it blocks our path. We reprogrammed the bot so that it turns and push the cylinder out of our way.



A problem for M07 is that when we push the block back, it doesn't go straight; this is also because we don't have a line to make sure we're straight. Now we depend on our timer, which is not reliable. So we changed the time and chose the best time to do the job.

DATE: 10 OCT 2019



Today we are experimenting on M08 and M09. The problem for M08 is that when we try to get our sapling from the transit area our pole hits the other sapling. So, we made the robot turn around walk backwards, and turn around again. That way, it doesn't hit the other sapling. The problem for M09 is that the robot which is dancing might get stuck somewhere. The solution for that is that we programed the robot just to do little moves, not big ones.

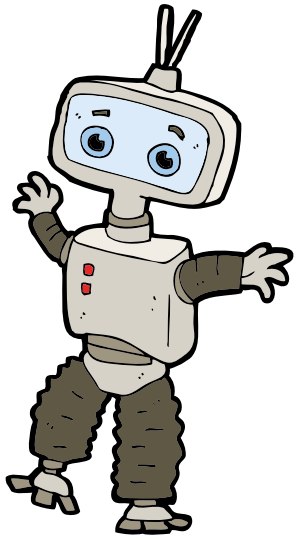
DATE: 24 OCT 2019

These days we will be practicing for the competition. We have practiced the whole competition. We are very proud that we have gone this far and we are fully prepared. We are very excited for this competition and are still practicing. There were a lot of errors and fixing to do; But we never gave up.

New!

TIN MAN STRATEGY

Simplifying and Improving Code



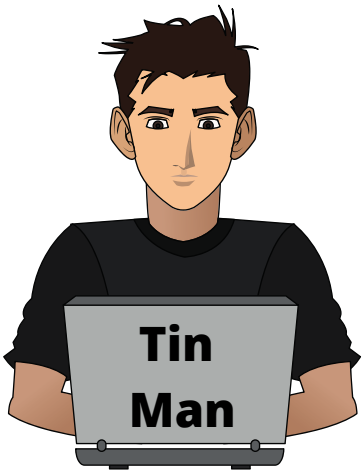
When we were competing in the first round, our code was complicated but sure. The problem was that when the code gets complicated, it takes away more time. We barely made it the last round, so in this round, we have to simplify it although we need to be careful because when we shorten the code, it might not work any more. What we want is simple and sure!

Teamwork Makes the Dream Work

The most important key to winning the match is teamwork. There are many roles to play in order to complete the robot in time. For example, someone has to do the coding while the other person simultaneously builds the robot. After that, we have to fix the values and try out every single mission. That means that someone needs to be done before or at the same time as the other person. The person who finishes first needs to double-check the person's work. It sounds complicated, but you can't deny, "Team work makes the dream work."

Practice Makes Perfect

Although we know how to make the code, we should practice. Practice can make us more accurate and faster at programming. It can also give us the ability to know and understand the code so that we won't have to think much in the competition. As they say, "Practice makes perfect!"



TIN MAN BY

Phacharaphol & Phacharaphorn Somboontham

New!

MY MIXED EMOTIONS

From Regional Competition - Northern Thailand

We walked into the practice area with confidence that touched the sky. I uploaded our code into the Mbot and tested it out. It went all wrong. First, the friction of the map so we couldn't turn properly. Then, we discovered that we were running out of time. There were only 2 hours left! We spent most of the time building and forming our robot. Our confidence fell until it was ten feet deep into the ground. We panicked. Sweat ran over my face; we were scared of losing. We rushed back to the table to fix the code. However, it was too late. There was not enough time. Yet we tried and didn't give up; hope is still there. After our lunch break, I felt a little better and added final touches to our robot. **continued -->**

TIN MAN BY

Phacharaphol & Phacharaphorn Somboontham

New!

MY MIXED EMOTIONS

Regional Competition - Northern Thailand

Then it was time for our first match; we were terrified because we still didn't talk to our alliance and plan our game yet. When we got to our table, I had five minutes to tell the other team my plan. Luckily, they agreed more quickly than I thought they would. I was going to do the alliance mission first, then the independant. While they would do the opposite and we would switch. When I let go of my bot, it pushed the block successfully to the other end.

I felt relieved, and happiness washed over us, I was about to yell and scream. Then I remembered that I was still in the match, so I picked up my bot after asking the referees for a retry. We danced off to do our independent missions. In the end, we got pretty good points, so I told my parents, and they said that we were doing well. That lifted our spirit so much, and our confidence touched the sky again.

TIN MAN BY

Phacharaphol & Phacharaphorn Somboontham

New!

LESSON LEARNT

From Regional Competition - Northern Thailand

Important Role of the participants

After we complete all the missions, we need to check the points on the paper that the referees show us. This is because if there are any errors or mistakes, we can ask them to recheck our score. Only if the scores are correct, we put our signature. Last time when we were on our 3rd round and we were done with all the missions, we looked at the paper and thought that everything was correct. But we didn't check that well and lost a lot of points.

Time Is Worth More Than Money

When we prepared everything at home, we were perfect and thought that we had nothing to worry about. And if we needed to fix something, it would just be a little bit. But we were wrong, we spent way too much time building the robot and left just a little time for fixing. When we went to test the robot we had a lot of fixing to do. It was pressuring as time was running out, our legs hurt from running back and forth, and our mind wasn't working because of the stress. And boy, were we frustrated! But we didn't give up and eventually, it got under control and everything was good again. We decided that for the next round we would manage time better!

TIN MAN BY

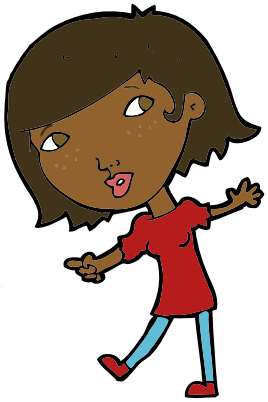
Phacharaphol & Phacharaphorn Somboontham

LESSON LEARNT

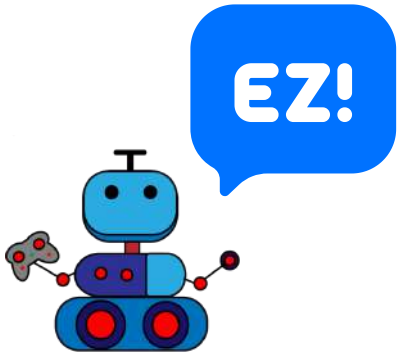
From Regional Competition - Northern Thailand

Following the line is not an important thing, it's everything.

The most important tool in all the missions is the line. We need the line to sense where we are going and how much too turn. We had a big problem in the mission MO7, we need a line to know how much too turn. It is challenging to keep on changing at home and then change it again at the competition because the floors are different. So we learned that in the next match we need to follow the line as much as we can.



Worse is Better



If we code the things that we don't really need to do and then spend a lot of time fixing them, then we run out of time. We don't really need to do things like MO1 Save and MO7 Help because maybe we don't need them. Then, when we are done fixing everything, we don't have time for the important things. So, for the next match, we're just going to focus on the important things.

Staying Calm Under Pressure

One of the most important things is to be calm under pressure because if we panic, then we will get stressed out and the last thing we know, we'll run out of time. The winner of the competition is the team who can stay calm under pressure. So for the next match, we should try to stay calm and handle things better.

TIN MAN BY

Phacharaphol & Phacharaphorn Somboontham

THANKYOU

Thank you Imagineering Education Co., Ltd and Makeblock (Tongxinzhiwu - 童心制物) for setting up this competition for us. This match has been a challenge for our team because it's the first time we ever experienced robotic coding. We had a lot of fun practicing for the competition, changing the values, and fixing problems. However, the most useful skill we can possess through this is getting prepared. Our future will be about AI and robotic coding, so it will be vital that we have a STEM education. We would like to thank you Imagineering Education and Makeblock again for allowing us to get prepared for a futuristic future.