Field Report - Aparaj

RoboCup 2019 was hosted by Australia and the competition was an amazing experience. The Major and Junior Leagues were all held in the International Convention Centre (ICC) in Sydney. There was a variety of countries that competed with a various ethical and cultural backgrounds. The exceptional organisation and the excellent equipment led to a high-quality competition.

# Videos

All our games can be found on YouTube by searching M&A robotics or clicking the following link <https://www.youtube.com/channel/UCFLQQ7A4bBnele9LdO1RbSA>.

# Interview

The interviewing process this year was different to previous processes. The 20-minute individual interview was replaced with a 40-minute group interview. Each group consisted of three individual teams. The teams were allocated 10 minutes to present their robots to the group. The remaining 10 minutes was used as a question and answer period after each team’s presentation. Our group consisted of a Mexican team and an Italian Team.

The new format presented a challenge for our team since we had prepared for a 20-minute interview. We had created a PowerPoint presentation that was designed to last 20-minutes. In order to stay within the time constraints, we had to skip over some of our slides. This did not present much of a problem since the timing for our 20-minute presentation had included a question and answer period. In our question and answer period none of the other teams asked us any questions. The only person to ask us a question was the main interviewer, Marek Suppa. He asked us how we calculated the movement for our robot. This was answered easily since it was a relatively simple question.

There were four interviewers that interviewed the group. Marek asked all the questions and was the most interactive interviewer. This was because he was the only interviewer that could speak English easily and fluently. He seemed to be more interested in the software components of our robots and how our software was constructed.

I believe that our interview went very well as the new time factor didn’t really affect us too much. We were able to cover all the important aspects of our robots but still go into enough detail so others knew how our robots worked and the manufacturing process of our robots. I believe that this new process has benefits and detriments. The main benefit is we can share our ideas and processes to other teams in our group and we are able to ask and answer questions. The main detriment is that we couldn’t go into as much detail as possible, meaning we couldn’t explain all our innovative features. In my opinion the new process is better since it is easier for interviewers to compare different teams which is advantageous towards us.

# Poster

The posters were marked in a 2-hour poster presentation session. All the teams from the same league would stand next to their poster and explain their robots to anyone who was interested. This encouraged teams to go around and talk to other teams about their robots and share ideas to better improve their robots in the future. Our poster had a lot of visitors since we were currently in first place.

There was a marker that came around looking at all the posters. The marking criteria for the poster which is found on the international marking rubrics. The marker would sometimes ask questions, but this was very rare. Even though there was a marker, the main purpose of the session was to share ideas to other people and to interact with people from all over the world. This process was very effective as everyone who was competing in our league was able to interact with other people from around the world.

# Point Weightings

On-Field Performance – 40%

Interview – 10%

Poster – 20%

Teamwork – 10%

Team Spirit – 10%

Tech Challenges – 5%

Portfolio – 5%

# Referees

All the referees were volunteers or mentors. This meant that many of them did not know all the rules or misinterpreted certain rules. This didn’t really affect our team as we normally played on the top tables which consisted of the confident referees who understood all the rules. Most of the referees understood the basic rules, so the majority of gameplay was able to run smoothly. The main discrepancy in refereeing was the pushing rule. Most of the referees did not understand the pushing rule and this led to some wrong calls. This meant that most of the goals against us was technically pushing and some of the goals for us was also technically pushing.

Unlike the previous years, the double defence rule was not as strict as the years before. This is because most of the referees were not as familiar with the rules. However, in comparison to the Australian refereeing the double defence call was much stricter. If the referee knew the double defence rule, they would only call double defence when an opposing robot was pushing the other two robots into the penalty area. This meant that most of the double defence calls were useless as two robots were already in the penalty area when the attacker was trying to score. The damage call in relation to double defence was never used in any of the games since the referees were unaware of this rule.

The out of bounds rule was very strict at internationals. As soon as the robot went out it was taken off, even if it was trying to come back in. This presented a problem due to the speed of our robots. Since our robots were so fast, the referees would think that our robot had gone out even though it hadn’t. This meant that our robot sometimes got taken off for damaged even though it should have stayed in play. The pushed-out call presented a problem for us since our robots still tried to re-enter the field if the referees picked it up. We were able to overcome this problem since the referees were open to us explaining our robot logic in relation to our line-over logic.

# Results

Throughout the competition we did not lose a single game. Our results can be found at <https://drive.google.com/drive/folders/16U67NBvkr9AkMXo2WcytCHHbYLBjVjl4>. The marking rubric for all the aspects of the poster, presentation and teamwork can be found on the RoboCup Junior website.

# Event Organisation

The competition was organised very well. All the information in relation to game times was on a board just outside the competitor work area. This meant that we could easily find out when and what field our games were. Open and Lightweight games were at different times, so the fields weren’t too crowded. There were only two testing fields which meant that it was normally very crowded. This didn’t really present a problem for us as we didn’t really test too often. The inspection area was in between the fields and the work area so it was very easy to access. The fields were spread out so there was enough space for the referees, competitors and spectators. The layout of the fields was very effective and used the space well.

# Inspection Process

The inspection process was very rigorous. All the limitations of robots were checked. The size, weight, capture zone, handle and batteries on the robot were all tested. In addition, the colour and LEDs on our robots were tested to make sure they didn’t interfere. This meant that inspection did take a while but the people inspecting our robots were very quick and efficient. As well as the normal inspection at the start of the day, there were random inspections throughout the competition. We only had one random inspection which had no hiccups. This inspection process is a lot stricter than the inspections in local competitions.

# Workspace

The work area allocated to us was very small and inadequate. Each team got one table with four chairs. The table was very small, and we could barely fit all our components on the table. As a result, we ended up keeping most of our tools in our toolbox. We only took them out when we needed them. We also kept our robots in their boxes rather than on the table just so we could save space. The table was also equipped with four power points (daisy-chaining was banned). We didn’t end up using all the power points since our computers were always fully charged and we only needed power point to charge our batteries. We did need to keep all our gear organised, so we didn’t take up other teams’ space. Sometimes our neighbouring teams would take up part of our area due to their small work area. This didn’t present an issue as we had two great teams next to us. The work area was very poor, but we were able to overcome this problem by keeping our gear organised.

# SuperTeam

The SuperTeam competition is where multiple teams are combined into different SuperTeams. These teams then play a game of soccer on a field that is 4 times larger than a normal field. Each SuperTeam is allowed 5 robots on the field at a time, and each individual team needs to have at least one robot. Our SuperTeam consisted of GND (Israel), Team Raffles (Singapore) and SOY condimentum (Taiwan). We were able to have both our robots on the field because there were only four individual teams in our SuperTeam.

There were six SuperTeams and they were separated into two groups. There were two games where each team would play the other two teams in their group. The top team in each group would then play in the final. This process was fair in determining the best team but was not as good as determining second and third place. This didn’t matter since only first place was acknowledged with an award.

Our Superteam decided that we should have one defender and four attackers. This was so we didn’t let any goals in but had good attacking power. We decided to do this because goals in a SuperTeam game are a lot rarer, so we needed as many attacking robots as possible. At first Team Raffles used their robot as a defender but they had some issues with their compass so their defender couldn’t work. We ended up using our defender since it was the best defender and it ended up working well. We didn’t employ many game strategies since we weren’t able to calculate our position of the field due to its size. The SuperTeam competition was a way for all the competitors to have fun and to enjoy the competition.

SuperTeams did not have an interview but the way we worked together was a part of the Teamwork marks.

# Competitors

Our performance against other teams was very successful. The only teams that caused a problem was the two Japanese teams. This is due to the accuracy and speed of their robots. This was complemented by the strong hardware design which allowed their robots to be reliable.

Sky Crew had a very well-built robot with no top plate. They were able to fit all their components in a very small space. Their robots were very accurate, and their defender was very effective. This was due to their effective software. They also had line over detection which enabled them to go on the other side of the line and get the ball. They did not implement this in our game since they ran their robots at a higher speed. The main downside of their robots was the speed of their robot. This meant that their robot was not able to score as many goals since it wasn’t able to get to the ball first. When they did get the ball, their robots did not move that fast, except they had a very powerful kicker that made it difficult to defend against. Their defender, however, was very accurate and was able to stop almost all the goals that other robots might try and score against them. The only goal that we were able to score against them was when their defender crashed and moved away from the goal. This is a testament to the quality of their goalie.

Team LEGEND had the best robots in the whole competition; however, due to bad luck their compass sensors broke. Unfortunately, they did not have any spares, meaning their defender was useless; however, when their robots were working, they were very fast and very accurate. Their attacker had a dribbler and a kicker, which they used to bypass goalies effectively. They implemented strategies where they could attempt to hide the ball from the goalie and then quickly move back and shoot. The also could turn and shoot simultaneously so the goalies weren’t able to respond in time. Their defender only had a very wide capture zone, with a kicker. Their defender was broken for most of the competition, but it looked like it just moved in front of the goal. We were able to beat them because they only had their attacker on the field. Their defender was off for the whole game. This meant that whenever the ball was behind their robot, we were able to score.

# Self-Evaluation

## Weaknesses

The main weakness of the robot was the reliability of components on the PCB. We found that due to the speed of the robots, some of the components on the PCB would fall out. This was easily fixed with hot glue. Another weakness of our robot was its inability to score against teams with strong defenders. The game against Sky Crew was very intense and close since none of the attacking robots could score against the opposing defender. The best way to fix this issue is to incorporate a dribbler and a kicker into next year’s robots, but to maintain the reliability of our current robots. Another weakness was the construction of the wheels. The double layered wheels were effective; however, the O-rings were very thin and did not have much contact with the carpet. The best way to fix this is to have thicker O-rings, even if that means we would have less rollers all together. By having thicker O-rings, there will be increased contact with the ground, meaning that the robot can change directions faster.

## Strengths

The main strength of our robots was its speed, accuracy and reliability. Our robots were one of the fastest robots, the most accurate and reliable robots in the whole competition. These factors helped us achieve the results that we did. Since our defender was very effective, we did not let many goals in. This meant that it was very difficult for teams to beat us due to the quality of our defender.

# Improvements and R&D

I believe that BBC needs to invest in making our components as space efficient as possible. I think that the space between the bottom and middle plate needs to be used more effectively so we can have more components but not need more space. We also need to invest in making a better dribbler and a lighter kicker so we can implement more game strategies.