rUNSWift Team Report 2022

Mikhail Asavkin [1] **Neeraj Gopikrishnan** [1] **Maria Lizura** [1] **Claude Sammut** [1] **Peter Schmidt** [1]
Abhishek Vijayan [1]

Abstract

RoboCup continues to inspire and motivate our research in artificial intelligence and robotics. The 2022 UNSW Sydney team (*rUNSWift*) consists of undergraduate students, Masters and PhD students, alumni, and supervisors. *rUNSWift* has a rich history, with involvement in RoboCup for over a decade in the Standard Platform League (SPL). We work in research areas that include computer vision, localisation, locomotion, machine learning, and layered hybrid architectures. There were no major developments in 2022.

1. Introduction

Team *rUNSWift* has been competing in the Standard Platform League (SPL) since 1999. Every year, we strive to improve the weakest aspects of our system and adapt it to new challenges presented by the committee through rule changes.

In 2022, RoboCup returned to the in-person format of Sydney 2019 and prior years, at the Bangkok International Trade and Exhibition Center (BITEC) Thailand. The competition took place from 13-16 July 2022, with a day and a half of setup and a closing research symposium. The seeding round consisted of a Swiss tournament which seemed to accommodate the 13 competing teams better than the pools and play in rounds of prior years. A single-elimination tournament decided the winner, with a 3rd place playoff added. rUNSWift achieved 3rd place in the competitions at BITEC, equaling the team's performance in Sydney 2019.

To say rUNSWift, and indeed all of RoboCup was significantly impacted by COVID-19 would be an understatement, as is true of many teams and organisations globally and clearly seen in the postponement of 2020 and eventual withdrawal in 2021 of Bordeaux, France as host. It is also evident in that 13 teams, significantly fewer than previous years, competed for the 2022 championship.

2. Team Organisation and Development Methodologies

rUNSWift in general maintained regular weekly meetings and testing routines that have been used in past years, while embracing new ways of working towards the mid-21st century RoboCup goal. [1]

We often could not meet once a week in person, so used Google Hangouts, Slack and Discord for remote communication. At weekly meetings we would discuss team updates and technical direction for the next week. It also allowed team members to ask for assistance on difficulties they had experienced, fostering a culture of collaboration and support for other team members.

Discord was introduced, both internally for team workshops and for external communication with other RoboCup SPL teams. This was crucial in coordinating with other teams on each of the challenges, YouTube live streaming and RoboCup SPL Team Leader meetings in 2021 and continued to be useful in 2022.

GitHub continued to be used to collaborate on a git-based codebase. As in prior years, most documentation is made available to the world. [2]

Regular testing was materially more difficult than prior years, due to recurrent lockdowns of Sydney suburbs including the UNSW RoboCup laboratory in Kensington.

3. Vision

The basic structure of the 2022 vision system remains the same as that of 2017-19 (Bai et al., 2017), (Brameld et al., 2018), (Ashar et al., 2019).

[1] https://www.robocup.org/objective
[2] https://runswift.readthedocs.io/

[1]School of Computer Science and Engineering, The University of New South Wales, Sydney, New South Wales, 2052.

4. Localisation and State Estimation

Localisation and state estimation remain largely the same as 2018 (Brameld et al., 2018) and 2019 (Ashar et al., 2019).

5. Motion

rUNSWift's motion is primarily based off the Hengst's walk generator (Hengst, 2014) developed in house and used since the 2014 RoboCup competition.

6. Tooling

The basic structure of the 2022 tooling remains the same as that of 2019 (Ashar et al., 2019).

7. Visual Referee Challenge

rUNSWift competed in the Visual Referee Challenge, earning 5 points. [3] We implemented the various hand signals and associated audio phrase required to be enacted by the robot. However, since we did not have enough time to complete the signal detection, we resorted to randomly showing a signal in each of the 5 rounds.

8. Behaviours and Networking

Behaviours remain largely the same as that of 2019 (Ashar et al., 2019), with the main change being to stay under the 1200 packet limit rule (s2.5.2 Wireless Communications[4]), to send packets every 8 seconds instead of 5 times a second. Anecdotally, this appeared to negatively impact our ability to play as a team, such as accurately deciding on a kick off play, relative to prior years, and so would be a good candidate for future improvements.

9. Concluding Discussion

rUNSWift feels fortunate to have placed 3rd overall this year, winning 2 games out of 4 in the seeding round, a quarter final and 3rd place game. [5]

For the upcoming year, we plan to focus on rebuilding the team's capability post-COVID, passing the metaphorical baton to a new generation of RoboCuppers.

[3] https://spl.robocup.org/results-2022/#technical-challenges
[4] https://spl.robocup.org/wp-content/uploads/SPL-Rules-2022.pdf
[5] https://spl.robocup.org/results-2022/

Acknowledgements

The 2022 team wish to acknowledge the legacy left by previous rUNSWift teams and deeply thank the School of Computer Science and Engineering, University of New South Wales for their continued administrative, financial and laboratory support to our team. We'd also like to warmly thank additional sponsors and contributors, including though not limited to, RoboWorks, Marathon Robotics, Ocius, ANT61, WisME and CR8. We also wish to pay tribute to all RoboCup and in particular RoboCup SPL teams that inspire and drive our innovations in the spirit of friendly competition.

Bibliography

Ashar, J.; Brameld, K.; Jones, E. R.; Kaur, T.; Li, L.; Lu, W.; Pagnucco, M.; Sammut, C.; Sheh, Q.; Schmidt, P.; Wells, T.; Wondo, A.; and Yang, K. 2019. runswift team report 2019. Technical report, The University of New South Wales.

Bai, G.; Brady, S.; Brameld, K.; Chamela, A.; Collette, J.; Collis-Bird, S.; Hall, B.; Hendriks, K.; Hengst, B.; Jones, E.; Pagnucco, M.; Sammut, C.; Schmidt, P.; Smith, H.; Wiley, T.; Wondo, A.; and Wong, V. 2017. runswift 2017 team report and code release. Technical report, The University of New South Wales.

Brameld, K.; Hamersley, F.; Jones, E.; Kaur, T.; Li, L.; Lu, W.; Pagnucco, M.; Sammut, C.; Sheh, Q.; Schmidt, P.; Wiley, T.; Wondo, A.; and Yang, K. 2018. runswift 2018 team report and code release. Technical report, The University of New South Wales.

Hengst, B. 2014. rUNSWift Walk2014 report. https://github.com/UNSWComputing/rUNSWift-2014-release/blob/master/20140930-Bernhard.Hengst-Walk2014Report.pdf, University of New South Wales.