RedBackBots Team Poster
RMIT University, Melbourne, Australia

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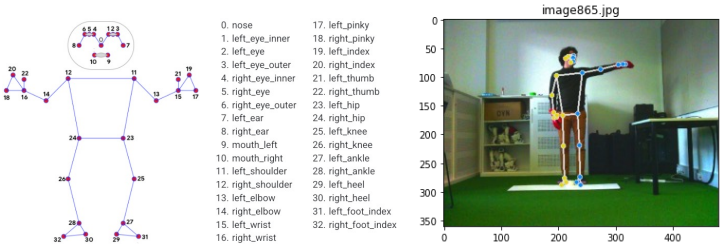
About

RedBackBots is from RMIT University. 2022 will be the first time we are able to participate in a the Nao SPL league. We have focused on the visual referee challenge, due to university travel restrictions. This poster details our contributions for this challenge, across different vision approaches and the use of Python3.

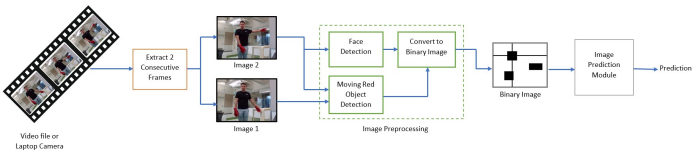
Skeleton-based Detector

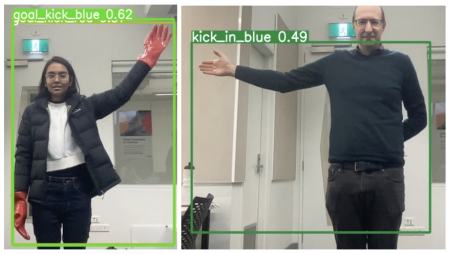
We have investigated a skeleton based pose classifier. We use MediaPipe to generate a 33-pose landmarks in 3D space (left image). We then process the poses through a Radius-K-nearest-neighbours classifier. The input of the R-KNN model is a vector of connected pose-landmarks (right image) representing referee signals. This method had an overall accuracy of 79%.



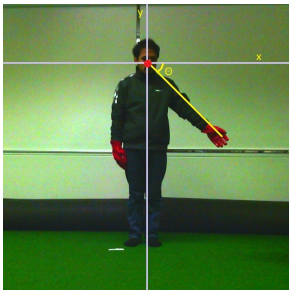
Learning Pose Detection

We have investigated three vision-based Machine Learning methods (1) Naïve bayes classifier, (2) SVM classifier, (3) Yolo V5. Our processing pipeline (image) includes a Haar Cascade face detector and OpenCV colour filter. The accuracy of on our training set are Naïve Bayes (74.6%), SVM (77.1%), Yolo (98.0%).. We observe that Yolo V5 doesn't require the red-gloves (image).





Heuristics Pose Detection



We have investigated a heuristic rule-driven approach based on features, such as angle (image) from our above processing pipeline, as a tradeoff of computation for the accuracy of the Machine Learning approaches.

Python 3 in the Standard Image

We have made progress towards building a Python 3 compiler/interpreter for the Standard Nao image as provided by Softbank. This was to use our trained methods above from Python. At the time of competition, we can successfully run Python 3 code, however, have yet to fully port Pip and our required Python Pip packages.

Acknowledgements & References

RedBackBots have based our initial codebase on the rUNSWift code release.

Viola, P., & Jones, M. J. Robust real-time face detection. Int. J. of Comp. Vision 57.2 (2004). p137-154
Grishchenko, I., & Bazarevsky, V.. Mediapipe holistic. (2020).
Yolo V5 (2022). https://github.com/ultralytics/yolov5

RMIT University acknowledges the people of the Woi wurrung and Boon wurrung language groups of the eastern Kulin Nation on whose unceded lands we conduct the business of the University. RMIT University respectfully acknowledges their Ancestors and Elders, past and present.
Artwork created by Lou Bloomer (Kamilaroi/Bundjalung)

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