Social Robotics Architecture and Component Integration

Our innovative architecture and component integration supports our approach for human-robot engagement via the following:

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1 Robot Task Management System

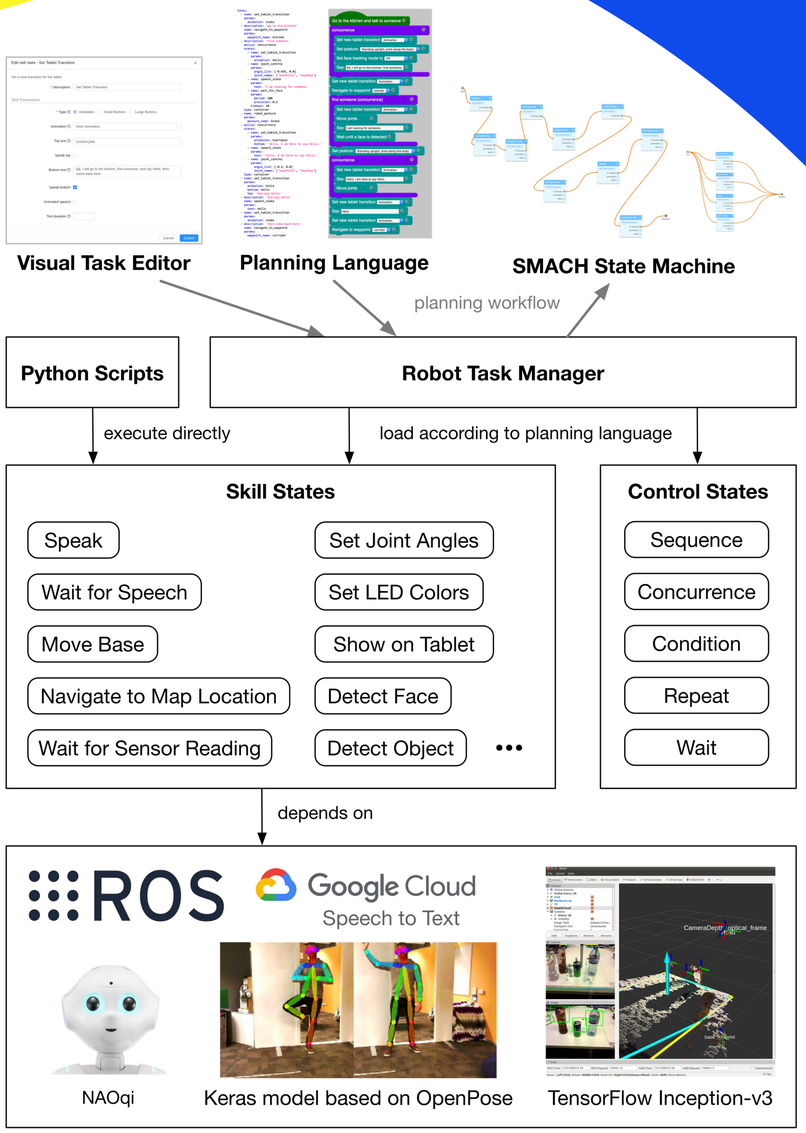
An innovative purpose-built platform independent system, that aims to provide a vastly superior system for developing Pepper behaviours that systematically generate state machines from a schedule of tasks. This system is still under development. The main benefits to date are simplicity, flexibility and modularity, all critical for rapid prototyping, testing and evaluation, especially when working with our industry partners and ordinary humans in our HRI experiments in real world settings including airports, shopping centres and banks.

2 Formal Robot Skill Specification

Our novel, highly expressive formal language is used to specify each robot skill. This formal specification enables Robot Skills to be created and updated in our visual editor and made readily accessible to our highly flexible Robot Task Management System. We have a developed a library of over 40 reusable Pepper Skills that are easily combined to create sophisticated behaviours.

3 Robot Skill Visual Editor

Our novel visual editor enables the dynamic creation and update of robot skills in real time allowing experts and novice users to rapidly define new capabilities and interactions effortlessly. A key feature is that every task a robot is requested to perform is also generated and saved on-the-fly, thereby enabling extensive reuse, audit reviews and rapid iteration in real-time.



4 Multi-Modal Human-Centric Interface Design

Our rich human-centric multi-modal interface is central to all our Human-Robot Interaction designs. We integrate speech, LEDs, gestures, and the robot tablet screen in all our robot behaviours to engage humans and to enhance their robot interaction experience. For example, our fully integrated robot tablet screen communicates information about the current state of the robot as it undertakes tasks in an engaging and interactive manner, carefully complimenting the other modalities by purposefully communicating explanatory information to manage human expectations and enhances the fluency of the Human-Robot Interaction experience.

Human-Robot Engagement

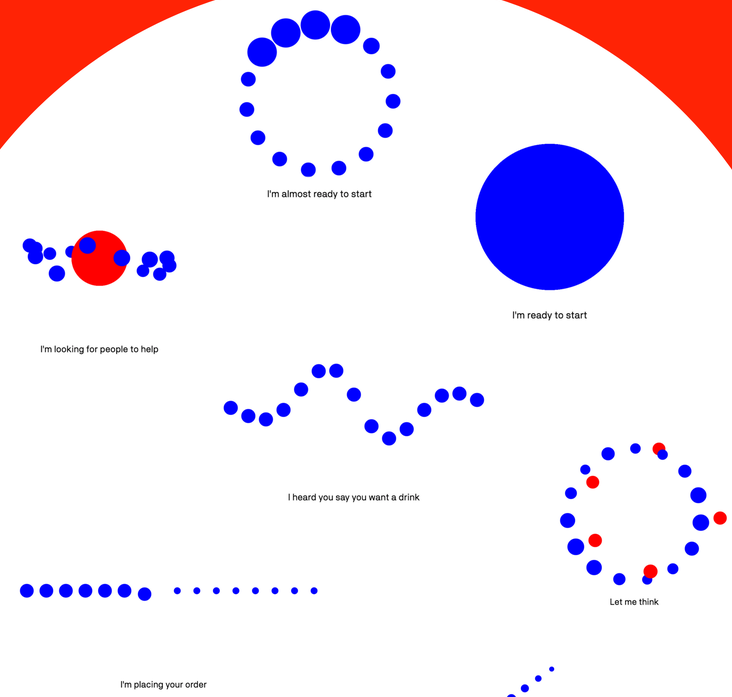
Robots for Human Rights

Our Vision: Ensure Pepper builds trust and enhances human well-being.

Our Approach: We employ a human-centric methodology that champions social intelligence [10] and human rights [11] with a strong focus on enhancing accessibility and human experience. We use our extensive HRI experiment outcomes [1, 2, 3, 4, 5, 6, 7, 8, 9] to inform our robot behaviour designs.

Respect For Human Rights: Our HRI designs respect the rights of human users. For example, we ensure they are in control of how their information is collected, shared, and stored by the robot. Privacy is a basic human right and of critical importance in social robotics. This frames our research focus. We work directly with the United Nations on developing ways that ensure social robots demonstrate social intelligence [10] and respect Human Rights see [11].

Human-Robot Visual Communication: Our novel tablet animations increase accessibility by augmenting other modes of human-robot interaction such as sounds, speech, gesture and eye lights. They are generated from a bespoke Javascript engine and comply with strong UTS branding guidelines.



References:

1. Agrawal, S. and Williams, M-A. (2017). Robot Authority and Human Obedience. Late Breaking Report, 2017 ACM/IEEE International Conference on Human-Robot Interaction (HRI 2017).
2. Agrawal, S. and Williams, M-A. (2018). Would You Obey an Aggressive Robot: A Human-Robot Interaction Field Study. 27th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN 2018).
3. Herse, S., Vitale, J., Tonkin, M., Ebrahimian,D., Ojha, S., Johnston, Judge, W. and Williams, M-A., Do You Trust Me, Blindly? Factors Influencing Trust Towards a Robot Recommender System, 27th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN 2018).
4. Ojha, S., Vitale, J., Williams, M-A. (2017). A Domain-Independent Approach of Cognitive Appraisal Augmented by Higher Cognitive Layer of Ethical Reasoning. 39th Annual Meeting of the Cognitive Science Society (CogSc 2017).
5. Tonkin , M., Vitale, J., Ojha, S., Clark, J., Pfeiffer, S., Judge, W., Wang, X. and Williams, M-A. (2017), (2017). Embodiment, Privacy and Social Robots: May I remember you?. 9th International Conference on Social Robotics (ICSR 2017).
6. Tonkin, M., Vitale, J., Ojha, S., Williams, M-A., Fuller, P., Judge, W. and Wang, X. (2017). Would you like to Sample? Robot Engagement in a Shopping Centre. 26th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN 2017).
7. Vitale, J., Tonkin, M., Herse, S., Ojha, S., Clark, J., Williams, M-A., Wang, X. and Judge, W. (2018). Be More Transparent and Users Will Like You. ACM/IEEE International Conference on Human-Robot Interaction (HRI 2018).
8. Vitale, J., Williams, M-A., & Johnston, B. (2017). Facial Motor Information is Sufficient for Identity Recognition. 39th Annual Meeting of the Cognitive Science Society (CogSc 2017).
9. Williams, M-A., Judge, W., Vitale, J., Tonkin, M., Johnston, B. and Pandey, A. (2017). 1st Workshop on Human-Robot Engagement in the Home, Workplace and Public Space. 26th International Joint Conference on Artificial Intelligence (IJCAI 2018).
10. Williams M-A. (2012) Robot Social Intelligence. 4th International Conference on Social Robotics (ICSR 2012).
11. Williams, M-A. and Dawson, N. (2018). United Nations Impact of AI and Robotics on Human Rights, Sustainable Development, and Peace and Security Report, for release September 2018 published by the United Nations.

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