New submission from ARC Award Final Report

webteam@langara.ca <webteam@langara.ca>

Thu 1/6/2022 7:13 PM

To: Scholarly Activity <scholarlyactivity@langara.ca>

Name of Researcher

Trista Townsend

Department/Faculty

Continuing Studies

Position in Department/Faculty

Instructor

Project Title

A study of robot brain architecture using methods of animation principles.

Term of Project

January 2020

Please introduce yourself – include pertinent background information relating to the topic of your research project.

I am an instructor and instructor assistant at Langara, and have been working in various capacities at the college since 2018. I have worked in various roles while volunteering in the community, promoting girls and women in technology and STEAM, through coaching robotics teams, mentoring in hackathons and judging at robotic competitions. I am an instructor for animation and robotics in continuing studies, at both campuses, and an instructor assistant for the Web and Mobile Design and Development (WMDD) program. My background comes from 15 years in the animation industry, and a further 5 in working in startup and technology, from startups to robotic academic research.

Please discuss your educational background and your work experience that led you to taking on this research project. If possible, include a quote that helps define your interest in this project.

My educational background is in animation and coding. The integration of the two led me to this project, as I had recently co-written a paper that was published at the ACII conference in England. This paper was on human-robotic interaction with groups, but I found the experiment lacked some feedback when the subjects were engaging with the robot. I was interested to see if a robot could have programmed logic that allowed the same gesture to vary in speed and pacing in order to give the impression of mimicked emotion to the subject. This mimicry could reduce lag and lack of engagement with robots.

Please explain the concept for your project in terms that others not in your field would understand, like an executive summary.

This project was created to make a more seamless transition of gestures made by a robot that has human-like features. Generally in the field of robotics, when a person interacts with a robot, the logic that is built into the computer code, has a delay between the point of contact and the final robotic response. This response could be a gesture or an answer to a question or an expression. I wanted to use the idea of animation principles to direct the coded logic. So if the human was happy, the robot would make a happy gesture. If the person interacting with the robot was sad, then the robot would make a slower, sad movement. The timing of the movement (the speed) would be based on the emotion of the person interacting with the robot, instead of a generalized gesture.

Identify goals and objectives for the project, and how the results may be used, perhaps to solve a problem, or to inform further research in that field.

The goals were to produce a robot, program a machine learning interface that could map the perceived emotions of an individual through image recognition, and vary the speed and variance in a robotic gesture based on this input. As the pandemic has hampered the collection of data, with the interactions being only preliminary tests, further development must happen in order for strong data points to be recorded. However, the progress that was made in thinking of interactions and the feedback-engagement loop can have far reaching results in the human-robotic interaction (HRI) field. This would help guide more natural HRIs, such as therapy robots and educational robots that are already in the market.

Briefly explain the steps taken to conduct the project research, and the results found.

The team assembled and myself, met twice a week to construct the robot and the wiring. I bought a 3D printer and printed all the parts in PLA plastic, from an open source robot called InMoov. We divided into sub teams, and one worked on assembly while the other started the coding. The intent was to present the assembled robot at the presentation day, and recruit volunteer participants to drop in the month after the presentation for data collection, on the lag time, and engagement, as compared to a professionally created robot. With my connections with SFU and the ROSIE Lab, headed by Dr. Angelica Lim, the plan was to compare the Pepper Robot to my team's robot.

Who else was involved in this project? How did their involvement help? Ie: other faculty, students, community partners

The team that helped facilitate the construction were students from continuing studies, Denis MacFarlane, and Richard Grey. Other faculty members from computer science and continuing studies that participated were Nadar Beyzaei and Rod Ornellas.

What were/are you hoping to get from conducting this research?

I was hoping to build community and skills through making a robot, which was achieved, but it could have gone further. I was also hoping to develop a new way of approaching robot logic, as through my work experience with a robotic start up in town, I noticed that a computer science slant was always the starting point for robotics physics. Considering my background in animation, I wanted to program the logic from a different perspective.

Can you share any personal stories that made this research experience memorable/valuable?

It was really a labour of love for all of us. We learned so much, exchanged ideas and looked forward to the nights when we were building together. One student had tools and circuit experience, and he carried the team through the early days. It was an open lab, of sorts, where we would tinker and curious people and students would drop by to help out. Once the robot got more assembled, we would have to transport it back and forth from either my shared office or the display case in a cart or wagon. We started a lot of conversations that way.

Do you have any tips/suggestions/ideas for applying this research in your field? Or for others in their fields? Or for conducting future research of this kind?

I had planned to make a robot dog and experiment with tactile language learning through robotics. As an indigenous person, I am interested in saving endangered languages through play. Since this is a hands-on field, it has been difficult to find a safe space or ways to assemble safely with community members. I would love to pursue building something in the future with a diverse group of folks again. It was an amazing experience, and the support from ARC was invaluable.

Any final comments? What are the “next steps” for this project? And for you?

The next steps for this project would be to dust it off and relook at the constraints in order to revive the ideas. More robust motors would help with the lag time in animation of the arms, but the data gathering would be excellent. For me,

since I am largely self taught, I am pursuing an engineering degree in mechatronics while teaching at Langara, in order to pass on some knowledge and do further research from varying perspectives.

Please upload any images that will help to showcase your project.

- Screen-Shot-2020-03-29-at-3.03.30-PM.png
- IMG_20200220_151812.jpg
- IMG_20200208_230528.jpg
- 20201004_155246.jpg
- 20200927_173829.jpg
- 20200201_224537.jpg