0. Cover Page

DEIfy: A Social Robot for Diversity, Equity and Inclusion

We pilot different behaviors of a social robot named DEIfy. We measure the impact of these behaviors on the ability of DEIfy to inspire human-partner engagement with Diversity, Equity and Inclusion (DEI)-related concepts.

Gauri Iyer, Lead: Gaze and Vocalization
Christopher D'Ambrosia, Lead: Media Creation

1. Executive Summary

Social robots are designed to interact with people in naturalistic settings. These interactions are often tailored to achieve positive outcomes defined by the designers of the robot. In this study, we design a social robot named “DEIfy” to engage passerbys using three different interaction behaviors: (1) gaze orientation, (2) verbal communication, (3) coordinated gaze orientation and verbal communication. Our desired outcome of these interactions was to encourage passersby to take a survey measuring their engagement with Diversity, Equity, and Inclusion (DEI) related themes

In our study, we use our three different interaction behaviors as our three experimental conditions, and we compare the number of passersby who engage with our survey across each of the three conditions. This measures the impact of interaction behavior on human-participant engagement. In our survey, we utilize questions from a standardized Diversity Engagement Survey and Civic Engagement Survey to measure each human-participant’s engagement with DEI-related themes both prior to and following exposure to DEI-related media. The DEI-related media for this study created by the research team included a video monologue as well as a text-based story. We compared pre- and post-media exposure survey results both within experimental conditions and across experimental conditions to measure the effect of media-exposure on engagement with DEI-related themes as well as the effect of different robot interaction behaviors on engagement with DEI-related themes.

Our results are not statistically significant. So, as our experiment currently students, they reveal that increasingly complex interaction behaviors **do not necessarily** result in greater participant engagement with our survey. Our results also reveal that more complex interaction behaviors **may not** increase a human-participant’s engagement with DEI-related themes. Social robots which are able to utilize more complex interaction behaviors may be more successful in encouraging human-robot engagement, but further work is needed to test whether modulating interaction behaviors can achieve desired positive outcomes from robot-human interaction.

2. Introduction

Social (or sociable) robots are designed to interact with people in a natural, interpersonal manner. This interaction is often designed to achieve positive outcomes in areas such as education, health, quality of life, entertainment and communication.[1] Proxemics, the socially communicative or expressive aspects of spatial positioning and orientation, have been studied extensively to enable researchers to design robots with more socially appropriate behaviors.[2] Gaze orientation, a research topic within proxemics, has been demonstrated to be an important component of non-verbal robot behavior. Gaze behaviors have been used to capture attention, maintain engagement, increase conversational fluidity.[3,4,5]

Verbal communication is another key aspect of human-robot interaction. For effective verbal communication, robots must not only recognize and produce speech, but also coordinate speech acts with physical movement in space.[6] Researchers have implemented the ability to initiate verbal communication with human-partners into various social robots as a tool to increase engagement by human-partners.[7,8]

In this research, we attempt to study the influence of gaze orientation, verbal communication and coordinated gaze orientation with verbal communication on human engagement with our social robot, DEIfy. We also measure the impact of these robot behaviors on human-participant engagement with DEI-related themes. Our goal was to answer two research questions: (1) how do three different robot social behaviors (gaze orientation, verbal communication, gaze orientation with verbal communication) impact human-participant engagement with a social robot; (2) how do three different robot social behaviors (gaze orientation, verbal communication, gaze orientation with verbal communication) impact human-participant engagement with DEI-related themes.

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[6] Thomaz, A., Hoffman, G., & Cakmak, M. (2016). Computational human-robot interaction. Foundations and Trends in Robotics, 4(2-3), 105-223.

[7] Brown, L. N., & Howard, A. M. (2014, March). The positive effects of verbal encouragement in mathematics education using a social robot. In 2014 IEEE integrated STEM education conference (pp. 1-5). IEEE.

[8] Rodriguez-Lizundia, E., Marcos, S., Zalama, E., Gómez-García-Bermejo, J., & Gordaliza, A. (2015). A bellboy robot: Study of the effects of robot behaviour on user engagement and comfort. International Journal of Human-Computer Studies, 82, 83-95.

To measure engagement with DEI-related themes, we utilized select questions from two previously validated surveys. The Diversity Engagement Survey (DES) is a survey developed by the University of Massachusetts Medical School (UMMS), DataStar, and the Association of American Medical Colleges (AAMC) intended to allow institutions to develop a meaningful inclusion scorecard that characterizes their progress toward creating an inclusive work environment. The survey was validated in a 13K+ participant study and was demonstrated to be a reliable and valid instrument for assessment, evaluation, and external benchmarking of institutional engagement and inclusion.[9] The questions we selected from the DES were intended to measure participant perception of their academic community's commitment to DEI concepts.

The Civic Engagement Survey (CES) is a validated tool to measure participant engagement in community building. The questions we selected from the CES were intended to measure past participant engagement with community building initiatives as well as intended future engagement with community building initiatives.

Our survey also utilized video and text-based media that highlighted DEI-related themes. We first interviewed various students at the University of California San Diego (UCSD) who were also members of UCSD's Computer Science and Engineering (CSE) department. We selected one of these students for a follow-up interview based on the relative prototypicality of the student with respect to a "typical" UCSD CSE student as assessed by the researchers. We attempted to select the student whose personal story, life experiences, academic background, and abilities were the least "prototypical" of a UCSD CSE student. We videotaped this follow-up interview and, with the permission of the CSE student, shared it with an acting student in UCSD's Theater Department. We worked with this performer to create a 5-minute monologue, delivered from the perspective of the CSE student, designed to share the unique experiences of the CSE student. We videotaped this monologue and edited the resulting video for display in the survey. To accompany this monologue, we created a text-based story to highlight other elements of our CSE student's experience that were not included in the video monologue. This text-based story was also included in our participant survey. Our study participants were exposed to both forms of media following successful engagement with DEIfy and completion of the pre-survey. After watching the video and reading the text-based story, our participants then completed our post-survey.

This research will yield insights into the fields of proxemics, verbal communication, and the impact of various speech-movement coordination controllers on human engagement with social robots as well as the influence of robot behaviors on achieving desired outcomes such as engagement with DEI-related themes.

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[9] Person, S. D., Jordan, C. G., Allison, J. J., Ogawa, L. M. F., Castillo-Page, L., Conrad, S., ... & Plummer, D. L. (2015). Measuring diversity and inclusion in academic medicine: The diversity engagement survey (DES). Academic medicine: journal of the Association of American Medical Colleges, 90(12), 1675.

3. Methodology

3.1. Technical Approach

The robot's behavior was intended to be one where the researchers did not need to physically intervene (but remote intervention was allowable). We wanted the robot to be viewed as an independent entity in an open space; planar movement was therefore removed from our approach and we focused only on angular movement to engage passerby. For engagement, the robot needed to be able to detect an occlusion; move towards it; invite participants clearly; and not overwhelming the participant. All components required for our study are visible in Figure 1.

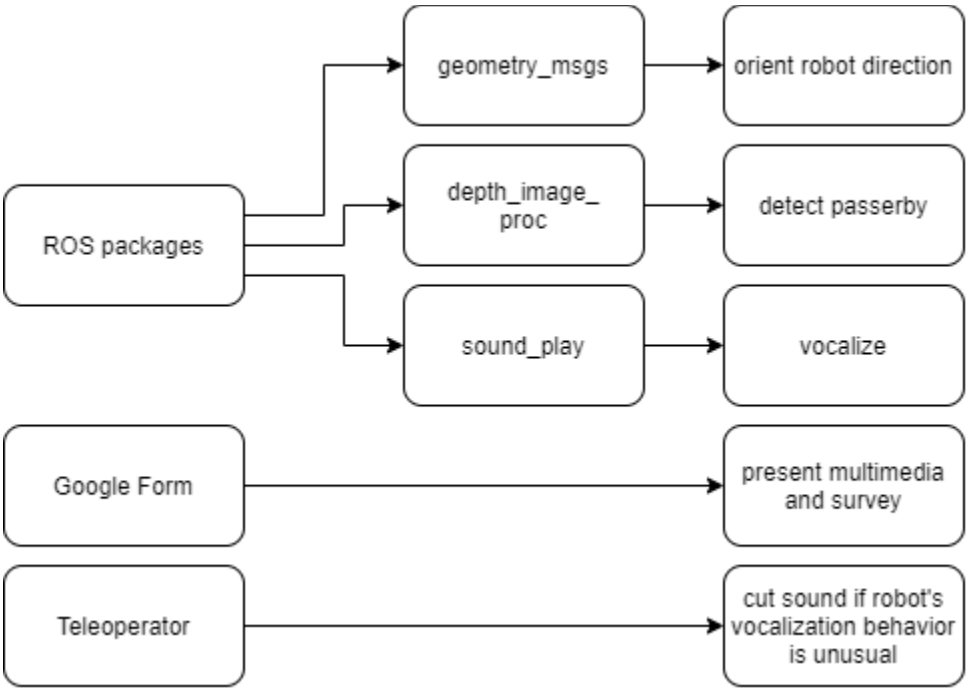


Fig 1: Experiment components

3.1.1. Technical Subtask 1: Orientation and Vocalization (Lead: Gauri Iyer)

Vocalization

We used vocalization to catch the attention of passerby. During testing, we decided that a distance of 0.6 meters would be the appropriate distance between robot and human. After launching and running sound_play node in advance of running our experiment, our code would cause the robot to say "Hi, come meet my friend!" when an occlusion was detected at or within 0.6 meters.

During testing, we witnessed that our robot frequently exhibited behavior for a new participant when, in reality, a continuing participant was still watching media or filling out the survey. This was due to our initial control flow: when the state goes from *camera occluded* to *camera not occluded*, we can assume that it is because a participant walked away, and therefore, re-entering the *camera occluded* state implies that there is a new participant. A participant's stance or orientation could result in repetitive *camera not occluded* to *camera not occluded* states, which meant the robot was constantly vocalizing. So, we ensured that one researcher had SSH'ed into the robot, and could remotely turn down the volume or "interrupt" the experiment using Linux's command-line mixer GUI, alsamixer. Figure 2 demonstrates the completed control flow, including the teleoperater silencing the robot if needed.

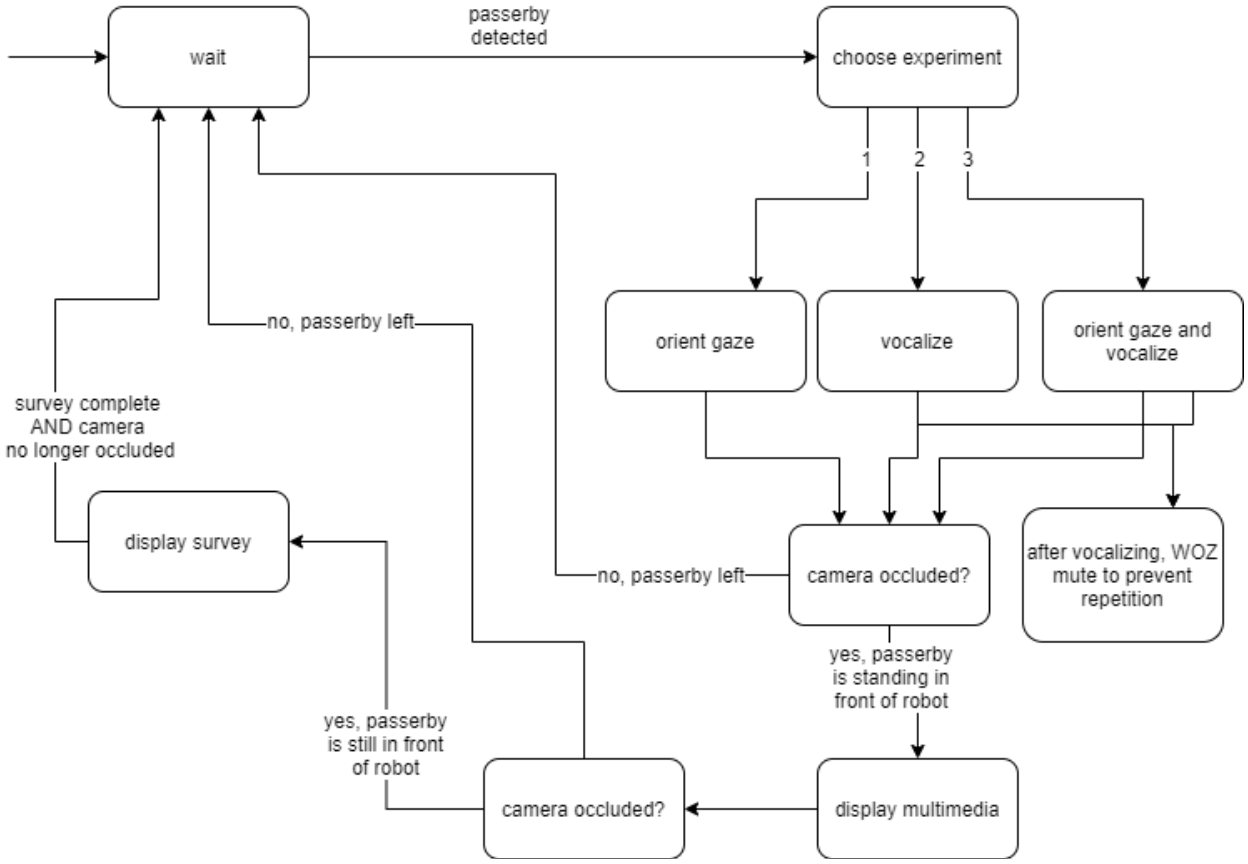


Fig 2: Finite State Acceptor

The volume coming out of sound_play would have been disruptive to the unusually small crowd with an external speaker, so using the laptop speakers was just fine for the "robot's voice." The audio volume of our multimedia section was not comparably loud; therefore, we had to remotely adjust the audio so that our participants could hear the multimedia without having to lean in greatly, as viewed in Image 1.

Image 1: Participant #4
(photographed with permission)

Orientation

In the first iteration of our experiment, we wanted our robot to casually approach strangers within a bounded 2x2 space of the CSE 3rd floor lobby. However, we did not want to hassle passerby without their initial interest, so we chose to simply simulate the robot's "gaze" without having it move towards participants. State is maintained to engage each passerby only once.

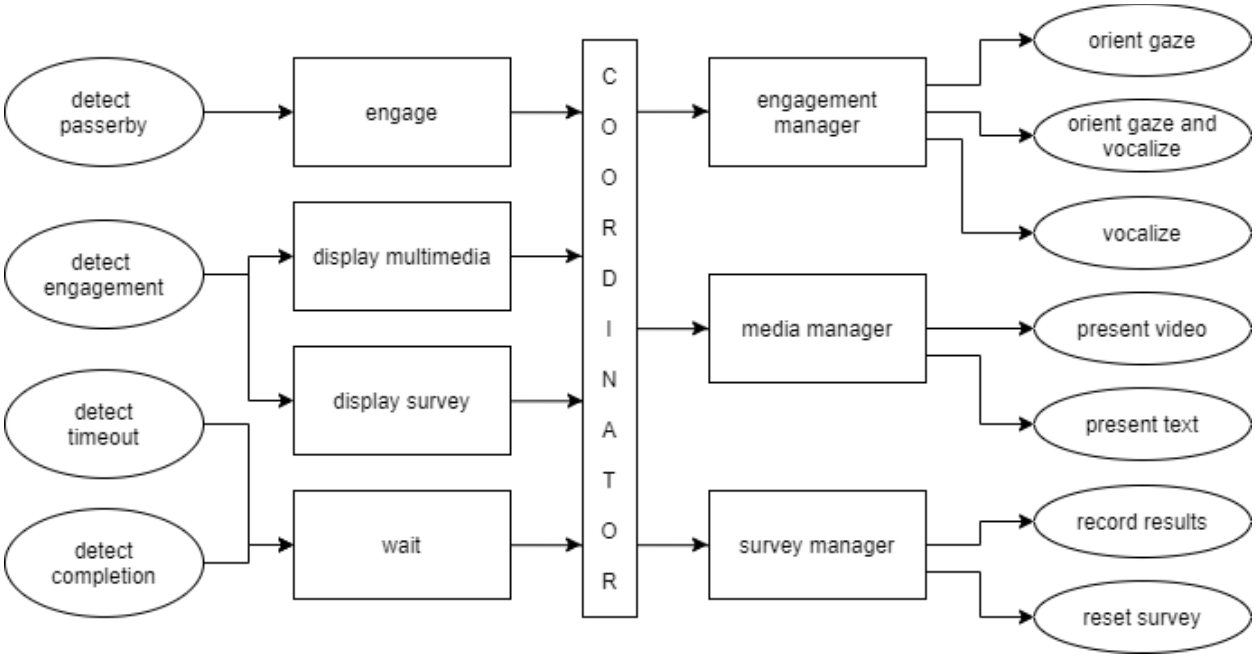


Fig 3: Stimulus Response Diagram

As long as a minimum threshold of points are detected from the camera, the robot will try to find the average point in 3d space. If that point is within 0.6 meters of the camera, it is safe to assume that a passerby has just occluded the camera. If that point is further than 2 meters away from the camera, the state of our experiment goes back to the “wait” state, since presumably the passerby left (see Figure 2). If the camera is occluded, and the robot is not newly exiting a “wait” state, that implies that the passerby is still in front of the camera, participating in the survey. If the camera is not occluded and the average depth is not further than 2m away, use geometry_msgs to turn towards the centroid. This is done by publishing a command to set the center of the robot to the negative of the average x-coordinate, since radial rotation is positive when counterclockwise and negative when clockwise.

3.1.2. Technical Subtask 2: Media and Survey Creation (Lead: Christopher D’Ambrosia)

We focused on media and survey creation in three stages: student and performer recruitment, monologue and story creation, survey formulation.

Student and Performer Recruitment:

We solicited recommendations from CSE faculty, students and staff regarding potential undergraduate or graduate students who would be able to speak to life experiences and educational backgrounds that were “atypical” for a UCSD CSE student. We then interviewed the recommended students to identify those who were members of underrepresented groups in CS, had "atypical" backgrounds for CS students, and had overcome significantly challenging life experiences prior to or during their time at UCSD. We selected three students for videotaped follow-up interviews based on our personal assessments of the most “atypical” stories. After

completing these videotaped interviews, we recruited a performer from the UCSD Theater department for each student story. Following consent by the CSE student, we shared the videotaped interview with the performer we assigned to that story.

Monologue and Story Creation:

After sharing the videotaped interviews with the performers, we met with each performer to craft a 5-minute monologue from the interview. Our goals were to highlight the aspects of the CSE student's story that would be most surprising to other CSE students, faculty, and staff. We then asked the performer to share the CSE student's story as if the performer were that CSE student. We taped these 5-minute monologue performances and edited the resulting videos for length and clarity. At the same time, we created text-based stories to accompany the performed monologues. We selected one performed monologue and its accompanying text-based story to use in the survey.

Survey Formulation:

We selected questions from the DES and CES to include in our survey. The elements of the DES we included in our survey focused on assessing participant perspectives of trust in their institution's commitment to DEI-related concepts. The CES items we included in our survey focused on participant's attitudes towards current and potentially future civic engagement and community building. We also collected demographic information, including identification as faculty, staff, student or other and the academic department affiliation, if any, of the participant. Our final question in both the pre-media and post-media question bank was a short answer question requesting participants to provide their email address if they wanted to engage in the department's DEI-related work. This question was designed to measure intention to act on DEI-related community building initiatives.

The survey had three primary modules: pre-media survey, media, and post-media survey. In the pre-media survey, we included demographic questions, our selected DES and CES items, and our intention to act question. The media module included the performed monologue accompanied by the text-based story. The post-media survey included all of the same questions as the pre-media survey except for the demographic questions.

The survey was implemented as a Google Form and displayed via the Chromium App on the Turtlebot laptop.

3.2 Human-focused Work

3.2.1. Methodology

Overview:

Our goal was to understand how different behaviors of a social robot could impact engagement as well as engagement outcomes in human-robot interaction. This was a between-subjects study with three experimental conditions: (1) gaze orientation only, (2) verbal communication only, (3) coordinated gaze orientation with verbal communication. We utilized a subjective, quantitative and short-answer based survey with multimedia elements to assess participant perspectives on institutional commitment to DEI-related themes and participant attitudes towards civic engagement. Through this study, we wanted to explore the following research questions:

(1) How do three different robot social behaviors (gaze orientation, verbal communication, coordinated gaze orientation with verbal communication) impact human-participant engagement with a social robot?
(2) How do three different robot social behaviors (gaze orientation, verbal communication, coordinated gaze orientation with verbal communication) impact human-participant engagement with DEI-related themes?

We created this study to test the following hypotheses:

(1) Social robots utilizing increasingly complex interaction behaviors (gaze orientation, verbal communication, coordinated gaze orientation and verbal communication) experience increasing levels of human-participant engagement as measured by number of engaged participants relative to number of potential participants.
(2) Social robots utilizing increasingly complex interaction behaviors (gaze orientation, verbal communication, coordinated gaze orientation and verbal communication) motivate human-participants to engage more meaningfully with DEI-related concepts as measured by DES and CES survey metrics.

We hoped that studying these research questions would illuminate the power of increasingly complex social behaviors to not only engage human partners but also to drive more positive outcomes following this engagement.

Participants:

There were 4 participants for this study: two male M.S. students and two male Ph.D. students.

Protocol:

We placed a human-robot interaction research notification on two pillars located in the 3rd Floor Lobby of UCSD's CSE Building. The notification read: "Please be aware, human-robot interaction research for CSE276B: Human-Robot Interaction taking place in this area." We placed the Turtlebot Robot in the lobby and oriented it towards an approximately 2m x 2m empty space in the main hallway. We set the laptop display to show our survey in a "never sleep display" mode.

We then ran our controller program on the Turtlebot using an SSH connection to the robot platform. To avoid influencing the experiment, we sat 3m away from the robot and did not interact with the robot or the potential participants. For the first hour of the study, we used our "coordinated gaze orientation and verbal communication" controller. For the second hour of the study, we used our "verbal communication only" controller, and for the third hour of our study, we used our "gaze orientation only" controller.

In each phase of the study, human passersby in the main hallway walked past the Turtlebot platform and survey display. The robot reacted to each in-range passersby (in-range threshold was set to 0.6m or less from the Turtlebot) with either a gaze orientation only action, a verbal communication, or a coordinated gaze orientation with verbal communication action depending on the currently running controller.

In the "gaze orientation only" mode, the robot would detect an in-range passerby, turn to the in-range passerby, and continue to orient to the passerby as the passerby walked past or towards the robot. Gaze orientation would stop as soon as the passerby was out of range. In the "verbal communication only" mode, the robot would detect an in-range passerby and without orienting towards the passerby, initiate verbal communication by saying "Hi! Come meet my friend!" In the "coordinate gaze orientation with verbal communication" mode, the robot would detect an in-range passerby, orient towards the passerby, and say "Hi! Come meet my friend!"

Measures:

We counted the number of people who walked by our robot and received either verbal or non-verbal communication from our robot. From this group of people who received verbal or non-verbal communication, we counted the subset of people who actually engaged our robot. We defined engagement as starting and completing our survey.

Our survey was presented in the following format (see Appendix for complete survey):

1. **Welcome page and graphic**
2. **Pre-media exposure survey:**
    a. Demographic Information
        i. I am: [Faculty, Staff, Student, Other]
        ii. ...and my department is: [CSE, Other engineering, Non-engineering, No academic affiliation]
    b. Select DES Survey Questions (answered on a 5-pt Likert scale with (1) Strongly disagree and (5) Strongly agree)
        i. The culture of my institution is accepting of people with different ideas.

ii. In my institution, I experience respect among individuals and groups with various cultural differences.
iii. I feel connected to the vision, mission and values of my institution.
iv. I believe my institution manages diversity effectively.
v. The leadership of my institution is committed to treating people respectfully.
vi. In my institution, I experience respect among individuals and groups with various cultural differences.

c. Select CES Survey Questions (answered on a 7-pt Likert scale with (1) Strongly disagree and (5) Strongly agree)
i. I believe I should make a difference in my community.
ii. I am committed to serve in my community.
iii. I believe that all citizens have a responsibility to their community.
iv. I believe that it is important to volunteer.

d. Intention to Act Question (short answer)
i. Please enter your email address if you would like us to contact you regarding an upcoming opportunity to help build a culture of diversity, equity and inclusion in the CSE department.

3. DEI-related media

a. Monologue video
b. Text-based story

4. Post-media exposure survey:

a. Select DES Survey Questions (answered on a 5-pt Likert scale with (1) Strongly disagree and (5) Strongly agree)
i. The culture of my institution is accepting of people with different ideas.
ii. In my institution, I experience respect among individuals and groups with various cultural differences.
iii. I feel connected to the vision, mission and values of my institution.
iv. I believe my institution manages diversity effectively.
v. The leadership of my institution is committed to treating people respectfully.
vi. In my institution, I experience respect among individuals and groups with various cultural differences.

b. Select CES Survey Questions (answered on a 7-pt Likert scale with (1) Strongly disagree and (5) Strongly agree)
i. I believe I should make a difference in my community.
ii. I am committed to serve in my community.
iii. I believe that all citizens have a responsibility to their community.
iv. I believe that it is important to volunteer.

c. Intention to Act Question (short answer)
i. Please enter your email address if you would like us to contact you regarding an upcoming opportunity to help build a culture of diversity, equity and inclusion in the CSE department.

4. Results

4.1 Engagement

Interaction Behavior	# of in-range passersby	# of engaged passersby	Success rate (%)
Coordinated gaze orientation and verbal communication	8	3	37.5%
Gaze orientation only	3	0	0.0%
Verbal communication only	3	1	33.3%

Table 1: Engagement

These results suggest that more complex interaction behaviors resulted in greater human engagement with our robot, but not to a statistically significant extent. We performed a one-way ANOVA test, using F distribution to determine if the difference between the averages of all groups is big enough to be statistically significant. The test statistic $F = 0.683$, and $p(x > F) = 0.525$, which is much too high to prove correlation between the interaction behavior and the counted human engagement.

4.2 Outcomes

	Pre-media exposure			Post-media exposure		
Interaction Behavior	**DES Survey (avg.)**	**CES Survey (avg.)**	**Intention to Act (# of responses)**	**DES Survey (avg.)**	**CES Survey (avg.)**	**Intention to Act (# of responses)**
Coordinated gaze orientation and verbal communication	3.6	5.8	0	3.7	5.4	0
Gaze orientation only	N/A	N/A	N/A	N/A	N/A	N/A
Verbal communication only	2.0	4.3	1	1.5	4.8	1

Table 2: Outcomes

These results indicate that media-exposure had relatively little impact on participant perspectives of their institution's commitment to DEI-related concepts and little impact on attitudes towards civic engagement.

- In the "coordinated gaze orientation and verbal communication" condition, there was a slight increase in participant perspectives of institutional commitment to DEI-related

concepts but a slight decrease in attitudes towards civic engagement when comparing pre-media and post-media results. None of the participants in this condition signaled an intention to act.

- In the “verbal communication only” condition, there was a slight decrease in participant perspectives of institutional commitment to DEI-related concepts but a slight increase in attitudes towards civic engagement when comparing pre-media and post-media results. The single participant in this condition signaled an intention to act. The

- No passerby participated in the survey when we performed our “gaze orientation only” condition.

We have insufficient data due to the lack of passerby when conducting this study. Since there was only one participant in one condition and zero in another, we cannot conduct the ANOVA test for outcomes. Although we are disappointed that we couldn’t produce statistically significant results, we are aware of the circumstances that may have caused limitations, as discussed in Section 5.2.

5. Discussion and Future Work

5.1. Hypothesis

Our results did not confirm or deny either of our two hypotheses. Therefore, we cannot reject the two implicit null hypotheses:

(1) Social robots utilizing increasingly complex interaction behaviors (gaze orientation, verbal communication, coordinated gaze orientation and verbal communication) experience **the same** levels of human-participant engagement as measured by number of engaged participants relative to number of potential participants.

(2) Social robots utilizing increasingly complex interaction behaviors (gaze orientation, verbal communication, coordinated gaze orientation and verbal communication) motivate human-participants to engage **in the same manner** with DEI-related concepts as measured by DES and CES survey metrics.

5.2. Limitations

Unfortunately, our study was conducted in the midst of a global pandemic that was approaching California with unprecedented ferocity. Classes were just announced to be fully remote, finals were critically modified, the halls were empty and the students were worried about their well-being and their academics. Since the dependent variable in our study was how the robot engaged with and presented media to passerby, we could not come up with an alternate plan to host this study remotely. Therefore, we were left with very few participants strolling through the CSE building. This pandemic is contagious and is spread by respiratory droplets and surfaces. We did our best to sanitize the space, and participants only had to touch the mousepad on the laptop. However, we absolutely understand and empathize with the fact that passerby would be uncomfortable interacting with an unfamiliar robot in such circumstances.

Time-of-year is an additional confounding variable. The study was conducted in the last few weekdays before Finals week began. Students are presumably less willing to invest their time in activities that are not explicitly conducive to their goals, so general frustration, impatience, and stress may have impacted our results.

Lastly, we faced connectivity issues that caused the experiment to unexpectedly shut down. Going up to the robot to reconnect to the correct network and ensure teleoperation was possible may have discouraged passerby from participating.

5.3. Future work

The greatest addition to our project would be an increased sample size to know whether or not any changes are correlated with our dependent variable. Our current modes of engaging with participants could also use more work - for example, instead of just saying “Hi, come meet my friend,” the robot could ask the survey questions. An improvement on our non-verbal

communication could be more intentional proxemics, like maintaining a specific distance to a participant once they've crossed a threshold. The non-verbal communication could also include something more dynamic to catch passersby's attention, including waving/moving parts, flashing lights, or a wandering behavior.

6. Appendix:

(1) Final Presentation Video Link: https://photos.app.goo.gl/W4Y7KBVohUaFpaHi8
(2) Survey PDF
(3) Slides from Presentation

CSE 276B v2

* Required

1. I am: *

   Mark only one oval.

   - ◯ Faculty
   - ◯ Staff
   - ◯ Student
   - ◯ Other

2. ...and my department is: *

   Mark only one oval.

   - ◯ CSE
   - ◯ Other engineering
   - ◯ Non-engineering
   - ◯ No academic affiliation

3. The culture of my institution is accepting of people with different ideas. *

   Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

4. In my institution, I experience respect among individuals and groups with various cultural differences. *

   Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

5. I feel connected to the vision, mission and values of my institution. *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

6. I believe my institution manages diversity effectively. *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

7. The leadership of my institution is committed to treating people respectfully. *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

8. In my institution, I experience respect among individuals and groups with various cultural differences. *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

9. I believe I should make a difference in my community. *

Mark only one oval.

	1	2	3	4	5	6	7	
Disagree	◯	◯	◯	◯	◯	◯	◯	Agree

10. I am committed to serve in my community. *

Mark only one oval.

	1	2	3	4	5	6	7	
Disagree	◯	◯	◯	◯	◯	◯	◯	Agree

11. I believe that all citizens have a responsibility to their community. *

Mark only one oval.

	1	2	3	4	5	6	7	
Disagree	◯	◯	◯	◯	◯	◯	◯	Agree

12. I believe that it is important to volunteer. *

Mark only one oval.

	1	2	3	4	5	6	7	
Disagree	◯	◯	◯	◯	◯	◯	◯	Agree

13. Please enter your email address if you would like us to contact you regarding an upcoming opportunity help build a culture of diversity, equity and inclusion in the CSE department.

http://youtube.com/watch?v=By4TGPzkPtg

I'm at home with my daughter and husband, and I'm home before they're asleep because I don't have any exams this week. I sit down at the table and watch my daughter her programming homweork - building a Tetris game using Scratch - while my husband stands in the kitchen packing her lunch for tomorrow. I'm not usually home early, so I rest for a minute to enjoy simply being with them. I'm about to take my notebooks and laptop out of my backpack to start on my own homework when I see my husband looking at both of us. He doesn't realize I'm watching him. There's a familiar mix of emotions in his eyes, his forehead, his mouth. Surprise, wonder, puzzlement, pride, bashfulness, some exhaustion, and possibly a little sadness. I hear the voices in his head:

Who are these two, and what did they do with my 3-year old girl and the shy housewife who came here six years ago? I remember when they arrived, between them they spoke six words of English and they cried with relief when I said I would be working from home for a month to introduce them to their new lives.

My new life, I should have said.

My daughter is 10 years old now, and she makes me watch Disney movies to laugh at jokes I don't understand, she's virtual friends with Justin Bieber, and she wants to drive an "electric racecar" when she grows up. My wife, who came here too scared to leave the house, to learn how to drive, to meet American friends, and to even think about becoming something other than a housewife now spends her free time interviewing for jobs with technology start-ups, writing research papers, and dreaming of ways to turn our daughter into a STEM success story. I never thought I could be so proud of them.

But this life isn't the one I imagined when we started this family. My mother wanted me to marry a traditional wife because she was a traditional housewife, her mother was a traditional housewife...and their husbands were happy. What would she think of my wife leaving me at home to wash dishes, take my daughter to after-school lessons, and cook dinner almost every day? Would my mother ask if I was happy?

Am I happy? Do I miss the less complicated life I imagined for us?

I leave my homework on the dinner table and go to him. Standing behind him at the kitchen counter, I wrap my arms around his waist and lean my head against his shoulder. We watch our daughter finish another day in a life we never dreamed would be ours.

14. The culture of my institution is accepting of people with different ideas. *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

15. In my institution, I experience respect among individuals and groups with various cultural differences. *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

16. I feel connected to the vision, mission and values of my institution. *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

17. I believe my institution manages diversity effectively. *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

18. The leadership of my institution is committed to treating people respectfully. *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

19. In my institution, I experience respect among individuals and groups with various cultural differences. *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

20. I believe I should make a difference in my community. *

Mark only one oval.

	1	2	3	4	5	6	7	
Disagree	◯	◯	◯	◯	◯	◯	◯	Agree

21. I am committed to serve in my community. *

Mark only one oval.

	1	2	3	4	5	6	7	
Disagree	◯	◯	◯	◯	◯	◯	◯	Agree

22. I believe that all citizens have a responsibility to their community. *

Mark only one oval.

	1	2	3	4	5	6	7	
Disagree	◯	◯	◯	◯	◯	◯	◯	Agree

23. I believe that it is important to volunteer. *

Mark only one oval.

	1	2	3	4	5	6	7	
Disagree	◯	◯	◯	◯	◯	◯	◯	Agree

24. Please enter your email address if you would like us to contact you regarding an upcoming opportunity help build a culture of diversity, equity and inclusion in the CSE department.

DEIfy: A Social Robot for Diversity, Equity and Inclusion

Gauri Iyer and Christopher D’Ambrosia

Overview

Diversity, Equity and Inclusion (DEI):

- Can social robots help us move the department towards a more DEI-oriented culture?

Research Questions (RQs) and Goals:

(RQ #1) How do three different robot social behaviors (gaze orientation, verbal communication, coordinated gaze orientation with verbal communication) impact human-participant engagement with a social robot?

(RQ #2) How do three different robot social behaviors (gaze orientation, verbal communication, coordinated gaze orientation with verbal communication) impact human-participant engagement with DEI-related themes?

Technical Approach (Robot Behavior)

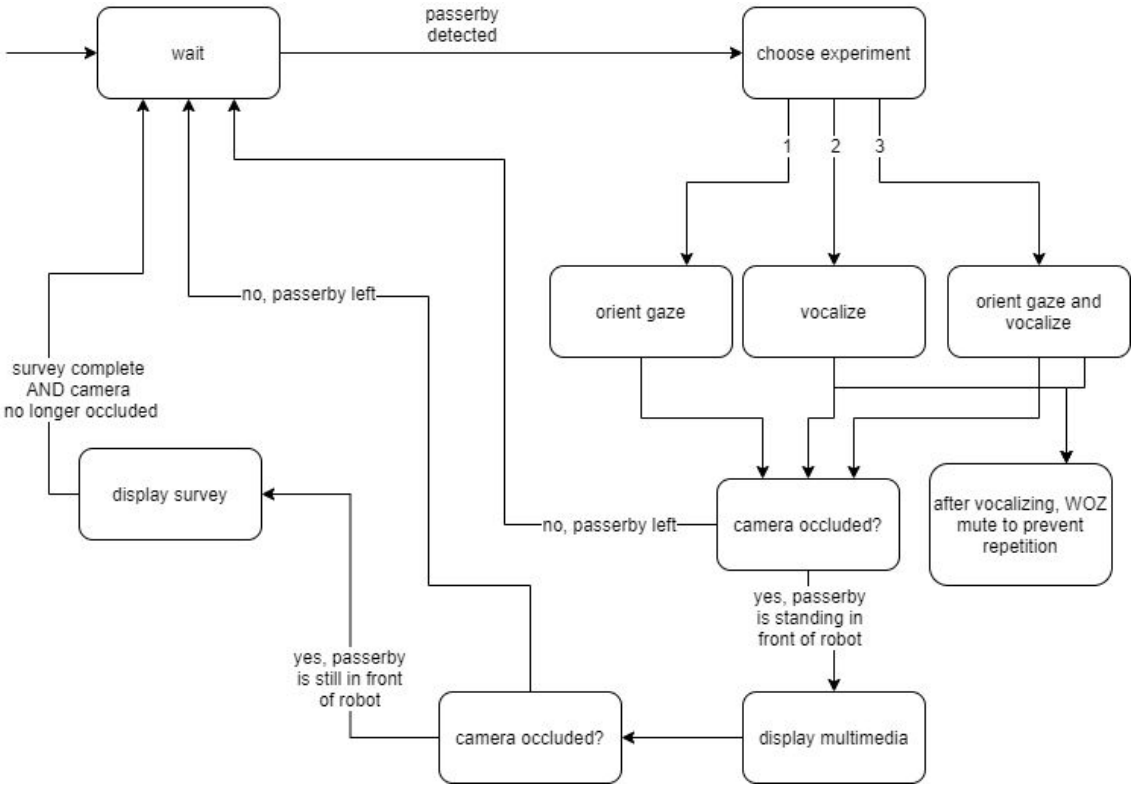
Social Robot Behaviors:

- Gaze orientation
- Verbal communication
- Coordinated gaze orientation and verbal communication

Software Design:

- Hybrid controller
- Globally accessible memory state

Technical Approach (Robot Behavior)



Technical Approach (Human Behavior)

Social Psychology
- “Relative prototypicality” and intergroup contact theory
- Superordinate categorization

Media Creation
- Low “relative prototypicality” stories
- Interviews, performed monologues, and text-based communication

Survey Creation (to answer our research questions, particularly #2)
- Diversity Engagement Survey (DES)
- Civic Engagement Survey (CES)

Methodology (Robot-Focused)

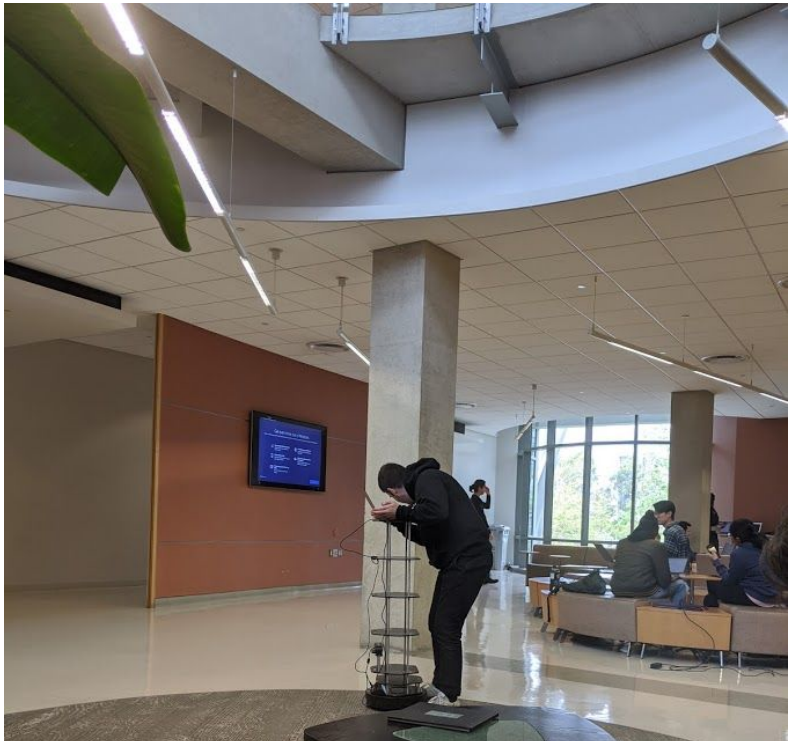
Overview

- Hour-long sessions for each value of dependent variable
- Researchers intended for autonomous behavior
    - Teleoperation required for sound adjustments

Measures

- Robot placement and orientation from testing
- Determining occlusions in specified range

Methodology (Robot-Focused)



Methodology (Human-Focused)

Overview
- 3 conditions based on robot behavior modes
- Between-subjects experiment based on 3 conditions (RQ #1 and 2)

Protocol
- Naturalistic setting
- Autonomous without researcher interaction

Measures
- Engagement via # of participants
- Pre- and post-media surveys with successfully engaged participants

Results (Engagement)

Research Question #1: How do three different robot social behaviors (gaze orientation, verbal communication, coordinated gaze orientation with verbal communication) impact human-participant engagement with a social robot?

Interaction Behavior	# of in-range passersby	# of engaged passersby	Success rate (%)
Coordinated gaze orientation and verbal communication	8	3	37.5%
Gaze orientation only	3	0	0.0%
Verbal communication only	3	1	33.3%

Results (Outcomes)

Research Question #2: How do three different robot social behaviors (gaze orientation, verbal communication, coordinated gaze orientation with verbal communication) impact human-participant engagement with DEI-related themes?

	Pre-media exposure			Post-media exposure		
Interaction Behavior	**DES Survey (avg.)**	**CES Survey (avg.)**	**Intention to Act (# of responses)**	**DES Survey (avg.)**	**CES Survey (avg.)**	**Intention to Act (# of responses)**
Coordinated gaze orientation and verbal communication	3.6	5.8	0	3.7	5.4	0
Gaze orientation only	N/A	N/A	N/A	N/A	N/A	N/A
Verbal communication only	2.0	4.3	1	1.5	4.8	1

Video

Discussion, Limitations and Future Work

Social Robot Behavior and Human Engagement

- Increasingly complex interaction behaviors increase human engagement

Social Robot Behavior and Outcomes

- Increasingly complex interaction behaviors may not modulate outcomes

Limitations

- Small study size, the rona, finals week, connectivity ...

Future Work

- Try more complex behaviors (gestures, physical interaction, proxemics)
- Try more dialogue *throughout* successful engagement as “encouragement”
- Try more people!