Reading 1

Comments due midnight on Tuesday 1/24

Note: You may need to use the CU Boulder VPN service to access the readings. Information on the VPN can be found here:
http://www.colorado.edu/oit/services/network-internet-services/vpn
The first reading contains a survey of HRI by Michael Goodrich and Alan Schultz. For your comments, respond to the questions listed below the reading. Post your response in this forum.
Goodrich & Schultz: Human-Robot Interaction: A Survey (2007)

- Goodrich states: "In essence, a designer can affect five attributes that affect the interactions between humans and robots." Do you agree with this list of attributes? Is it complete?
- Table 5.1 presents several examples of roles and proximity patterns that arise in several application areas. Which do you find most interesting? Why?
- Section 7 describes the relationship of HRI to many closely related fields. Can HRI really be considered a distinct discipline, or should it be considered a sub-field of another area of study (e.g., robotics, hci, etc.)? Why or why not?
- Anything else you found interesting about the article or didn't understand?

Alternative direct-download link to reading: Human-Robot Interaction: A Survey

Reading 2

Reading #2

Due: start of class on Wednesday 2/1

We will discuss the following 2 readings as a group:
Cassell, Justine. Embodied Conversational Agents: Representation and Intelligence in User Interfaces. *AI magazine* 22.4 (2001): 67.
Simmons, Reid, et al. Believable Robot Characters *AI Magazine* 32.4 (2011): 39-52.
Additionally, the lecture content will draw from the following reading:
Mcgrath, E. Methodology Matters: Doing Research in the Behavioral and Social Sciences. *Readings in Human-Computer Interaction: Toward the Year 2000 (2nd ed*. 1995).
All three are required readings!
Before class:

1. Make a forum post that answers one (1) of the following questions:
2.
3.
    - What do you think about the FMBT model for ECAs? Does it provide useful guidance for robot developers? Is it complete or missing key elements?
    -
    -
    - We have made many advances in natural language processing (NLP) since the "Believable Robot Characters" article was published. However, most modern conversational agents (Siri, Alexa, Google Home) do not make much use of either embodiment or the framework of "dramatic structure with rich backstory and evolving story line, verbal and nonverbal social behaviors, and believable culturally specific characters" (or maybe you'd argue that they do?). On the other hand, the Jibo robot represents a project that does strive to take advantage of such elements. How important do you think these elements are? Do you think the Jibo robot will be successful?
    -
    -
4. Reply to one other person's forum post. For example, you might ask a question about their response, provide an answer to a question they raised, or raise further points of discussion.

Reading 3

Due: start of class, Wednesday 2/8

I've switched up reading 3 as we have a special opportunity with a HRI researcher visiting campus next week. Marynel Vazquez, a Ph.D. Candidate at CMU, will be giving a colloquium presentation titled "Beyond One-on-One Human-Robot Interactions" in DLC 170 on Tuesday, Feb. 7 from 3:30-4:30 PM.

For Reading 3, you can either:

- Read both of the papers listed below

OR

- Read one of the papers listed below (your choice) and attend Marynel's talk

Readings:

- Vázquez, Marynel, et al. "Spatial and other social engagement cues in a child-robot interaction: Effects of a sidekick." *Proceedings of the 2014 ACM/IEEE international conference on Human-robot interaction*. ACM, 2014.
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- Vázquez, Marynel, Aaron Steinfeld, and Scott E. Hudson. "Maintaining awareness of the focus of attention of a conversation: A robot-centric reinforcement learning approach." *Robot and Human Interactive Communication (RO-MAN), 2016 25th IEEE International Symposium on*. IEEE, 2016.
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Submit a response to this forum that either:

- Provides a review of both readings
- OR
- Provides a review of one reading (your choice) and a picture that provides some proof you were at the talk (e.g., take a picture of the talk with your cell phone or come talk to me so I know that you attended)

In crafting your review, please conform to the format listed below (which is a pseudo review format I took from HRI and related conferences):

1. Briefly state what contribution the paper makes to the field of Human-Robot Interaction in your view. Use this field to summarize the contribution (not the flaws) of this work.
2.
3.
4. Write your full review of the paper here, including strengths and weaknesses. Think about:
    - Significance of the work's contribution to HRI and the benefit that others can gain from the contribution: why do the contribution and benefit matter?
    - Originality of the work: what new ideas or approaches are introduced?
    - Validity of the work presented: how confidently can researchers and practitioners use the results?
    - Presentation clarity;
    - Relevant previous work: is prior work adequately reviewed?
    - If you have concerns about the methodological or statistical approaches taken by the authors, or its level of advancement over prior work, please cite a source

for your objection (e.g., a definitive paper, a set of professional guidelines or a standard textbook

Reading 4

In class on Monday 2/13 we will discuss the following two readings as a group:

- Fallman, Daniel. "Design-oriented Human-Computer Interaction." *Proceedings of the SIGCHI conference on Human factors in computing systems*. ACM, 2003.
-
- Nass, Clifford, and Youngme Moon. "Machines and Mindlessness: Social Responses to Computers." *Journal of social issues* 56.1 (2000): 81-103.
-

Additionally, the lecture content will draw from the following reading:

- Edmondson, Amy C., and Stacy E. McManus. "Methodological Fit in Management Field Research." *Academy of management review* 32.4 (2007): 1246-1264.
-

There is no requirement of making a forum post about any of these readings, however the forum below can be used for discussion if you so desire.

Reading 5 - Bayesian Inference for HRI

Due: start of class on Wednesday 2/22

For Reading 5 we will take a short break from human-subjects research methodology and go into a topics area: Bayesian Inference. These readings will require a bit more technical background than some of the previous readings - if you have never been introduced to probability theory or Bayesian methods, these might be a bit harder to follow. If this is the case for you, try to get a general sense of the paper and we will go over Bayesian methods from the ground up in class. As with reading 4, a forum response is not required, but the forum below is available if you'd like to discuss the readings outside of class time.

- Kaupp, Tobias, Alexei Makarenko, and Hugh Durrant-Whyte. "Human–robot communication for collaborative decision making—A probabilistic approach." *Robotics and Autonomous Systems* 58.5 (2010): 444-456.
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- Tellex, Stefanie, et al. "Approaching the symbol grounding problem with probabilistic graphical models." *AI magazine* 32.4 (2011): 64-76.
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- Yang, Hee-Deok, A-Yeon Park, and Seong-Whan Lee. "Gesture spotting and recognition for human–robot interaction." *IEEE Transactions on Robotics* 23.2 (2007): 256-270.

Reading 6

Due: start of class on Monday 2/27

Reading 6 will go along with guest speaker Dr. Dan Grollman who will talk about Learning from Demonstration (LfD) and what it is like to do HRI research in industry. Required readings are:

- Argall, Brenna D., et al. "A survey of robot learning from demonstration." *Robotics and autonomous systems* 57.5 (2009): 469-483.
-
- Sparrow, Robert. "The march of the robot dogs." *Ethics and information Technology* 4.4 (2002): 305-318.
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Dan's lecture content will draw on:

- Grollman, Daniel H., and Aude G. Billard. "Robot learning from failed demonstrations." *International Journal of Social Robotics* 4.4 (2012): 331-342.

Reading 7

Due: start of class on Wednesday 3/8

Reading 7 is designed to provide additional context to the methods lectures on experimental design. No response is required, however the forum is open for discussion if you like.

Lazar, Jonathan, Jinjuan Heidi Feng, and Harry Hochheiser. *Research methods in human-computer interaction*. Chapter 2. John Wiley & Sons, 2010.

Szafir, Daniel, and Bilge Mutlu. "Pay attention!: designing adaptive agents that monitor and improve user engagement." *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*. ACM, 2012.
(for the second reading, pay attention to the Experimental Design, Experimental Procedure, Participants, and Measurements sections)

Reading 8 - Social Robotics

Due: start of class on Wednesday 3/22

In response to some questions last week, I wanted to give more readings on social robotics. Here are two readings that show the importance of considering social factors in a given HRI setting (manufacturing and hospital):

Mutlu, Bilge, and Jodi Forlizzi. "Robots in organizations: the role of workflow, social, and environmental factors in human-robot interaction." *Proceedings of the 3rd ACM/IEEE International Conference on Human-Robot Interaction (HRI)*. IEEE, 2008.

Sauppé, Allison, and Bilge Mutlu. "The social impact of a robot co-worker in industrial settings." *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*. ACM, 2015.

We will discuss both of these papers in class on Wednesday. In addition, though we won't have time to discuss it in class (and thus, it is not a mandatory reading), an extremely useful (and seminal) paper surround social robotics is:

Fong, Terrence, Illah Nourbakhsh, and Kerstin Dautenhahn. "A survey of socially interactive robots." Robotics and autonomous systems 42.3 (2003): 143-166.

I highly recommend you review if you are interested in the principles and applications of social robotics.

Reading 9: Form, Morphology, and Embodiment

Due: Start of class, Wednesday 4/5

Duffy, Brian R. "Anthropomorphism and the social robot." *Robotics and autonomous systems* 42.3 (2003): 177-190.

Klemmer, Scott R., Björn Hartmann, and Leila Takayama. "How bodies matter: five themes for interaction design." *Proceedings of the 6th conference on Designing Interactive systems*. ACM, 2006.

Answer both questions below:

1. Duffy summarizes the question of anthropomorphism with: "Robots are learning to walk and talk. The issue is rather should they walk? Walking is a very inefficient motion strategy for environments that are more and more wheel friendly. Should robots become the synthetic human?" What is your answer? How does it relate to the concepts of strong vs weak AI?
2.
3.
4. How might the theories of embodiment discussed in Klemmer et al. impact our understandings of human-robot interaction? E.g., is it likely we would see evidence of "thinking by doing" as people interact with robots? Is the idea of "situated learning" applicable to traditional approaches in machine learning?

Reading 10 - Intentions

Due: start of class on Monday 4/10

This first two papers build our understandings regarding the psychological background of intention and actions in humans:

Baldwin, Dare A., and Jodie A. Baird. "Discerning intentions in dynamic human action." Trends in cognitive sciences 5.4 (2001): 171-178.

Csibra, Gergely, and György Gergely. "'Obsessed with goals': Functions and mechanisms of teleological interpretation of actions in humans." Acta psychologica 124.1 (2007): 60-78.

The third paper presents an example of how we might leverage such information when designing robot behaviors:

Ziebart, Brian D., et al. "Planning-based prediction for pedestrians." Intelligent Robots and Systems, 2009. IROS 2009. IEEE/RSJ International Conference on. IEEE, 2009.

There is a high likelihood of a reading quiz on these readings.

Reading 11: Communicating Intent

Due: Start of class on Monday 4/24

This set of readings builds on Reading 10 to explore how we might design robot behaviors that better convey robot intent to people, specifically using motion.

The first paper examines how computer animators are able to craft expressive and intuitive characters:

Lasseter, John. "Principles of traditional animation applied to 3D computer animation." ACM Siggraph Computer Graphics. Vol. 21. No. 4. ACM, 1987.

The other two papers explore applications of such ideas to the design space of robot motion:

Dragan, Anca D., Kenton CT Lee, and Siddhartha S. Srinivasa. "Legibility and predictability of robot motion." Human-Robot Interaction (HRI), 2013 8th ACM/IEEE International Conference on. IEEE, 2013.

Szafir, Daniel, Bilge Mutlu, and Terrence Fong. "Communication of intent in assistive free flyers." Proceedings of the 2014 ACM/IEEE international conference on Human-robot interaction. ACM, 2014.