CAP 4112 Generating Expressiveness in Intelligent Agents and Avatars

Readings

[HRI] Human Robot Interaction An Introduction, C. Bartneck, Cambridge, 2020 ISBN: 9781108735407
(*official PDF version freely available online at https://www.human-robot-interaction.org/)*

[DSR] Designing Sociable Robots, Cynthia Breazeal, MIT Press, 2004 ISBN: 9780262524315
(Readings will be assigned from this textbook.)

[AC] Affective Computing, R. Picard, MIT Press, 1997 ISBN: 9780262661157

Prerequisites

COP 3530 (Data Structures and Algorithms)

Tentative Course Topics (may change based on class interest/weather related university closures, etc.)

Topic#	Topic Name	Reading Material	Topic-level Objectives	Assessment Examples
0	What to expect	Syllabus	1) Classroom expectations 2) Grading scheme	
1	Why we need expressiveness	Ch 1, 2, 3 [AC] Ch 1 and 4, [DSR]	3) Describe the multiple ways in which emotions are expressed in humans (pg 26-27, Ch 1, Picard) 4) Describe the design criteria for an intelligent agent that can express emotion (pg 60, Ch 2, Picard) (Ch 4, Breazeal) 5) List the ingredients of a social robot and provide examples of each ingredient (Sec 1.3, Ch 1, Breazeal) 6) Propose evaluation criteria for an expressive/sociable intelligent agent (Ch 4.5, Breazeal) (also in Picard somewhere)	Q1: Describe how a person expresses happiness when receiving a friend at the airport? Q2: Design a robot that will welcome the Olympic delegation at the airport. Q3: Implement Himmer and Siedel's experiment

2	Physical vs Virtual Intelligent Agents	Ch 2.3 [DSR] Ch 3 [HRI]	1) Provide examples of physical and virtual intelligent agents 2) Contrast agent and avatar 3) Define embodied agents 4) Discuss the limitations of physical robots (Ch 3.6, HRI)	Q1: List three examples of physical intelligent agents and three examples of virtual intelligent agents. Q2: Is HAL from 2001A Space Odyssey a fictional example of an embodied intelligent agent? Why or why not? Q3: Find examples of expressive intelligent agents from movies. Classify them as physical or virtual agents, embodied or non-embodied agents.
3	Anthropomorphism, Realism	Ch 4.1, 4.2, 5.2, 10.5 [DSR] Ch 4 [HRI] Too real for comfort? Uncanny responses to computer generated faces, MacDorman et al. (2009)	1) Define anthropomorphism 2) Compare and contrast realistic and stylized anthropomorphic agents 3) Explain the Uncanny Valley hypothesis 4) Explain how mismatched facial cues can lead to the uncanny valley effect? 5) Design an anthropomorphic intelligent agent 6) Compare and contrast strategies for evaluation (e.g., compare with a human's facial expressions; conduct a perceptual study where you ask humans to rate the expression) (Ch 10.4-10.5 [DSR])	Q1: Find three pictures where a non-human agent has been anthropomorphized. Discuss the anthropomorphic cues for each picture. Q2: Provide three examples of appearance [behavior] features that can be added to an autonomous vehicle to trigger anthropomorphic inferences. How will you evaluate your success? Q3: Discuss the pitfall in designing a realistic anthropomorphic agent.
4	Intent	Ch 5 [HRI]	1) Define proxemics 2) Provide examples of socially (in)appropriate positioning of physical agents 3) Synthesize examples of robot motion that communicate its intent and goals	Q1: Provide an example of how a human could use space to indicate intent. Q2: Give an example of how a drone may indicate intent to deliver a package to a user. Q3: Implement a face whose eyes follow a

			4) Discuss the role of head orientation and gaze in expressing intent	person (webcam, face tracking, animate eyes) [Mini-project]
5	Non-verbal Expressiveness	Ch 6 [HRI] Geppetto: Enabling semantic design of expressive robot behaviors, Desai et al. (2019) Ch 10 [DSR] Chap 6 [AC]	1) List the primary types of nonverbal communication [6.2, HRI] 2) Compare and contrast nonverbal cues for humanoid and non-humanoid agents 3) Design nonverbal expressive cues given an agent form and morphology and an associated use case context 4) Implement facial expressions through blendshape interpolation.	Q1: List three types of nonverbal communication and give one example of each for a human/robot arm/Kismet Q2: Imagine you are coding a Pepper robot which will welcome visitors to the Reitz Union during UF Homecoming. How would it express happiness if someone introduced themselves as a UF alum?
6	Verbal expressiveness	Ch 7 [HRI] Ch 7 [DSR] Ch 6 [AC]	1) Contrast verbalizations and vocalizations (e.g., grunt is a vocalization, “uff this is heavy” is a verbalization) 2) List the components of speech that impact expressiveness (language: she said vs she proclaimed, prosody, back channeling) 3) Guest lecture by Bonnie Dorr?	TBD
7	Affect and Emotion	Ch 8 [HRI] Ch10.2 [DSR] Ch 6 [AC] Affective body expression perception and recognition: A survey Cross-cultural differences in	1) Describe the basic models of emotion (Ch 8.4.4, Ch 6) 2) Generate facial expressions as weighted interpolation of facial prototypes (10.3, pg 169 [DSR]) 3) Discuss ways in which affect is expressed nonverbally beyond facial expressions	Q1: Explain the valence-arousal model of emotion with a graphic and three examples of positive and negative emotions Q2: Implement facial expressions on the above face. [Mini-project]

		recognizing affect from body posture		
8	Style	Bonus topic	TBD	
9	Personality	Pgs 124-125, 236 [DSR] A conversational agent framework with multi-modal personality expression, Sonlu et al. (2021)	TBD	