CIS 6930-8XYZ (30197) Generating Expressiveness in Intelligent Agents and Avatars

Course Objectives

At the end of this course, students will be able to locate literature relevant to their interest, analyze research papers, demonstrate critical thinking and effective technical communication, and translate scientific reports related to this area of work into practical implementations.

Readings

Required textbook:

[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/)

Additional books:

[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

Topics that fall within the purview of this course (subject to student interest)

Topic Name	Reading Material	Topic-level Objectives	Example Activities
What to expect	Syllabus	1) Classroom expectations 2) Grading scheme	
Physical vs Virtual Intelligent Agents	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)	A1: Find three examples of physical intelligent agents and three examples of virtual intelligent agents. A2: Find examples of expressive intelligent agents from movies. Classify them as physical or virtual agents, embodied or non-embodied agents.
Anthropomorphism, Realism	Ch 4 [HRI] Too real for comfort?	1) Define anthropomorphism 2) Compare and contrast realistic and stylized anthropomorphic agents	A1: Find three pictures where a non-human agent has been anthropomorphized. Discuss the

	Uncanny responses to computer generated faces, MacDorman et al. (2009)	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)	anthropomorphic cues for each picture. A2: 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? A3: Discuss the pitfalls in designing a realistic anthropomorphic agent.
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 4) Discuss the role of head orientation and gaze in expressing intent	A1: Think of an example of how a human could use space to indicate intent. A2: Discuss examples of how a drone may indicate intent to deliver a package to a user. Recent news on this topic. A3: Implement examples of non-humanoid characters displaying intent.
Non-verbal Expressiveness	Ch 6 [HRI] Geppetto: Enabling semantic design of expressive robot behaviors, Desai et al. (2019)	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	A1: Think of three types of nonverbal communication and give one example of each for a human/robot arm/Kismet A2: Imagine you are coding a Pepper robot which will welcome visitors to the Reitz Union during UF Homecoming. Think about behaviors that would express happiness if someone introduced themselves as a UF alum?

			A.3: Implement facial expressions through blendshape interpolation.
Verbal expressiveness	Ch 7 [HRI]	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)	A.1: Modify speech procedurally by changing pitch, etc. A.2: Experiment with off-the-shelf generative models
Affect and Emotion	Ch 8 [HRI] Affective body expression perception and recognition: A survey Cross-cultural differences in recognizing affect from body posture	1) Describe the basic models of emotion (Ch 8.4.4, Ch 6) 2) Discuss ways in which affect is expressed nonverbally beyond facial expressions	A.1: Explain the valence-arousal model of emotion with a graphic and three examples of positive and negative emotions A.2: Generate facial expressions as weighted interpolation of facial prototypes (blendshapes)
Personality	A conversational agent framework with multi-modal personality expression, Sonlu et al. (2021)	Bonus topic	