Report 2

DECO3200 - Human Computer Experience Design Studio
Semester 2 2012

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Course Blog

Misanthropic System

Goal

The installation in it's current conceptual form is a modular collection of robotic systems that communicate with one another. The aesthetic form that this communication takes, their layout, contextual influences, and the content of their discussions remain fragmented within the concept, as progress has been made to refine these aspects of the work. Thematically, the behavior of the system has been outlined as misanthropic, yet light-hearted.

Independently, work has been done on the initial logistical structure of the installation - the use and sourcing of plinths, ironing out problems with a potential modular component of the network - a thermal printer, and the technical setup of the communication network between systems and some of their associated visuals and audio. Discussions throughout the week, and feedback (both direct and indirect) has lead to to the evident need for conceptual validation of the technical implementation of our system. As a response, this report has been augmented with additional supporting research that will inform future development of our communication framework.

Background

Language is crucial to the development of a social species. Symbols on cave art suggests humans learnt written communication as early as 30,000 years ago (McKie, 2012). The need for language within communicative robotic systems is equally important. Artificial Intelligence (AI) has already granted us with bots that can ask the right questions (Schaefer, 1990) in the form of diagnostic chatbots (e.g. Androctor.com, 2012) and systems that aid medical doctors in narrowing down a problem domain (e.g. Deep Blue) (Pavlov, 2011), syphoning through vast amounts of information that may be too much to handle for any one entity, artificial neural network or otherwise (Torre, 2010). Conversely, systems that answer questions like Google's Knowledge graph (Google.com, 2012), Wolfram (Gray, 2009), and Watson are employed by wall street to predict outcomes (Jinks, 2012), and even play a game of Jeopardy, however, in the latter case - the system can fail without the provision of context (Johnston, 2011).

In additional to the fields of medicine and economics, artificial intelligences have been used in the argumentation process of law (Bench-Capon, Dunne, 2007), and the creative process of art. As such, new forms of creative intelligence evaluation have been developed as substitutes to the Turing test. Two such models are the FACE (framing, aesthetic, concept, expression) and IDEA (Iterative,

Development, Execution, Appreciation) models as put forward by (Pease, Colton, 2011). The AI community is moving away from attempting to reproduce human intelligence (Turing), but rather into "evolving something new and potentially much more exciting" - Marcus du Sautoy (2012).

Knowledge is important to a system if it is to generate anything useful. It has been demonstrated that even a simple database of generic responses is sufficient to convince some human twitterers of a reciprocal human conversation (Isaacson, 2011). A similar study was halted over ethical concerns when one twitterer became too friendly with a bot and desired a face-to-face meeting. Knowledgebases (collections of knowledge) can also be assembled from emotions that are tagged to photos, information that can be later used for empathic art (ThePaintingFool.com, 2012). Additional human knowledge can be found in the annals of wikipedia to train positive and negative assertions within a bot (Lin et al., 2011). Associated information can also be aggregated together to form Twitter stories of a particular topic, as evidenced by Narrative Science (Kafka, 2012) whoms services is also used by Forbes to generate articles (blogs.forbes.com, 2012) on economics.

Argumentation is a crucial part of society, philosophically, it can be considered as the method by which assertions are produced, discussed and resolved. Artificial Intelligence has had long historical ties with philosophy, and in the area of argumentation, this is no different. Bench-Capon and Dunne (2007) provide an overview of the state of argumentation in artificial intelligence; outlining computational elements such as: the deconstruction of an argument into it's component parts, identifying rules and protocols, and the identification of legitimate arguments. Also outlined is the reliance of practical reasoning on theoretical reasoning, and various implementations that commonly use graph representation, argument mapping (Reed, et al, 2004) (Uren et al, 2004), in addition to other trending techniques such as deductive argument frameworks, probabilistic (bayesian) argumentation, generation of natural language arguments and applications of classical game theory. Bench-Capon and Dunne also state the importance of coherence to argumentation and how this can be achieved through semantics, and propose networks as beneficial systems for carrying dialogue and exploiting the benefits of argumentation.

Networks are significantly useful in the alleviation of traditional memory bounds. This is especially the case in Neural networks, and networks of neural networks - a concept not often exploited (Sing, 2011). Networks that facilitate this have been suggested, such as a 'twitter' for robots, or a world wide web of argumentation (Rahwan et al., 2007). Global optimisers such as altruism can also be used to benefit swarm intelligences (Waibel et al., 2011). Kyle Li (2008a,b) also proposes the implementation of relations and variations within groups of NPCs (Non Playable Characters in games) to simulate group behavior, combining multiple statecharts with graph grammar into a total state.

Dialogue is useful in reaching optimal states of 'wisdom' in a system. For example, Dragoni, et al. (2007) stimulate a conversation between individual agents who retain the same belief revision mechanism to find and solve contradictions. It was found that interaction refines the amount of correct information in each agent's cognitive state. Dialogues have the most effect in networks where entities are convinced independently and not as a group. Computationally, dialogue provides the process for gradually deciding acceptability. It helps entities identify fallacious arguments, potentially attack, support, justify, cooperate, coordinate, and dispute with entities whilst distinguishing intentions (Bench-Capon, Dunne, 2007).

Semantics is important in the mutual communication between entities. Jakobovits (2000) provides a good framework on argumentation semantics. The idea of coherence is formed upon extension-based semantics and ideal semantics (Bench-Capon, Dunne, 2007). As an example; Luc Steels has

created an installation of 20 robots whom communicate and develop their own language as they map shapes with the orientations of their bodies in front of a mirror. As the robots synchronise their definitions of different sounds, a sophisticated common language emerges over time with words representing 'left' and 'right' communicated between the bots (Sautoy, 2012).

Curiosity and Creativity can play important roles in the evolution of a bot and it's contexts. Such examples include Robococo's Zwischenräume installation (robococo.net, 2011), robot's that request for additional parts based on evolved necessity, and the Painting fool (thePaintingFool.com, 2012) "a computer program and an aspiring painter".

Generative Algorithms are important to the process of creativity. It can be found in crowd sourced evolving screensavers such as Electric Sheep (electricSheep.org, 2012), Karl Simms' (1994) sea creatures, and even in PS3 applications used to conduct medical research whilst the machine is idle. It has also been proposed for generative planning in crisis' (Bienkowski, et al., 2008), and in the generation of behavior patterns of intractable NPCs (Cutumisu, et al., 2005).

Empathic intelligences appears more frequently in artistic articles. The Painting Fool is an example where emotionally aware paintings can be generated along with the use of emotion-tagged images. Technically, emotions and mood swings can benefit the education of bots (Park S, et al., 2010). Such implementations address concepts that limit artificial intelligence as speculated by Alexandru Tugui. Tugui (2004) lists the issues as including; the law of entropy is not always accounted for, AI is currently based on informatic procedures, the notion of binary truth values are borders to ai, and the fact that ai is based very much on symbolic logic rather than affective logic (a theory on the laws that connects feeling and thinking) (affect-logic.com, 2007). Psychologically, empathy is important and Tapus et al (2006) have suggested the following quantifiable variables as empathic measure in socially assistive robots; empathic concern, perspective taking, personal distress, and the ability to fantasize.

The above concepts of language, creative evaluation, establishing knowledgebases, argumentation, the importance of networking, dialogue and semantics, and in the evolutionary benefits of curiosity, creativity and empathy are applicable to many layers of a system; conceptually, technically and aesthetically.

Approach

Whilst the conceptual aspect of the installation evolved through discussion and research, technical implementation was also undertaken.

After initial research of plinth structures, and the logistics of their creation or acquisition, a group discussion was called with the conclusion that we would opt for the convenience of constructing our own plinths, along with their layout.

Discussions with Mark regarding what was to be said by the bots, as informed by our own independent research, concluded in the decision to rely on bad poetry for the time-being as it provides an uncanny human factor to the audience. The potential of expanding spoken content to more generative and argumentative means were also discussed, noting that humanity, interest, and ease-of-implementation needed to be maintained.

Discussions with Ollie brought forth the importance of themeing the concept and the potential importance of the technical system, a point that had been ignored in favour of simulated aesthetics.

The thermal printer had stopped working, through experimentation, it was discovered that it required harder wires to transmit information and power.

In setting up the communication between two computers, two laptops were originally used. Visualisations were quickly constructed, independent from the programs that operate speech, that visualised microphone input. A program was used to route the sound output to input so the visualisation did not pick up any background noise. A smoother github workflow was simultaneously established with the noted omission of nonessential files such as .classpath, .class, and other hidden files. Additional visualisations were developed to explore their aesthetics on different screens.

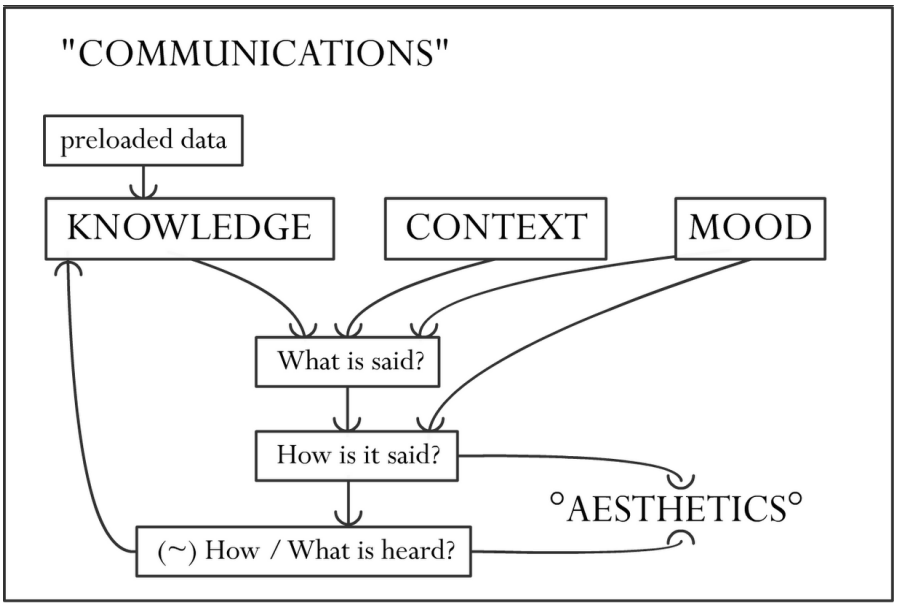
After four university computers were obtained thanks to Ollie, Mark and I got working on them. It was discovered that OSX 10.3 was incompatible with Java 1.5 and above. We currently attempt to remedy this with an externally bootable OSX running 10.4 which is compatible with all the software we're currently using. Ollie also provided a more efficient method of running java by calling a script from the command line.

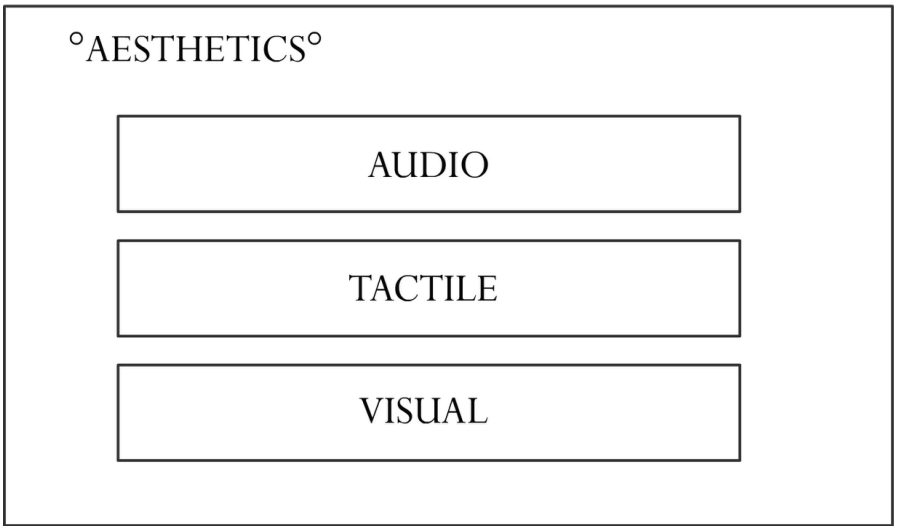
Eject trays were serendipitously discovered on the macs, and since the speech was generated by commands to the command line, control of the cd-trays could similarly be acquired - this was a nice surprise.

Throughout this setup, it was found that it would be more convenient to control the speech of a computer through the server and that the visualisations should be made a part of the main program, along with the routing of audio. Alternate sonifications and other features should also be provided for experimentation (without experimentation, the disk tray would not have been found). Interaction and context was also found to be a beneficial addition to the system.

The extended research that has been conducted due to the fallacy of previous systems (e.g. chatbots), accumulated discussions, and feedback, has provided methods in granting our network of bots conceptual-technical validity. Our concept and theme can be refined through ideas that can be applied at the hidden and aesthetic levels; argumentation, dialogue, empathy, and curiosity. Such results warrant further discussion before more in-depth research.

The following is a diagram of the current conceptual system structure.





Conclusion

The background research has provided a stunning domain for the conceptual-technical validation of our concept. This is currently sufficient research to inform, validify, and focus us on any conceptual technical implementation of our system that we are driven towards in future iterations of our misanthropic system of robots. Simultaneously, it is more important that there is a unified working system that facilitates experimentation. The generation and deployment of this program is the top priority for the time being, as it provides a framework that further implements and refines the concept.

Word Count (excluding references): 1986

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Lit-Ecology

Due to the devotion to the Misanthropic Systems concept, and the length of this report, Lit-Ecology has been omitted from this report and will be continued as a side project.