EFAIRAES - Worksheet 1

1. Transcript: "The Writer" Automaton

I. One of the most remarkable realizations of **cam** technology is a device in the shape of a small boy. It's perhaps the world's most astonishing surviving automaton. What's on this card is a piece of writing made by a 240 year old machine. One of my favourite machines, one of the most magnificent automata of the 18th century - it's this boy, this writer. He was built in Switzerland by Pierre Jaquet-Droz, one of Switzerland's greatest clockmakers. And the aim was I think to **mechanize** reason and automate the passions.

II. Jaquet was about 50 years old in the early 1770s when he designed and built this **masterpiece**. Inside the boy are almost 6,000 parts. What's astonishing is that every one of these **crafted components** has been refined and miniaturized to fit completely inside the body of the boy himself.

III. What Jaquet-Droz did was to use the technologies of **homeostasis**, of **miniaturization**, to build really a true automaton. Inside the little writer is all his **source of energy** and all the machinery that drives him. He works on his own.

IV. At his core is a great stack of cams. As these cams move, three **cam followers** read their **shaped edges** and translate these into the movement of the boy's arms. Working together the cams control every stroke of the quill pen, and exactly how much pressure is applied to the paper, so as to achieve beautiful elegant and fluid writing. With this **sublime** machine Jacques had **reverse-engineered** the very act of writing.

V. But the mechanical boy contained one, perhaps, even more astonishing **feature**. The wheel that controlled the cams was made up of letters that could be removed, and then replaced and reordered. These allowed the writer, in principle, to make any word and any sentence. In other words, it allowed the writer to be programmed. This beautiful boy is thus a **distant ancestor** of the modern programmable computer.

Vocabulary

A	to mechanize	crafted components	shaped edge	cam followers
B	homeostasis	miniaturization	source of energy	masterpiece
C	to reverse-engineer	sublime	distant ancestor	feature
Example	*cam*			

Exercise 1.1.

In pairs or groups of three, explain the following sets of terms from the box above in the context in which they are used in the video clip, but using an example from another field/age of computing, robotics or mechanics to support and illustrate your explanation.

Example

A cam is a rotating component used in a mechanical linkage (an assembly of parts designed to control and direct movement), whose function is to convert rotary into linear motion. The rotating cams in the automaton cause its arm to move in an up and down motion, and the paper it writes upon to move in a lateral, right to left motion. The camshaft in car engines is an another example of such a linkage. Its rotary action controls the opening of the engine's valves at different speeds.

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Questions 1.2

1. What is an automaton? Explain the etymology of the term (clue: it derives from the Greek words *autos* and *matos*).
2. What do you think the presenter of the documentary means when he says that Jaquet-Droz, the creator of *The Writer*, wanted "to mechanize reason and automate the passions"?
3. *The Writer's* action is based on the reverse-engineering of the human act of writing. What is being reverse-engineered in today's more far-reaching and sophisticated AI and robotic systems?
4. Can this process of reverse-engineering cause human beings to see themselves more as high-level automatons than the self-motivating, self-actuating creatures of free that we have traditionally perceived ourselves to be? Explain your answer.
5. In what way is *The Writer's* controlling mechanism "programmable"?
6. Can you see any parallels between the programmable wheels and cams used in *The Writer's* central mechanism with the algorithms used to programme today's AI systems? Explain.

What is AI?

1.3 – Reading Exercise

Four approaches to devleloping AI Systems

Thinking Humanly	**Thinking Rationally**
"The exciting new effort to make computers think . . . *machines with minds*, in the full and literal sense." (Haugeland, 1985) "[The automation of] activities that we associate with human thinking, activities such as decision-making, problem solving, learning . . ." (Bellman, 1978)	"The study of mental faculties through the use of computational models." (Charniak and McDermott, 1985) "The study of the computations that make it possible to perceive, reason, and act." (Winston, 1992)
Acting Humanly	**Acting Rationally**
"The art of creating machines that perform functions that require intelligence when performed by people." (Kurzweil, 1990) "The study of how to make computers do things at which, at the moment, people are better." (Rich and Knight, 1991)	"Computational Intelligence is the study of the design of intelligent agents." (Poole *et al.*, 1998) "AI . . . is concerned with intelligent behavior in artifacts." (Nilsson, 1998)

Figure 1.1 Some definitions of artificial intelligence, organized into four categories.

From: *Artificial Intelligence: A modern approach*, Chapter 1, "What is AI?", Russel and Norvig, (2016)

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Exercise 1.4

Look up the meanings of the following terms and explain them in your own words.
What do you notice about some of these these terms with respect to how they are used by different AI commentators and experts:

Term	Explanation
1. AI	
2. Strong AI	
3. Weak AI	
4. Machine learning	
5. General AI	
6. Applied AI	
7. Full AI	
8. Narrow AI	
9. Deep learning	
10. Game AI	

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Pair and group task 1.5

i. *Research one of the following topics (1a, 2a, 1b, or 2b) in pairs:*

1a: ELIZA (early chatbot system)
2a: Siri (Apple chatbot system)

1b: Deep Blue/Deep Thought (IBM high level chess-playing system)
2b: AlphaGo (Lee version) (Go-playing system)

ii. *Organize your finings under the following findings:*

a. The background behind the programme (who developed the system, why, where and when it was developed etc.)
b. How the system functioned (internally and, if relevant, for the user)
c. What kind of AI (if any) underpinned and supported the functioning of the system (hard/soft/game AI etc.) Explain and justify your characterization of the AI

iii. Make a group of four with your opposite numbers and produce a short presentation that compares and contrasts the older with the newer system under the above headings, as well as:

d. Conclusion: In what ways have AI systems advanced in these areas? What factors and circumstances (technological, financial, economic, social, historical, organizational etc.) have made these developments possible?