Homework 1

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Abstract—Homework 1 of CS7637 covered semantic networks and the concept of generate and test, as well as the European Union's General Data Protection Regulation of 2016.

1 Question 1

This first question was a modified Sheep and Wolves problem, using rules and characters related to the Star Wars Sequel Trilogy.

1.1 Semantic Network

The following figure illustrates two states and the transition between the two states. The left column indicates that the represented figures are on the planet Quesh, while the right column indicates that the characters are on the ship. The location and direction of the shuttle (called the ship in the legend included in Figure 1) are indicated by the column and arrow symbol ('>' or '<'). For example, a '>' in the left column indicates that the shuttle sits on Quesh, directed towards the orbiting ship.

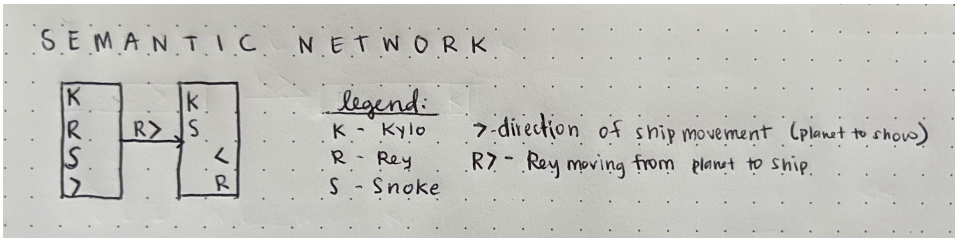

Figure 1—Semantic Network, transition from initial state to next state. Source: Student Generated

1.2 Application of Generate and Test

The following semantic network shows the full path to solve the problem, moving all three Force-sensitive beings from Quesh to the waiting ship in the shuttle. During the generate and test process, the generator did not produce states that had already been found. The tester checked the validity of each state, where validity is defined as following the rules and invalidity breaks the rules. States that are not valid are followed by an "X" in Figure 2.

More in-depth generation steps can be found in "Appendix: Expansion on Development of Semantic Network."

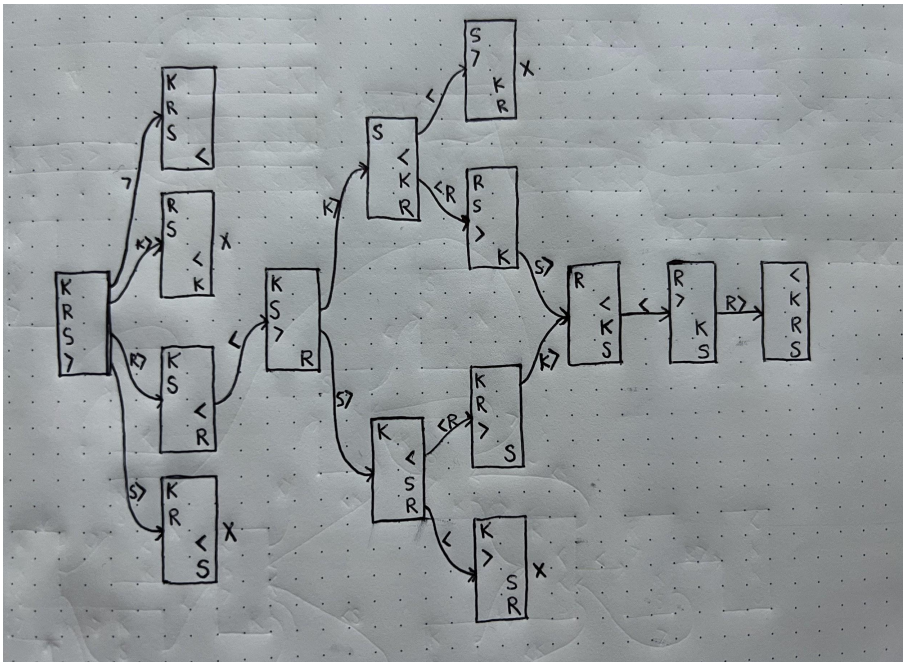

Figure 2—Semantic Network, all states generated when solving the problem. Source: Student Generated

2 2016 EUROPEAN UNION GENERAL DATA PROTECTION REGULATION

The second question regarded the EU General Data Protection Regulation (GDPR), including a summary of the regulation, analysis of its implications, and application of the regulation with several examples of services.

2.1 Describe the GDPR

The GDPR, passed by the European Union in 2016 and enforceable in May 2018, works in tandem with, and is sometimes superseded by, the ePrivacy Directive, most recently amended in 2009 (Wolford). In the GDPR, Recital 30 states that "natural persons may be associated with online identifiers," which can hold personal data and therefore fall under the purview of the policies, principles, and practices of the GDPR (Document 32016R0679).

A data processor or data controller acting through a website must ensure that they have a justifiable reason for maintaining the data, provide information about the cookies, allow users access to the site even if some cookies are not

allowed, and keep clear records of consent once it has been given. A user who has given consent must also be allowed to withdraw consent for a cookie as well, under the right of erasure. This means that all data connected to a unique individual must be removed.

Beyond cookies, any personal data collected must be stored for a justifiable reason, with the data controller or processor providing accountability for the safeguarding of that information. Any data collected must be the minimum amount of data necessary for the service.

In summary, any personal data collected and used to personalize user experiences online must follow informed consent and a justifiable reason.

2.2 Analyze application of AI

Artificial intelligence, by design, relies on knowledge, most often in the form of stored data that can be synthesized to provide new inferences as new information and data is gathered. The deliberation step in particular, as shown in the architecture of an AI Agent, relies on the coordination of reasoning, learning and memory. This implies that personal data would need to be stored to create the best personalized experience. In order to store this information, the data collector would need to prove that they had a justifiable reason for storing the information (most likely through a user opting-in to the service). The data collector must also follow the seven data protection principles, provide excellent data security and accountability.

2.3 Example of Deeply-Embedded Personalization

One example of a service that has deeply-embedded personalization, but is not reliant on that personalization as a service, is Netflix. Netflix uses information such as location (through IP address, most likely) to provide the top shows in a user's area. They also use previously watched and currently queued titles to recommend future titles. Finally, payment information is also stored, used to complete auto-billing. A user could, theoretically, opt out of this recommendation service and watch only titles they specifically search for, or find through browsing by category, as well as log into their account every month to pay, or pay with a gift card to increase anonymity.

2.4 Example of Required Personalization

An example of a service that cannot function without personalization is the OrangeTheory Fitness (OTF) OTbeat system. It uses a Bluetooth device, with an individualized serial number, to track fitness during an exercise class. This tracker is tied to an individual account, which holds the client's age, height, weight, name, and other identifiable information. Without this information, the tracker would not be able to calculate the appropriate heart rate zones while working out and the client would not get an accurate number of splat points, which are OTF's trademark tracker for how hard someone worked in a class. Outside of the tracker, the OTF mobile app tracks when clients went to class and what future classes they've booked. All information is tied to a user's account.

2.5 The European Economic Area

The European Economic Area (EEA) includes all countries within the European Union, but adds Iceland, Lichtenstein, and Norway (Countries in the EU and EEA). The United Kingdom still follows the GDPR, but has adopted what it calls the "UK GDPR" (The UK GDPR). In the examples given in sections 2.3 and 2.4 of this paper, Recital 30 of the GDPR, as well as Articles 5, 6, and 7 are applicable. Recital 30 of the GDPR relates to cookies, which are used in Netflix applications and the web-based access of OTF accounts. Article 5, specifically sections 1 and 2, relates to the principles of accountability and protection of personal data, which both services would need to follow within the EEA. Article 6 focuses on the justifiable reasons to process personal data. Finally, article 7 of the GDPR defines the conditions for consent, which means what conditions must be present to meet the justification that unambiguous consent was given (Document 32016R0679).

2.6 Adaption of Above Examples to GDPR

To be compliant with the GDPR, these services would first need to prove that they are accountable and follow the seven principles outlined in Article 5. Employees handling personal data would need to go through training, and a specific person might need to be appointed to ensure compliance with the GDPR. Next, users would need to be informed of all uses of the data collected, what data is necessary for the service, and options to opt-out of any unnecessary collection (this aligns with Article 7). Both Netflix and OTF have opt-in agreements, which

could be modified to comply with the justification that a user has given informed consent to the data collection and processing. Both platforms operate on a non-contract basis, so users can cancel future services at any time. This process could also be modified to follow the individual right to erasure.

I believe both Netflix and OTF could operate without waiving clients' rights to privacy under the GDPR. While services might have to be modified–perhaps initial data can be used to set parameters, then deleted–users should still be able to get the experience of using both Netflix and OTF.

3 REFERENCES

1. *Countries in the EU and EEA.* Gov.uk. https://www.gov.uk/eu-eea
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3. *European Union General Data Protection Regulation*. (2022) It's Your Yale. https://your.yale.edu/research-support/human-research/news-events/european-union-general-data-protection-regulation
4. Koch, R. *Cookies, the GDPR, and the ePrivacy Directive.* GDPR.eu. https://gdpr.eu/cookies/
5. *Recital 30 - Online identifiers for profiling and identification.* GDPR.eu. https://gdpr.eu/recital-30-online-identifiers-for-profiling-and-identification/
6. *The UK GDPR.* Information Commissioner's Office. https://ico.org.uk/for-organisations/dp-at-the-end-of-the-transition-period/data-protection-and-the-eu-in-detail/the-uk-gdpr/
7. Wolford, B. *What is GDPR, the EU's new data protection law?* GDPR.eu. https://gdpr.eu/what-is-gdpr/

4 APPENDICES

4.1 Expansion on Development of Semantic Network

Question 1 was phrased in a way that suggested the semantic network follow a Breadth-First generation. I think through problems such as these in a depth-first manner, so my original semantic network was very messy and extended over four notecards, including the back of one. They are attached here to provide further clarity on how the semantic network in Section 1.2 was generated.

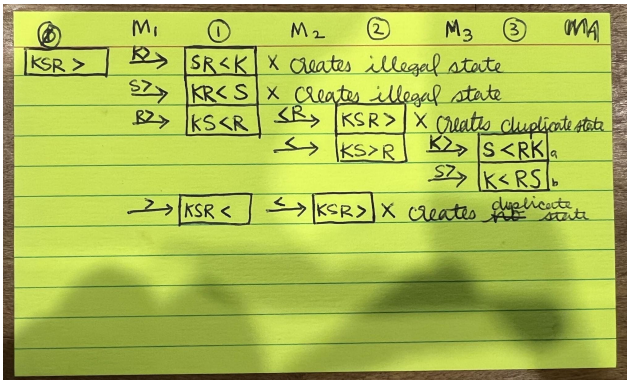

Figure 3—Semantic Network, part 1 of DFS generation. Source: Student Generated

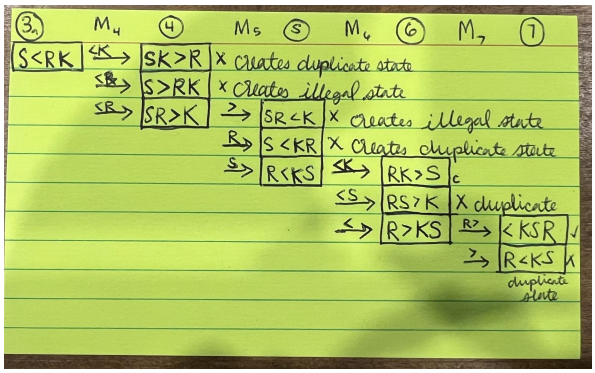

Figure 4—Semantic Network, part 2 of DFS generation. Extends from State 3a in Figure 3. Source: Student Generated

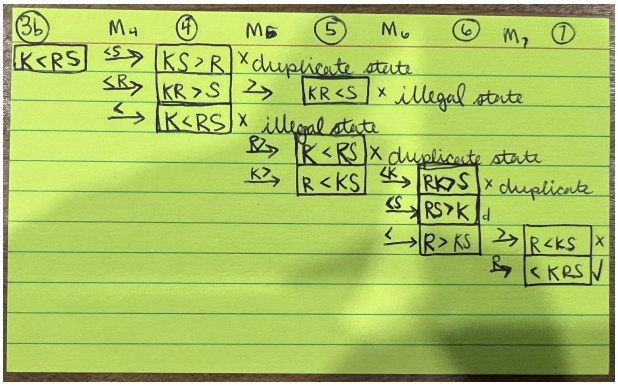

Figure 5—Semantic Network, part 3 of DFS generation. Extends from State 3b in Figure 3. Source: Student Generated

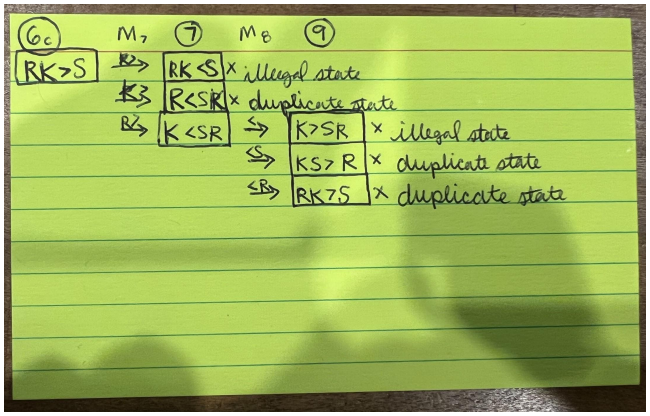

Figure 6—Semantic Network, part 4 of DFS generation. Extends from State 6c in Figure 4. Source: Student Generated

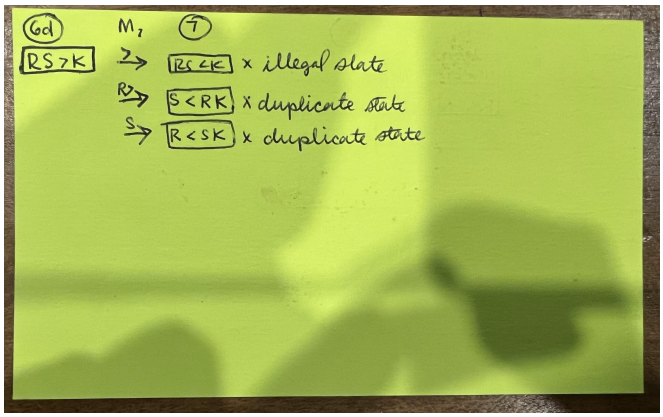

Figure 7—Semantic Network, part 5 of DFS generation. Extends from State 6d in Figure 5. Source: Student Generated