Final Project Proposal
Literature in the Age of Artificial Intelligence

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1. Artifact

The artifact I have chosen to work with is Quirinus Kuhlmann's Love-Kiss XLI. "Kuhlmann published his first major collection of poems in 1671 at age twenty - a sequence of fifty sonnets in alexandrines entitled *Himmliche Libes-Kussë* (Heavenly love-kisses), derived in part from the allegorical erotics of Solomon's Song of Songs."[1] The purpose of this artifact was to generate love poems using a method Kuhlmann described in the following manner:

a. Begin a sentence with the given first word.
b. Select one of thirteen words for a given line at random, and use this as the next word in the sentence.
c. Concatenate the first two words from a b with the last two words of the sentence which are given on the respective line.

Example for Steps a-c using the first line in *Love-Kiss XLI*: *From Fog and Plagues*

d. Construct 11 more sentences following steps a-c with each of the 12 lines in the poem.
e. Attach Kuhlmann's given final two sentences, one of which contains a combinatorial element.

By step e, one will have created 1 of 622,720,800 variations that are possible by permutation of the poem according to Kuhlmann.

2. Genealogy

Khulmann's Love-Kiss was published in 1671 and owes direct tribute, according to the poem's accompanyment as well as the translator Richard Sieburth, to the works of contemporaries of his time: Ramón Llull, Gottfried Leibniz, and Athanasius Kircher.[2] The works of Llull, "Ars Brevis" / "Principles of Medicine", and Leibniz, "On the Combinatorial Art", were the focus of weeks two and three of this course and provided the combinatorial pre-cursor to Kuhlmann's work. Prior to the combinatorial works of these three authors, a direct linage can be traced from the works of Aristotle.

In the introduction to Aristotle's *Poetics*, D.W. Lucas attempts to distill the essence of this work by stating that truth is a fundamental requirement of Poetry. Lucas states "If *mimēsis* is to produce the sort of realization that Aristotle demands of art at its best, a prime requirement is obviously truth."[3] This search for an underlying truth is reflected in Khulmann's work in the accompanying text with the poem: "... that the major portion of Human Knowledge in fact lies hidden in permutation."[4]

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[1] KUHLMANN, QUIRINUS, and Richard Sieburth. "Love-Kiss XLI." *Poetry* 194, no. 1 (2009): 13-16. Accessed April 22, 2020. www.jstor.org/stable/25706521.
[2] Ibid.
[3] ARISTOTLE, *Poetics*: Introduction, Commentary, and Appendixes by D.W. Lucas, Oxford, 1968.
[4] Ibid.

3. Evaluation Function

I propose to design a reinforcement learning problem around finding the the most meaningful permutations of Kuhlmann's Love-Kiss XLI. In this problem, an agent will be trained to formulate meaningful sentences while adhering to the 5 steps outlined in part one of this paper.

3.1. Search Space

An important consideration needs to be made early within the scope to limit the size of permutations. Given access to unlimited resources the full scope of Khulmann's work may be realized but this would require considerable compute and queries to third-party resources. Therefore I propose to begin by setting the limitations on the upper-bound of the problem to be as described in part one.

3.2. On "Meaningful Permutations"

To ascertain objective meaning of a sentence is a very difficult thing to do, especially when it comes to poetry, as each sentence or given permutation in a poem can hold different levels of meaning to different individuals. For the purposes of this experiment, I will let Aristotle guide me. I will consider "meaning" and therefore "truth" to be the number of Google search results of a given phrase order. For example from part one, the example text "*From Fog and Plagues*" yields zero results for a strict search whereas "*From Fire and Plagues*" yields nine results. In the previous example, "*From Fire and Plagues*" would hold more objective meaning than "*From Fog and Plagues*" for our purposes.

3.2.1. Strict Search

A strict search will be defined as a search entry with double quotes around the phrase. This means only search results that match the exact phrase will be displayed.

3.3. Agent Rewards

The agent will be rewarded based on maximizing total search results for each sentence of the poem. Results will be cumulative, and will add up for each sentence created in the thirteen lines required for the poem.

3.4. Reinforcement Learning Methods

A variety of reinforcement learning algorithms will be used so that a given agent is walking the fine line between exploration and exploitation. There are many phrases that might result in millions of results and could overwhelm an agent's trajectory on finding unique combinations, therefore I propose to use algorithms that generally prefer exploration, however, it might be too early to make this decision.

4. Bounds & Results

This project's largest limitation will be the amount of searches the Google API will allow. If Kuhlmann is correct in his math, we have at a minimum to search 622 million permutations of his most basic version of the poem. If the API limits us to 1 search every second, this project will only be able to test 86,400 phrases in a given day. Hopefully, this is not the case and I will find a more aggressive way to query the API.

Once completed, the agent should have a top ten ranking of permutations of Love-Kiss XLI which hold inherent truths. The phrases and sentences of this poem should occur in the English language frequently through other mediums. We should be cautious in terms of assigning meaning to the poems the agent finds. We are building a system on a pre-existing system (Google Search) that we do not have deep insight into. Therefore, until we can claim to know why each phrase or sentence has the given amount of search results, these resulting poems should be taken with a bit of skepticism.