

# 15-400 Project Proposal: The Scone Project

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## 1 Project Description

During the spring semester, I plan on working with Dr. Fahlman and his Scone Project research group. Scone is a knowledge-base system for symbolic knowledge. That is, it stores information in a more common-sense way than standard databases, including links between classes and superclasses and common reasoning (such as does object  $x$  have property  $y$ ?). The majority of Scone is a Common Lisp program that one currently has to interact with using Lisp commands. Thus, there are several paths my project could take, which will be decided more specifically after I familiarize myself with Scone.

Firstly, one of Dr. Fahlmans goals is making Scone more accessible for use as open-source software. The intention is that Scone should be easy to install and plug in as part of a larger project that requires a knowledge base for its information. While Scone is currently on GitHub, it does not have an easy tutorial and example knowledge bases to go along with it, so the setup generally requires one-on-one help. I could play a part in improving this process by creating a general-purpose knowledge converter to create example Scone-based knowledge bases from other knowledge bases, as creating knowledge bases from scratch is a time-consuming task.

Another project is the creation of a language processing part of Scone. The idea is to create a natural language tool that would allow most anybody to add information into the knowledge base by typing English sentences that contain the new knowledge into the tool. Then the tool would process this information and allow the necessary updates to be performed. Once again, this would allow for easier adoption of Scone as a system in someone elses project and lower the threshold on technical knowledge required. Out of the three options Ill describe, this one seems the likelier for me to be pursuing; I am also interested in taking the Natural Language Processing course next semester, which would be a good companion. Therefore, Ill be basing my project goals and the milestones on this project.

Finally, another current goal is to enable better representation of episodic knowledge, or knowledge of events, actions, plans, and so forth. For example, a robot with Scone as the underlying system would be able to create a sequence of actions that would form a plan to achieve some goal, but also understand the implied plan / sequence of actions to perform given somebody elses goal. This idea requires reasoning through multiple contexts (e.g. a humans mental state and the robots mental state) and while contexts are already part of Scone, the interaction between them in relations to a sequence of events is in progress.

## 1.1 Project Web Page

<http://sanopa.github.io/15400-web/>

## 2 Project Goals

To reiterate, these are based on the hypothetical project of creating a language processing tool to add knowledge with Scone.

**100%:** implement a limited-extent English sentence processing tool for Scone that, given a sentence, would perform all the necessary updates to Scone to reflect the changes the user intended. Its limited extent would mean that not all free-form English would be accepted, but variability in sentence structure would be processed without problems.

**75%:** implement a more-limited English sentence processing tool. For example, it would have more noticeable limitations - the sentences would have to follow a more constrained structure. However, all the necessary updates would still be performed and the requested information would be retrieved.

**125%:** complete the 100% goal, and at least begin to add a language other than English. I expect that if the infrastructure is set in place with the English implementation, adding a new language should be easier. I would start with a language close to English in terms of language families so minimize the special cases that could arise.

## 3 Milestones

### 3.1 15-300 Technical Milestone

For the rest of the semester, my goal is to get myself familiarized with Scone and read up on the previous work accomplished. By the end of the semester, I should have installed Scone and interacted with it to be able to create my own tiny knowledge base and interact with the information. I also plan on having a reading-level understanding of Common Lisp, and hopefully start on learning Common Lisp beyond the commands required to load and interact with Scone. Finally, I will keep reading the papers previously published that talk about the implementation of Scone to have more detailed knowledge. I also hope to have a better idea about my specific project after I complete this part, but still by the end of the semester.

### 3.2 Bi-Weekly Milestones

**January 25th:** being able to create concepts by processing limited word sequences

**February 8th:** being able to request all the other information with the same limited word sequences

**February 22nd:** accepting simple sentences for concept creation

**March 14th:** accepting simple sentences for other actions as well

**March 28th:** accepting sequences of sentences

**April 11th:** completing the 75% goal

**April 25th:** 100% goal

## 4 Literature Search

The papers on Scone are all accessible through a web page dedicated to the project, so that has been my source for the papers I have read so far. I have also looked at online tutorials having to do with Common Lisp; one of the research groups teammates also suggested a book on Common Lisp, which I will probably consult as well. Once my specific project is decided, I will have to find more information. Dr. Fahlman also maintains a slightly more general-purpose blog (though still focused on Scone) having to do with the trends in the area and some implementation decisions that have not made it into papers, so I have read some of the posts there as well.

## 5 Resources

As mentioned, Scones engine is implemented in Common Lisp, so as far as I know I require an installation of Common Lisp and the parts it requires. I have already installed it on my machine, which is sufficient so far; as far as I understand, my own machine is enough for running Scone as well.