

## **Sigma Language Translator**

### **Research Group:**

As a current member of the Automated Reasoning Tools (ARTists) research group, in the Department of Computer Science at the University of Miami, I have both witnessed and dealt with multiple investigations and projects in the field of Automated Reasoning devoted to primarily developing and expanding new theories and tools for logic based theorem libraries and systems. With such a high interest in the growth of Automated Theorem Proving (ATP) systems, I have undertaken a self-implementation project where I can aid in the expansion of both reasoning tools and their functionalities. Currently designing and creating a Java based conversion program, my goal is to translate the popular Knowledge Interchange Format (KIF) into the Thousands of Problems for Theorem Provers (TPTP) format. Once accomplishing this task, various other ATP systems can work in unison with KIF knowledge bases and allow the windows of communication with other systems to expand along with continuation of research undergoing in ATP.

### **Project Proposal:**

When enrolling into CSC410, my adviser Dr. Geoff Sutcliffe informed me that his acquaintance Adam Pease was working on a project and was requesting aid. Adam has constructed a system called Sigma that provides an environment for developing, viewing and debugging theories in first order logic. Sigma primarily works in the Knowledge Interchange Format (KIF) and in turn, Adam has created his own language SUO-KIF, a slight twist on KIF where he has added some of his interpretations. Dr. Sutcliffe too has developed his own library of problems known as the Thousands of Problems for Theorem Prover's (TPTP) that works for Automated Theorem Proving (ATP) systems and outputs such results into the TPTP format.

In order to further use other tools and work on new theories, the TPTP has become convenient for ATP systems. Adam thus would like a conversion tool to translate the KIF format into the TPTP format. In order to do so, I along with Dr. Sutcliffe, need to work on building the Sigma tool to better understand the purposes of Adam's project. Along with that, the dissection and understanding of the Adam's source code is necessary to work out all possible translations and properly allocate the new code to be integrated into the system. With the use of a parsing function that Adam has provided for us, I will scan each token in the quantified sentence of KIF files and apply a stack-based algorithm to accurately perform the conversion and provide Adam with the new ability that he desires.

Once converted, Sigma becomes open to a world of new purposes and functions that can propose new methods of theory investigation. Such applications such as Vampire can read Adam's SUO-KIF and from it, have the capability of reasoning in the different

knowledge bases Sigma has collected; however, the applications available at Adam's disposal are quite limited and can extend much further. By translating the KIF format into TPTP, various other ATP systems can work with in unison with his knowledge bases. The conversion is just one of the many tasks in the attempt at opening up the communication with other systems. While other issues such as resource management and TPTP output interpretation are at hand in accomplishing Adam's goal, I will take one step at a time to progress the project and complete his requests.