

CS350 – Lab 2

Due Date: February 14

Purpose: There is a direct relationship between two big concepts of *problems* and *languages*. A *language* is the set of *problem instances* which have the answer "yes". So now these languages can be described as *decidable* if there is a membership algorithm or *recognizable* if there is a program which accepts the strings in the language (and may reject or be undefined for strings not in the language).

The purpose of this lab is to explore the relationship between *problems* and *languages* as well as the differences between *decidable* and *recognizable* languages

Knowledge: This lab will help you become familiar with the following content knowledge:

- How to transform a problem into a language
- How to determine whether a language is recursive (decidable) and/or recursively enumerable (recognizable)
- How to determine if a class of languages is *closed* under an operation

Task: Follow the steps in this lab carefully to complete the assignments.

Assignment 1:

Complete exercises 4.20 on p70 of the text.

Criteria for Success: You have explanations for parts a) through d) and an example for part e).

Assignment 2:

Suppose that L is a finite language. Show that L^* is recursively enumerable.

Criteria for Success: One way to show that a language is recursively enumerable is to describe an enumeration procedure for it. Recall that *recursively enumerable* and *recognizable* mean the same thing.

Assignment 3:

Complete exercises 4.25 a) and 4.26 c) on p70 of the text.

Criteria for Success: You always show a closure property by showing that after performing the operation (complement, in this case) you still have a language of the same kind. Recall that *recursive* and *decidable* mean the same thing. Likewise *recursively enumerable* and *recognizable* mean the same thing.

Assignment 4:

Suppose we have a procedure for enumerating the language L in *proper order*, which is similar to dictionary ordering but we order first by the length of the strings. Show that this means that L is recursive.

Criteria for Success: One way to show that a language is recursive is to give a membership algorithm. Describe such an algorithm.

Submit your written answers in Canvas for grading or turn in on paper assignment if your prefer.