Building a Taxonomy of Genetic Programming

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Abstract

There is still a lack of theoretical guidance on the selection of operational parameters and only a handful of empirical studies have provided help with parameter selection, usually for a limited set of problems. By building a taxonomy of GP it is envisaged that further guidance will emerge to assist users of GP to choose appropriate parameters.

1 THE APPROACH OF THIS CONTRIBUTION

The primary aim of this work is to create a taxonomy by analysing the results of previous experiments and systems. It is then hoped that the application of the taxonomy to new problems will help workers in GP arrive at suitable parameter sets. It is noted that there is little in the way of a taxonomic analysis of GP in the literature.

This contribution starts by considering a variety of problems that have been tackled using GP. For each problem a number of attributes are collected and analyzed. In general the attributes include those which are commonly discussed in the GP literature. In addition, the problems themselves are analyzed to identify some more general attributes that may be of use when constructing the taxonomy. Once identified, the attributes can be used to construct the groups (taxa) and to separate these groups into subgroups (taxons).

A number of key characteristics of a taxonomy are identified and the resultant taxonomy evaluated against these criteria.

The attributes identified are placed into one of three high level categories. These three categories reflect the process of decomposition often encountered in problem solving and were chosen to reflect the process of solving a problem using GP.

2 A PRELIMINARY TAXONOMY

The attributes analysed so far have been used to construct a taxonomy, where the x axis represents the 3 main categories of attributes. Within each category the major attributes are placed. Where appropriate these have first been grouped together into distinct taxa, and these taxa then further separated into taxons. This taxonomy is shown in figure 1.

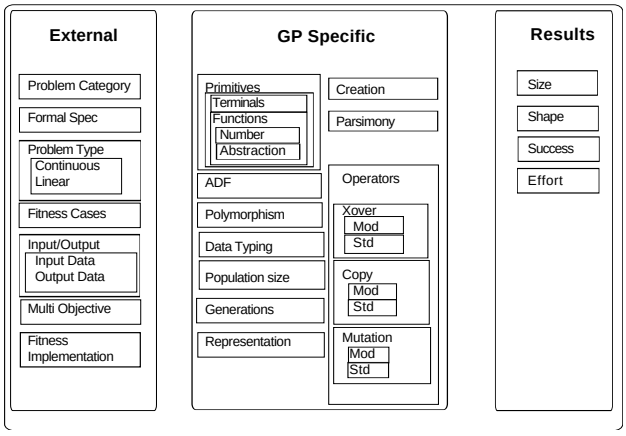

Figure 1: A Taxonomy of genetic programming

At the time of writing, over 130 examples of GP have been identified, and are being analysed, though the data set is not complete for these examples. The collection and analysis is ongoing work.

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