Programming by Examples

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Programming by Examples (PBE) has the potential to revolutionize end-user programming by enabling end users, most of whom are non-programmers, to create scripts for automating repetitive tasks. PBE involves synthesizing intended programs in an underlying domain-specific language from example based specifications (Espec). We will start out by formalizing the notion of Espec and the principles behind designing appropriate domain-specific languages.

A key technical challenge in PBE is to search for programs that are consistent with the Espec provided by the user. We will study a divide-and-conquer based search paradigm that leverages deductive rules and version space algebras. We will also briefly discuss other search paradigms based on constraint solving and heuristic based enumerative search.

Another technical challenge in PBE is to resolve the ambiguity that is inherent in the Espec. We will study how machine learning based ranking techniques can be used to predict an intended program within a set of programs that are consistent with the Espec. We will also discuss some user interaction models including program navigation and active-learning based conversational clarification that communicate actionable information to the user to help resolve ambiguity in the Espec.

The above-mentioned concepts will be illustrated using practical PBE systems for data manipulation (including FlashFill, FlashExtract, FlashRelate), some of which have already been deployed in the real world.

References

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[2] V. Le, S. Gulwani. *FlashExtract: A Framework for Data Extraction by Examples*. PLDI 2014.
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