Programming Not Only by Example

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Summary

This paper presents a novel approach to interacting with a synthesizer using a granular interaction model. The PBE approach is suitable for regular end-users who need more programming knowledge. But Using only examples is not expressive enough for programmers who can provide feedback on parts of the synthesized program. This interaction model is granular in both directions, from synthesizer to programmer and back. A candidate program is presented with debug information, showing execution values at different program points. And programmer can provide I/O examples (as in PBE) or granular feedback on the candidate program by explicitly accepting or rejecting parts of its code.

In the beginning, this paper tried to explain the insufficiency of examples by introducing two types of methods: Invertible and Nullipotent, which can produce equivalent programs. Examples only cannot role-out programs with such equivalent programs and couldn't avoid programs with incorrect methods if they are Invertible or Nullipotent.

Next describes the Granular Interaction Model (GIM) mechanism, which extends the PBE model with additional predicates, which allows the user to give feedback to the synthesizer on intermediate states. It has three primary operations. Remove filter programs that don't have some methods, retain filter programs that must have some methods, and affix filter programs with specified methods at the beginning. At every iteration, the user can give feedback with these types of operations to the synthesizer, which filters the program's space based on the user's feedback for finding the next candidate program.

Strengths

- It had a different idea from other papers because most have a basic PBA approach to synthesis programs. But this paper, besides the example, also counted on the programmer's knowledge.
- In the introduction section, the weakness of PBE methods and the reason for the need for interactive models are well explained.
- It also uses the programmer's knowledge to filter the search space and reduce the time to find the right program.
- Using various tables and experiments with different parameters has shown that this method is better than the previous methods.
- This innovative method is three times faster than previous example-only methods.

Weaknesses

- No specific idea has been proposed in the paper and it has tried to introduce a tool for interactive work with the synthesizer.
- In the introduction section, it has been mentioned several times that the previous PBE methods sometimes become difficult or impossible. It would have been better to provide a small example to clarify this.
- It was unnecessary to say the Advantages of granular interaction in the introduction section because all the topics were repetitive.
- There is an error in Table 1. q3 produces a program that returns the lexicographical minimum of all bigrams in the string. But in the first example, $'bd'$ isn't lexicographical minimum in the input string.
- The Key Aspects title at the end of page 3 should have been moved to the next page.
- Instead of explaining the primary approach, the overview section tried to clarify the introduction section with an example, which was not the place for this section.
- Claim 4.1 and its proof needs to be more evident and detailed, and it would have been better if it had been explained more precisely with an example.