QA Report

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研究題目：Step-by-step Folding Sequences from Origami Crease Patterns using Graph Rewriting

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Question 1:

Can your system cover all origami crease patterns?

Answer at presentation time:

A famous researcher in origami, Robert J. Lang, states that not all crease patterns can have a linear folding sequence, because the creases can be so interconnected that no linear sequence can be found [1]. The applicable set of CPs that can be handled is actually determined by the number of maneuvers that the system can handle.

Improved answer:

Not all CPs can be handled, but additionally, the system can output the result of the simplification of the input CP by using the registered maneuvers. This can still facilitate the folding of complex CPs to inexperienced folder even not outputting the complete step-by-step sequence.

Question 2:

In slide 16, you said that the model can be folded in several ways. I want to know if there is an optimal way to make the origami.

Answer at presentation time:

There is not an optimal way, because our goal is to reduce complexity of folding by breaking the sequence in several minor steps so that it will be easier for the user to follow the folding process. So the choice of the best path is subjective and free for the user to make.

Improved answer:

Although the choice is subjective, human beings tend to follow symmetrical step-by-step sequences for symmetrical CPs. By accounting facts like these the system could give only the sequences most likely to be chosen, also reducing computation time.

Question 3:

You said that the CP must meet some constraint. If the pattern does not meet such constraints the system fails to generate a solution. Is the system capable of telling in

advance if the CP can be handled?

Answer at presentation time:

It can tell only by trial and error. It tries to make the sequence and if it fails a dialogue is shown to the user telling that the system cannot handle this kind of CP.

Question 4:

But is it decidable is the CP can be handled without trial and error (regarding the explosion of possibilities)?

Answer at presentation time:

The system right now can handle only a few kinds of traditional origami steps so that by now there are not so many possibilities. So the system tries to make all the possibilities and if it is unable to get the unfolded square, it gives an error. But eventually if we increase the number of maneuvers, the possibilities will also increase drastically. There is no way yet to tell just by analyzing the input CP if it can or cannot be done.

Question 5:

Do you have a complexity analysis of the algorithm?

Answer at presentation time:

I do not have the complexity analysis but it uses, to match the patterns, subgraph isomorphism that is an np-complete problem.

Improved answer:

Although subgraph isomorphism is generally an np-complete problem, there are some cases in which it can be improved [2]. As origami crease patterns have some specific properties, further investigations are required to make the complexity analysis for the proposed algorithm.

Impressions:

By seeing the recording of the presentation, I saw that I was reading much of the presentation and have not memorized the main points of the presentation so that I could talk seeing the audience. Also, that caused the presentation to be longer than expected. I think the presentation can be improved by observing these points.

References:

[1] Lang R., "Origami Design Secrets: Mathematical Methods for an Ancient Art ", Second Edition. CRC Press (2012), pp. 680-681.

[2] Eppsteint D., "Subgraph Isomorphism in Planar Graphs and Related Problems", SODA '95 Proceedings of the sixth annual ACM-SIAM symposium on Discrete algorithms, pp. 632-640, 1995.