Bidirectional A*

Eckel, TJHSST AI1, Fall 2022

Background & Explanation

If you're working on this, you've done Bidirectional BFS as well as A*. You've also improved the efficiency of A* as far as you possibly could. This assignment is wide open – can you think of, or research, a way to combine these ideas?

There is a specific reason I'm asking you to do this, and it's not just for the fun of exploring. We've explored tradeoffs of runtime vs memory usage with ID-DFS, and we've explored tradeoffs of algorithmic simplicity vs runtime in looking at A* compared with BFS. There's one tradeoff we haven't explored yet – **runtime vs accuracy**. There are a bunch of ways of thinking about Bidirectional A*, and a lot of them don't give an accurate answer… but they do run *insanely* fast.

So: your exploration might lead you to an idea that rocks the whole korf100 in seconds, but produces paths that are not always ideal. Or, your exploration might lead you to an idea that doesn't improve much on normal A* but still guarantees ideal paths. Or both! It's up to you.

Required Task

You can go about this two ways, and I want to be clear both of them are 100% valid.

- Come up with something that feels like a bidirectional version of A* totally on your own and see what happens. You've played with a lot of search algorithms; you can probably find a way to incorporate these ideas on your own.
- Do some searching and see if you can find a description of Bidirectional A* somewhere. This could be online or at TJ; I believe Kim's AI classes have an assignment based on this; you can ask a student from that class or Kim herself to explain her ideas. (You can then use them or not, it's up to you.)

I personally enjoy the challenge of conceptualizing things on my own, and I want to be clear that if you do that I'm NOT grading you on how well you match some canonical version of this algorithm – I'm excited to see what you come up with even if it doesn't work out! Alternately, researching algorithms on your own is also an important skill if you continue in this field. Both are valuable experiences; do what feels right to you.

Specification

There is no link to submit this assignment. Do something, and then find a time to tell me about it, either in person or on Mattermost. I might ask you to send me your code or some more detailed writeups, depending on what you come up with. If this is the last assignment you work on in this unit, I'm happy for you to turn it in on the first day of the following unit so you can discuss it with me in class.

This assignment is **complete** if:

- You did something that is interesting, incorporates the ideas of Bidirectional BFS and A*, and told me about it and reported your results clearly.