SAT Based Two-Terminal Path Finding Demonstrate

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June 3, 2017

SAT Problem

Given a number of variables, functions, test if there is a way to fullfill them.

Integer satisfying proglem is **NP-Complete**

Z3

Z3 is a theorem prover from MSR, released using MIT license.

Z3 can automatically check and find a model in relatively short time.

For C, Z3 provides process based functions, while classes are provided for CPP.

Routes

For a block, it may belong to a specific path between a pair of terminals or nothing.

Let c_i be the number of block i.

If $c_i \neq 0$, i is on the ith path.

$$\sum c_j = 2(\text{j is next to i})$$

Minimize

For each terminal i

$$\sum c_j = 1(\text{j is next to i})$$

To maximize the pairs of satisfied pairs, you have to maximize

$$\sum (int)(c_j = terminal_j)(\text{j is terminal})$$

.

If the terminal pair on j is not chosen in the answer, we regard it as a whitespace.

Z3 optimize

From the task instructions, we are told that Z3 does not support maximize a variable. However, it does.

Using `optimize solver; solver.maximize(expr)` can maximize a variable.

Router class

Use vectors to store the map.

Build the equations to fulfill.

PPM

PPM is a file format on Linux, using **ASCII RGB Matrix** to indicate a picture.

`ppmtojpeg` provided by `NETPBM` can convert a ppm picture to jpeg easily.

Have a look

A game that can provide testcases

`http://www.4399.com/flash/187947.htm`