

Below we have two programs. The first, in Figure 1, might suffer from undefined behavior. The second program, in Fig-2, presents a performance problem that perhaps we could eliminate automatically.

```
01 void quocf(int a, int b) {
02     int quoc;
03     if (a != 0) {
04         quoc = b - a;
05     }
06     printf("Res: %d\n", quoc);
07 }
```

Figure 1: problem that might present undefined behavior.

```
01 int foo(int *v, int N, int a, int b) {
02     int add = a + b;
03     int res = add;
04     for (int i = 0; i < N; i++) {
05         int aux = v[i];
06         if (aux < a + b) {
07             a = aux;
08         }
09         res = a + b;
10     }
11     return res;
12 }
```

Figure 2: program that could benefit from optimizations.

1. What is the problem with the program in Fig-1?
2. Which information do you need to detect this problem automatically?
3. Could you come up with a general algorithm to find this kind of information that you need?
4. What is the problem with the program in Fig-2?
5. How could you detect this problem automatically? Which information would you need to do it?
6. Could you rewrite the program, so that the performance problem goes away?

