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 (b > a) {
04     quoc = b / a;
05   }
06   printf("Res: %d\n", quoc);
07 }
```

Figure 1: problem that might present undefined behavior.

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?

```
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.

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?

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DEPARTAMENTO DE CIÊNCIA DA COMPUTAÇÃO
Compilers Laboratory