

Exercise 13

Mar 29, 2010

1. Categorize the following program analysis problems based on their nature of approximation (may vs. must analysis), precision (flow/path and context sensitivity) and scope (local, regional, global, and whole program). Note that each analysis problem may be solved using multiple choices and you should try to list all the valid options.
 - (a) What statements can produce the value for each variable reference v .
 - (b) The loop dependence between two statements within a common loop.
 - (c) Whether or not the two variable references could be aliased.
 - (d) Whether or not the two variable references are always aliased.
 - (e) Whether a pointer variable reference could point to an invalid memory location.
2. Given the following C code,

```
int a[100];
int *p, *q = a+100]1;
for ([p = a]2; [p < q]3; [++p]4) {
    [*p = 0]5;
}
```

If we associate each pointer variable with a base location and an offset to the base, apply abstract interpretation to the given code and decide a location for each pointer variable.

3. Given the following C code.

```
int a, b, c;
int *[p = &a]1, *[q = &b]2, *[r = &c]3;
[read(&a)]4;
if ([a < 0]5)
    [q = &c]6;
[*r = 2]7;
```

Apply the type inference approach to determine which pointer variables may be aliased to the same location.