COL352 Lecture 1

Contents

1 Logistics

1.1 Lectures

1. Timings - Monday 11AM, Wednesday 11AM, Thursday 12PM
2. Mode - synchronous, MS Teams

1.2 Grading

Class participation	5%
Quizzes (best 3 of 4-5)	30%
HW (best 25 out of 30+)	25%
Major exam	40%

2 The Halting Problem

2.1 Statement

Does there exist a program H that always halts, and given inputs a program P and an input i, determine whether P terminates/halts on i?

2.2 Answer

No, there does not exist such a program.

2.3 Proof

Suppose there does exist such a program H.

Consider the following program C:

```
1: function C(P)
2:     if H(P, P) then
3:         run an infinite loop
4:     else
5:         return
6:     end if
7: end function
```

Now consider what happens when we call C on the input C.

Suppose $C(C)$ doesn't halt. Then this means that $H(C, C)$ is false (by the definition of H). Hence, by line 2, $C(C)$ must run forever, and this gives a contradiction.

Hence $C(C)$ must halt. But in that case, we have $H(C, C)$ to be true, and by line 2, we have a contradiction yet again.

Hence our assumption that such a program H exists is false, and we have proved the claim. ■.