~~The~~ The universal Turing machine

Idea: Specific TM U that takes in a TM M as input, along with input I to ~~that TM~~ M, and do whatever M does on I.

(i.e. U is a TM-interpreter)

In order for this to make sense, we need some standard for

1) How to specify M (for U)

2) How to specify I.

E.g. one possibility:

(I need to specify transitions, start state, final state)

- Note - an arbitrary TM has an arbitrary alphabet - I can't allow this for U since U must have a single

How can we construct U?

We'll construct a 3-head 3-tape machine:

(well, there might be tempory changes)

Tape 1: Always just has (the encoding of) M.

Tape 2: The tape contents of M at the current point of the computation. (encoded (as 1's + #'s))

Tape 3: The current state of M (encoded as some number of 1's)

~~(Maybe we need a tape~~

(Maybe the current head position of tape 2 also has a special mark.)

We have to make U simulate M. So we should think about the "loop" on U that simulates a single transition in M.

2) Update ~~the~~ tape 2 & tape 3

a) copy the new state to tape 3
(and blank the rest of it)

b) copy the new symbol to tape 2
(moving the stuff do the right either to make room or to delete blank room as necessary)

c) move the marker for current spot on tape 2 as necessary.

This is the loop for 1 step.