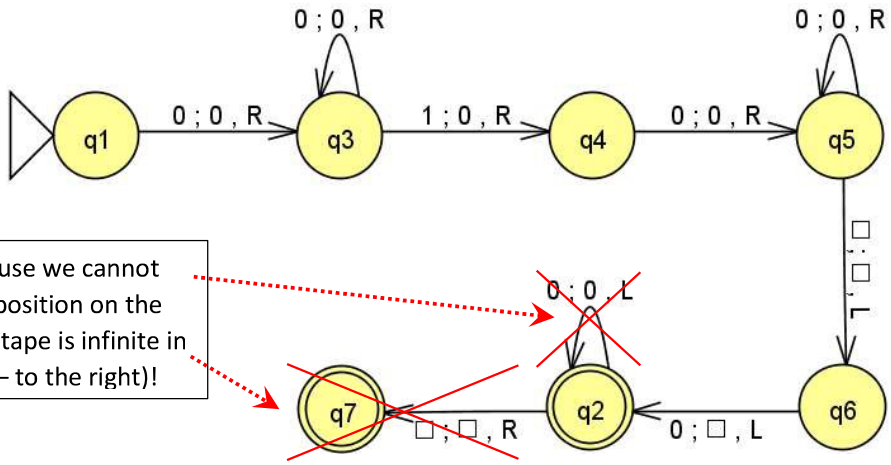
Reduction L_U → L_{MPCP}:

$M_U = \langle M_+ , w \rangle$ M_+ = TM for addition (of 2 natural numbers) $w = 0010$

M_+:



Not possible, because we cannot go left of the first position on the tape (assumption: tape is infinite in just one direction – to the right)!

Transition function of M_+:

1 $\delta(q_1, 0) = (q_3, 0, R)$ → $(q_1 0, 0 q_3)$
2 $\delta(q_3, 0) = (q_3, 0, R)$ → $(q_3 0, 0 q_3)$
3 $\delta(q_3, 1) = (q_4, 0, R)$ → $(q_3 1, 0 q_4)$
4 $\delta(q_4, 0) = (q_5, 0, R)$ → $(q_4 0, 0 q_5)$
5 $\delta(q_5, 0) = (q_5, 0, R)$ → $(q_5 0, 0 q_5)$
6 $\delta(q_5, B) = (q_6, B, L)$ → $(0 q_5 \#, q_6 0 \#)$, $(1 q_5 \#, q_6 1 \#)$
7 $\delta(q_6, 0) = (q_2, B, L)$ → $(0 q_6 0, q_2 0)$, $(1 q_6 0, q_2 1)$

MPCP pairs:

$(0q_20, q_2)$	(q_20, q_2)	A
$(0q_21, q_2)$	(q_21, q_2)	
$(1q_20, q_2)$	$(0q_2, q_2)$	
$(1q_21, q_2)$	$(1q_2, q_2)$	
$(\#, \#)$		B
$(0, 0)$		
$(1, 1)$		
$(q_2\#\#, \#)$		F

The derivation of the string »0010«:

$q_1 0010 \vdash^{1} 0 q_3 010 \vdash^{2} 00 q_3 10 \vdash^{3} 000 q_4 0 \vdash^{4} 0000 q_5 \vdash^{6} 000 q_6 0 \vdash^{7} 00 q_2 0$

The sequence of MPCP pairs when deriving the string »0010«:

$\#q_1 0010\#0q_3 010\#0q_3 10\#00q_4 0\#000q_5\#00q_6 0\#0q_2 0\#q_2\#\#$

1 2 3 4 6 7 A F

$\#q_1 0010\#0q_3 010\#0q_3 10\#00q_4 0\#000q_5\#00q_6 0\#0q_2 0\#q_2\#\#$