Counter-example to the solution proposed for the Kleene* construction during Lecture 2

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Let $\Sigma = \{0, 1\}$. We consider the NFA N_1 depicted below which recognizes the language 1^*0.

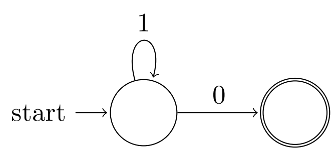

Figure 1: NFA $N_!$

We want to build N_2, a NFA recognizing $(1^*0)^*$. We distinguish between two cases:

Case 1: Following the lecture's recipe We obtain NFA N_2 (Figure 2).

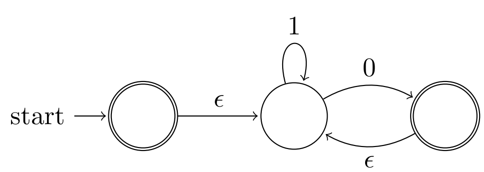

Figure 2: Case 1: NFA N_2

Case 2: Following the suggestion in the lecture As a reminder, the suggestion was to not add the extra starting state but turning the existing starting state into an accepting one instead (the rest of the recipe is kept as in case 1). Doing so, we obtain the NFA N_2' (Figure 3).

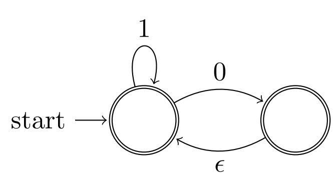

Figure 3: Case 2: NFA N_2'

One can see that $L(N_2') \neq (1^*0)^*$. For instance, it accepts the string 11111 while it should not.