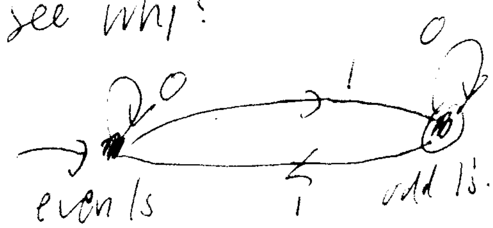
CSE 316 Recitation Examples (if time) Spring 2019

$L_1 = \{x \in \{0,1\}^* : x$ has an odd number of 1s$\}$. How to design a regular expression r_1 such that $L_1 = L(r_1)$?

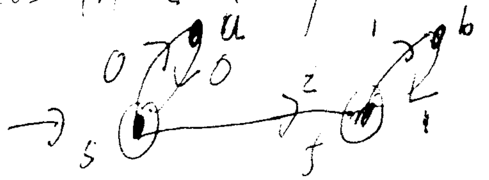
Directly: $L_0 = \{x : x$ has an even number of 1s$\}$ $(= \tilde{L_1})$ has the regular expression $r_0 = (0^*10^*10^*)^*$ (with two levels of * nesting). So take $r_1 = r_0 \cdot 0^*10^*$ since adding one 1 to "even" makes "odd". This gives $(0^*10^*10^*)^*0^*10^*$ which simplifies to $(0^*10^*10^*)^*10^*$ or to $(0^*10^*1)^*0^*10^*$ — see why?

By Machine: Design M_1 = 

so $L(M_1) = L_1$.

By the formula (to be) given in class, $L(M_1) = (0 + 10^*1)^*10^*$. Also $0^*1(0+10^*1)^*$. How can all these different answers be equally correct? We'll come to this in the last weeks on complexity.

Example 2: Build machines for $r = (00)^* \cdot (11)^*$. The NFA really needs an ϵ-arc for the concatenation $\bullet$ but not elsewhere:

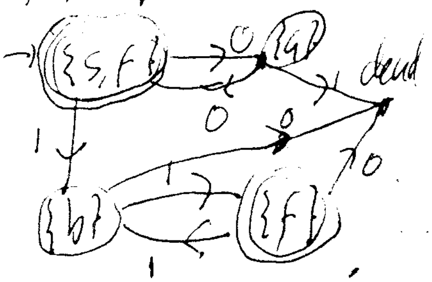
$N =$ 

δ:	0	1
s	a	$\emptyset$
a	s, f	$\emptyset$
b	$\emptyset$	f
f	$\emptyset$	b

$\Delta(S,0) = \delta(s,0) \cup \delta(f,0) = \{a\} \cup \emptyset = \{a\}$

$\Delta(S,1) = \emptyset \cup \{b\} = \{b\}$

We didn't need to make the start state accepting — it has an ϵ-arc to the accepting state f. But what we need to know is $S = \{s,f\}$ for the DFA M:

$M =$ 

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