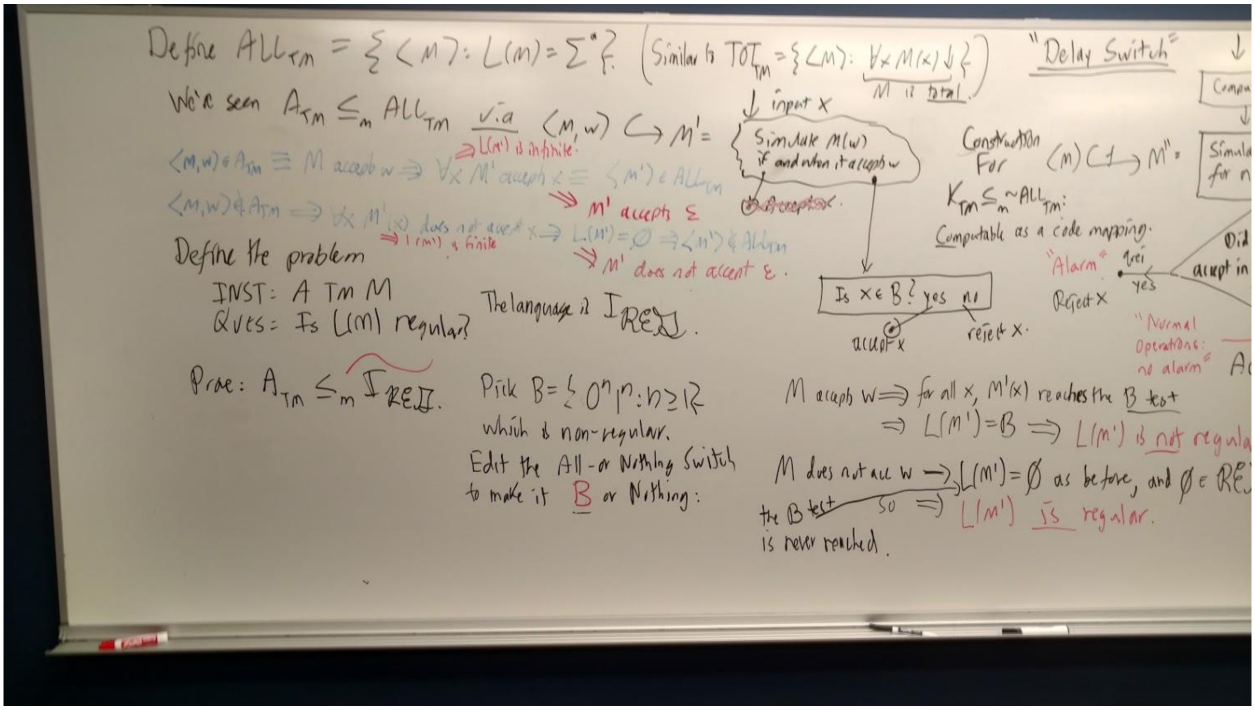
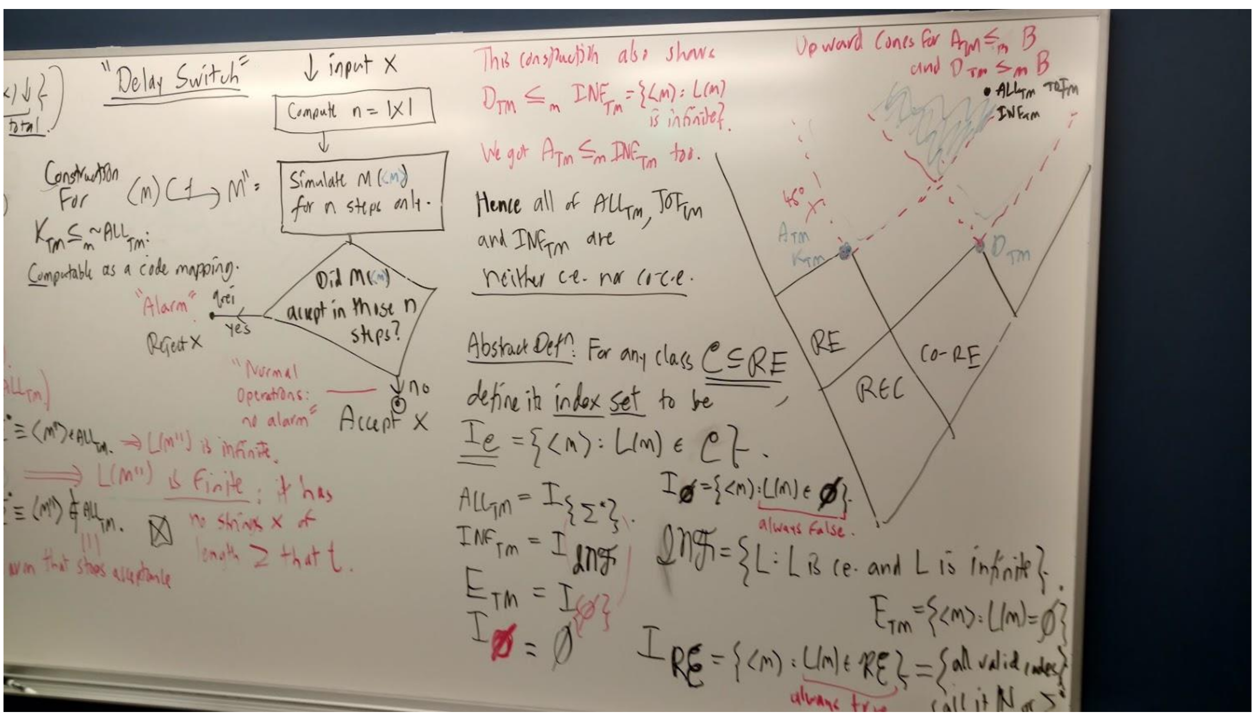
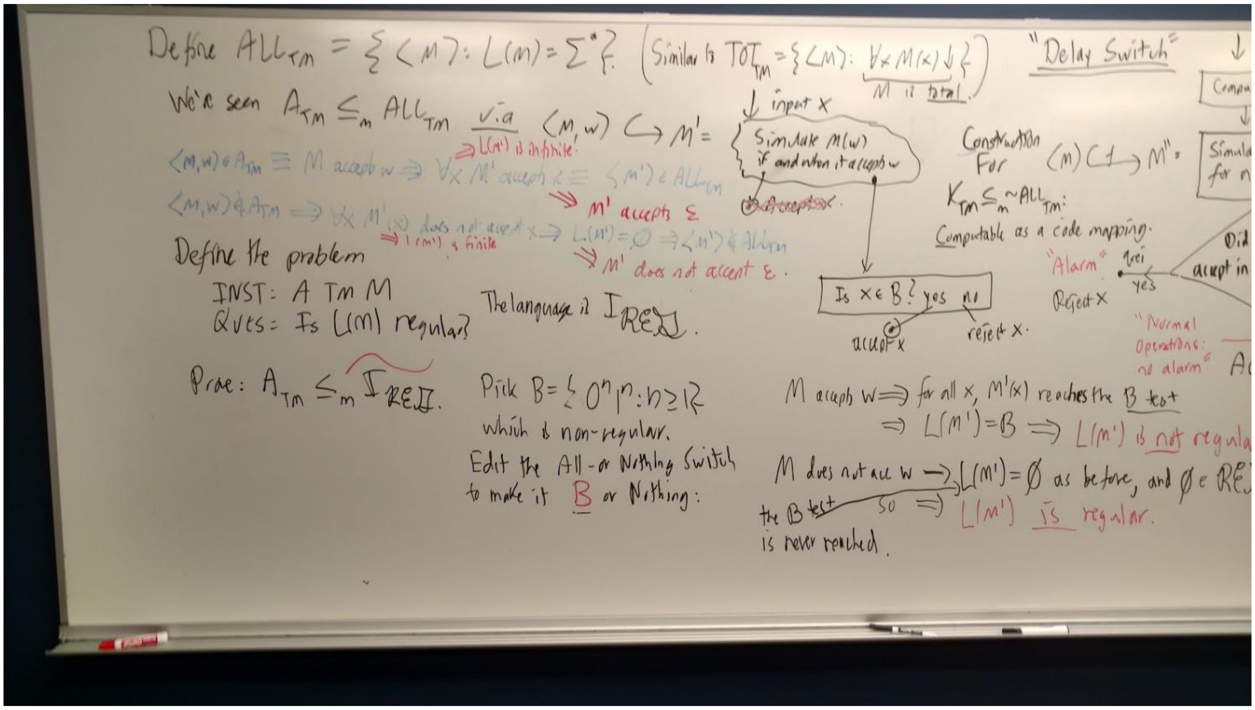
CSE596 Lecture Monday Oct. 7






Define $ALL_{TM} = \{\langle M\rangle : L(M) = \Sigma^*\}$.
(Similar to $TOT_{TM} = \{\langle M\rangle : \underbrace{\forall x\, M(x)\downarrow}_{M \text{ is total}}\}$)
"Delay Switch"
We've seen $A_{TM} \leq_m ALL_{TM}$ via $\langle M, w\rangle \hookrightarrow M' =$
$\Rightarrow L(M')$ is infinite.
$\langle M,w\rangle \in A_{TM} \equiv M$ accepts $w \Rightarrow \forall x\, M'$ accepts $x \equiv \langle M'\rangle \in ALL_{TM}$
$\Rightarrow M'$ accepts Σ
$\langle M,w\rangle \notin A_{TM} \Rightarrow \forall x\, M'(x)$ does not accept $x \Rightarrow L(M') = \emptyset \Rightarrow \langle M'\rangle \notin ALL_{TM}$
$\Rightarrow L(M')$ is finite
$\Rightarrow M'$ does not accept ε.
input x
Simulate M(w)
if and when it accepts w
~~Accept x~~.
Is $x \in B$? yes no
accept x
reject x.
Construction For $\langle M\rangle \xrightarrow{f} M'' =$
$K_{TM} \leq_m \sim ALL_{TM}$:
Computable as a code mapping.
"Alarm"
Reject x
yes
Did
accept in
"Normal Operations: no alarm"
Define the problem
INST: A TM M
QUES: Is L(M) regular?
The language is I_{REG}.
Prove: $A_{TM} \leq_m I_{REG}$.
Pick $B = \{0^n 1^n : n \geq 1\}$
which is non-regular.
Edit the All-or Nothing Switch
to make it B or Nothing:
M accepts $w \Rightarrow$ for all x, $M'(x)$ reaches the B test
$\Rightarrow L(M') = B \Rightarrow L(M')$ is not regular
M does not acc $w \rightarrow L(M') = \emptyset$ as before, and $\emptyset \in REG$
the B test is never reached.
so $\Rightarrow L(M')$ is regular.